Management of hepatitis B immunizations and blood exposure incidents in primary care

N. A. L. Smith

Aim
To investigate how well primary care health care workers, with no access to an occupational health service (OHS), have managed their hepatitis B immunizations and blood exposure incidents, compared with National Health Service Trust staff, with access to an OHS.

Method
A questionnaire was sent to 78 general practitioners (GPs), 93 general practice nurses, 81 NHS Trust consultants and 88 NHS Trust community nurses, in the Airedale area of West Yorkshire in June 2001.

Results
The response rate was 80%. GPs were significantly less likely than consultants to have received a hepatitis B booster vaccination after their primary course (57 versus 80%, \(P < 0.009\)) and significantly less likely to have had their blood anti-HBs test checked after their last vaccination (74 versus 94%, \(P < 0.011\)). General practice nurses were significantly less likely to fill in a blood exposure incident form after an injury than community nurses (56 versus 91%, \(P < 0.006\)). Overall, the group with access to an OHS was significantly more likely to have received a hepatitis B booster (\(P < 0.036\)), have had a blood anti-HBs test after last vaccination (\(P < 0.010\)) and to have filled in a blood exposure incident form after last blood exposure (\(P < 0.033\)), than the group without access to an OHS.

Conclusion
Any future OHS with responsibility for primary care, should consider calling in all GPs and general practice nurses for a review of their hepatitis immunity and for education regarding the management of blood exposure incidents.

Key words
Blood exposure incidents; doctors; general practitioners; health care workers; hepatitis B; National Health Service; nurses; occupational health service; primary health care.

Introduction
Wood [1] in 1989 and Kinnersley [2] in 1990 examined GPs’ attitudes to getting self-vaccination against hepatitis B. Wood found that despite the risks, 21% of GPs had no intention of being vaccinated [1]. Kinnersley found that only 48% of GPs had been vaccinated, although 88% thought they should be. Most who had not been vaccinated gave the reason ‘I just have not got round to it’ [2]. These studies are now over 10 years old, but we do not know whether the situation has improved in the UK. A more recent study by McCall and colleagues in 1999 from Victoria, Australia, surveyed 544 GPs [3]. They found 87% had completed vaccination, but only 49% had confirmed immunity to hepatitis B. They also found that half of the respondents would take no action after a needle-stick injury.

Miller undertook an in-depth audit at five randomly selected general practices in North Staffordshire. She found that there were no policies or procedures in place for screening of GP or staff hepatitis immunity [4]. Some evidence exists that occupational health services
(OHS) can improve the uptake of hepatitis B vaccine in hospitals. Stuart and colleagues in 1988 found that offers of immunization against hepatitis B from an OHS, over a 5 year period, doubled the rate of uptake in 72 orthopaedic surgeons [5]. Caruana-Dingli surveyed 140 surgeons and interventional cardiologists in 1994 [6]. He found that 90% had been immunized against hepatitis B, mostly by an OHS and 80% had their anti-HBs tested after immunization. 

Williams and colleagues [7], Nelsing and colleagues [8] and Burke and Madan [9] have shown that health care workers in hospitals are poor at reporting blood exposure incidents. 

Lum and colleagues sent a postal survey about needle-stick injuries to GPs and practice nurses in New Zealand in 1997 [10]. They found that recommended precautionary measures were not being followed by most individuals.

OHS are actively involved in the management of blood exposure incidents. The North Thames (East) Regional Occupational Health Audit Group looked at the management of reported incidents of exposure to blood in 15 OHS [11]. Although there was variation in provision, 11 units routinely took blood samples from the staff member and 12 took blood from source patients (albeit eight in high risk cases only).

For >20 years, an OHS has been provided for staff of the Airedale NHS Trust, including consultants and community nurses. This service has provided both primary and booster hepatitis B immunizations, along with blood anti-HBs testing 2–4 months after immunization. Blood exposure incidents have always been managed by individual wards or departments, according to the Sharps Injury Policy, with a staff member responsible for ensuring blood exposure injury forms were filled in and blood samples taken from the injured staff member and the source patient.

In contrast, there has never been an OHS provided for GPs and their practice nurses in the Airedale or Bradford areas. GPs have been responsible for organizing their own hepatitis B immunizations, and management of blood exposure incidents. Because GPs are the employers of their general practice nurses, they are also responsible for their nurses’ occupational health.

This study aimed to answer the question of how well a group of primary care health care workers, consisting of general practitioners and general practice nurses, have managed their hepatitis B immunizations and blood exposure incidents compared with consultants and community nurses employed by an NHS Trust hospital. These GPs and general practice nurses have had no access, in their current posts, to an OHS, unlike the consultants and community nurses.

The study further aimed to answer the question of whether they would benefit from OHS provision to help manage their hepatitis B immunizations and blood exposure incidents.

**Methods**

In June 2001 a questionnaire was sent to GPs, general practice nurses, consultants and community nurses working in the Airedale area of West Yorkshire, UK. Non-respondents to the first questionnaire were sent an identical reminder questionnaire 6 weeks later.

In total, 340 questionnaires were sent to:

1. 78 GPs working in the Airedale Primary Care Trust area and the adjacent Craven Primary Care Group area;
2. 93 general practice nurses working for GPs in the Airedale Primary Care Trust, Craven Primary Care Group and adjacent Bradford City Primary Care Trust;
3. 81 consultants employed by Airedale NHS Trust;
4. 88 community nurses (district nurses, health visitors and psychiatric nurses) employed by Airedale NHS Trust.

GPs and general practice nurses were identified from primary care trust/group records. Consultants and community nurses were identified from Airedale NHS Trust employment records. All the members of the defined groups were sent a questionnaire, negating the need for any form of randomization.

The questionnaire was an original design and sent with a covering letter to the study population. Questions were short and simple with yes/no and don’t know answers. The questions included such demographic details as sex, date of birth, main occupation [including whether exposure prone procedures (EPPs) were undertaken] and length of time in current post. Subjects were also asked for details about hepatitis B vaccinations and blood exposure incidents.

The questionnaire was peer-reviewed by a local consultant occupational physician with research experience and was approved by the ethics committee of Manchester University and the Airedale Local Research Ethics Committee.

A pilot study sampling 20 health care workers (five consultants, five GPs, five community nurses and five general practice nurses) was undertaken in early May 2001 and the questionnaire refined following this. The pilot sample were all employed in the Airedale area and were excluded from the main study results.

The main outcome measures were whether the health care worker had (i) received a primary course of three hepatitis B vaccines, (ii) received a hepatitis B booster vaccination after the primary course, (iii) had blood anti-HBs testing after their last hepatitis B vaccination and (iv) received appropriate management of their last
blood exposure incident (defined by a blood exposure incident form being filled in and a blood sample taken from the health care worker after the incident). Blood taken from the source patient was not included as the source could not be identified in all incidents.

The power of the study was calculated using the STATA software package. This showed that if the uptake of hepatitis B vaccine and appropriate management of blood exposure incidents was 80% in consultants and community nurses and 50% in GPs and general practice nurses, then the power of the study to reach a statistically significant conclusion at the 5% level would be 96.5% with the numbers being used.

All data from questionnaires were analysed using SPSS v. 10.1 for Windows software.

In the statistical analysis, GPs were compared to consultants and general practice nurses were compared with community nurses. The group with an OHS (consultants and community nurses) was compared with the group without an OHS (GPs and general practice nurses).

Sometimes, an individual question was not answered by those who completed the questionnaire. Comparisons between groups were confined to question responders only.

Differences in proportions between the groups were calculated and analysed by either the Pearson or Mantel–Haenszel χ² tests or Fisher's exact test. Statistically significant differences between the groups were considered present if P < 0.05.

Results
Demographic data and health care workers' replies to questions about hepatitis B vaccinations and blood exposure incidents are contained in Tables 1–3.

Table 1. Demographic data and the responses of the various categories of health care worker to questions about hepatitis immunity and blood exposure incidents

<table>
<thead>
<tr>
<th></th>
<th>Consult.</th>
<th>GPs</th>
<th>Comm. nurses</th>
<th>GP nurses</th>
<th>Group with access to OHS</th>
<th>Group with no access to OHS</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Response rate [number (%)]</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean age (years)</td>
<td>46.5</td>
<td>45.2</td>
<td>45.0</td>
<td>44.4</td>
<td>45.6</td>
<td>44.8</td>
<td>–</td>
</tr>
<tr>
<td>Number of females (%)</td>
<td>25</td>
<td>37</td>
<td>90</td>
<td>100</td>
<td>62</td>
<td>71</td>
<td>67</td>
</tr>
<tr>
<td>Mean time working in current post (years)</td>
<td>9.7</td>
<td>14.5</td>
<td>8.3</td>
<td>8.0</td>
<td>8.9</td>
<td>10.9</td>
<td>–</td>
</tr>
<tr>
<td>Number perceiving risk of catching hepatitis B in post (%)</td>
<td>94</td>
<td>96</td>
<td>87</td>
<td>97</td>
<td>90</td>
<td>97</td>
<td>93</td>
</tr>
<tr>
<td>Number who felt they were immune to catching hepatitis B in post (%)</td>
<td>85</td>
<td>70</td>
<td>71</td>
<td>67</td>
<td>77</td>
<td>68</td>
<td>73</td>
</tr>
<tr>
<td>Number who felt they performed EPPs (%)</td>
<td>80</td>
<td>90</td>
<td>65</td>
<td>97</td>
<td>72</td>
<td>94</td>
<td>82</td>
</tr>
<tr>
<td>Mean number of years since last blood exposure</td>
<td>5.2</td>
<td>8.4</td>
<td>8.7</td>
<td>5.0</td>
<td>6.7</td>
<td>6.4</td>
<td>–</td>
</tr>
<tr>
<td>Number instructed what to do if they had blood exposure (%)</td>
<td>80</td>
<td>82</td>
<td>96</td>
<td>97</td>
<td>89</td>
<td>90</td>
<td>90</td>
</tr>
<tr>
<td>Number who received counselling after last blood exposure (%)</td>
<td>11</td>
<td>8</td>
<td>13</td>
<td>31</td>
<td>12</td>
<td>21</td>
<td>16</td>
</tr>
</tbody>
</table>

OHS group = consultants and community nurses. Non-OHS group = GPs and GP nurses. EPPs = exposure prone procedures. Consult., consultants; Comm., community.
booster (77 versus 65%), have had a blood anti-HBs test after last vaccination (89 versus 76%) and to have filled in a blood exposure incident form after last blood exposure (64 versus 45%), than the group without access to an OHS.

Because of the differences in gender and length of time in post between the groups, results were stratified for sex (male and female) and length of time in post (≤11 and >11 years).

When stratified for sex, the differences found between

---

**Table 2.** Outcome measure responses of the various categories of health care workers to questions about hepatitis B vaccinations and blood exposure incidents (including statistical tests of differences between the groups)

<table>
<thead>
<tr>
<th>Health care workers who received a primary course of three hepatitis B vaccinations [number (%)]</th>
<th>Consult. Group with access to OHS</th>
<th>GPs Group with no access to OHS</th>
<th>Community nurses Total</th>
<th>GP nurses Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>56 (92)</td>
<td>130 (92)</td>
<td>49 (96)</td>
<td>115 (95)</td>
<td>245 (93)</td>
</tr>
<tr>
<td>Differences in proportions between groups (P-value)</td>
<td>P &lt; 0.72a</td>
<td>P &lt; 0.513a</td>
<td>P &lt; 0.264b</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Health care workers who received a hepatitis B booster vaccination after primary course [number (%)]</th>
<th>Consult. Group with access to OHS</th>
<th>GPs Group with no access to OHS</th>
<th>Community nurses Total</th>
<th>GP nurses Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>44 (80)</td>
<td>98 (77)</td>
<td>44 (72)</td>
<td>74 (65)</td>
<td>172 (71)</td>
</tr>
<tr>
<td>Differences in proportions between groups (P-value)</td>
<td>P &lt; 0.009b</td>
<td>P &lt; 0.708b</td>
<td>P &lt; 0.036b</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Health care workers who received a hepatitis B blood antibody test after last vaccination [number (%)]</th>
<th>Consult. Group with access to OHS</th>
<th>GPs Group with no access to OHS</th>
<th>Community nurses Total</th>
<th>GP nurses Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>45 (94)</td>
<td>101 (89)</td>
<td>49 (78)</td>
<td>81 (76)</td>
<td>182 (83)</td>
</tr>
<tr>
<td>Differences in proportions between groups (P-value)</td>
<td>P &lt; 0.011b</td>
<td>P &lt; 0.217b</td>
<td>P &lt; 0.010b</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Health care workers who suffered a blood exposure incident [number (%)]</th>
<th>Consult. Group with access to OHS</th>
<th>GPs Group with no access to OHS</th>
<th>Community nurses Total</th>
<th>GP nurses Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>38 (61)</td>
<td>61 (52)</td>
<td>33 (51)</td>
<td>57 (48)</td>
<td>118 (45)</td>
</tr>
<tr>
<td>Health care workers who filled in a blood exposure incident form [number (%)]</td>
<td>Consult. Group with access to OHS</td>
<td>GPs Group with no access to OHS</td>
<td>Community nurses Total</td>
<td>GP nurses Total</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>18 (49)</td>
<td>38 (64)</td>
<td>18 (56)</td>
<td>25 (45)</td>
<td>63 (55)</td>
</tr>
<tr>
<td>Differences in proportions between groups (P-value)</td>
<td>P &lt; 0.131b</td>
<td>P &lt; 0.006b</td>
<td>P &lt; 0.033b</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Health care workers who had a blood sample taken from them after last blood exposure [number (%)]</th>
<th>Consult. Group with access to OHS</th>
<th>GPs Group with no access to OHS</th>
<th>Community nurses Total</th>
<th>GP nurses Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>16 (44)</td>
<td>33 (56)</td>
<td>22 (71)</td>
<td>29 (53)</td>
<td>62 (54)</td>
</tr>
<tr>
<td>Differences in proportions between groups (P-value)</td>
<td>P &lt; 0.233b</td>
<td>P &lt; 0.811b</td>
<td>P &lt; 0.731b</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Health care workers who had appropriate management of last blood exposure [number (%)]</th>
<th>Consult. Group with access to OHS</th>
<th>GPs Group with no access to OHS</th>
<th>Community nurses Total</th>
<th>GP nurses Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>15 (39)</td>
<td>31 (50)</td>
<td>16 (49)</td>
<td>22 (38)</td>
<td>53 (44)</td>
</tr>
<tr>
<td>Differences in proportions between groups (P-value)</td>
<td>P &lt; 0.229b</td>
<td>P &lt; 0.117b</td>
<td>P &lt; 0.183b</td>
<td></td>
</tr>
</tbody>
</table>

OHS group = consultants and community nurses. Non-OHS group = GPs and GP nurses.

aFisher’s exact test.
bPearson χ².

---

**Table 3.** Hepatitis B immunizations and blood exposure incidents in consultants who perform EPPs, consultants who do not perform EPPs and GPs

<table>
<thead>
<tr>
<th>Number of health care workers who had received a primary course of three hepatitis B vaccinations</th>
<th>Consultants who perform EPPs [number (%)]</th>
<th>Consultants who do not perform EPPs [number (%)]</th>
<th>GPs [number (%)]</th>
<th>Differences in proportions between consultants who do not perform EPPs and GPs (P-values)</th>
</tr>
</thead>
<tbody>
<tr>
<td>29 (91)</td>
<td>27 (93)</td>
<td>52 (95)</td>
<td>P &lt; 0.192a</td>
<td></td>
</tr>
<tr>
<td>Number of health care workers who had received a hepatitis B booster</td>
<td>24 (89)</td>
<td>20 (71)</td>
<td>30 (57)</td>
<td>P &lt; 0.235a</td>
</tr>
<tr>
<td>Number of health care workers who had a hepatitis B blood antibody test</td>
<td>25 (100)</td>
<td>20 (87)</td>
<td>32 (74)</td>
<td>P &lt; 0.695a</td>
</tr>
<tr>
<td>Number of health care workers who had suffered a blood exposure incident</td>
<td>21 (66)</td>
<td>17 (57)</td>
<td>24 (44)</td>
<td></td>
</tr>
<tr>
<td>Number of health care workers who had adequate management of last blood exposure</td>
<td>10 (46)</td>
<td>5 (29)</td>
<td>6 (24)</td>
<td></td>
</tr>
</tbody>
</table>

bPearson χ².
consultants and GPs were still significant for both receiving a hepatitis B booster (Mantel–Haenszel $\chi^2$, $P < 0.017$) and receiving a blood anti-HBs test (Mantel–Haenszel $\chi^2$, $P < 0.035$).

When stratified for length of time in post, there was still a significant difference between consultants and GPs for receiving a hepatitis B booster (Mantel–Haenszel $\chi^2$, $P < 0.012$). However, for the blood antibody results, analysis just failed to show a significant difference between consultants and GPs (Mantel–Haenszel $\chi^2$, $P < 0.10$). The non-responders to questions were also examined.

Seven consultants failed to respond to the booster hepatitis B vaccination question compared with two GPs. If all the consultants and GPs who didn’t answer this question were counted as not having received the booster, then analysis just failed to show a significant difference between the consultants and GPs ($\chi^2$, $P < 0.066$).

Fourteen consultants either did not answer or answered ‘don’t know’ to the blood antibody question compared with 12 GPs. If all the missing answers for both groups are counted as not having received the blood antibody test, then analysis again just failed to show a significant difference between the consultants and GPs ($\chi^2$, $P < 0.101$).

Some consultants, particularly those in surgical specialties who perform EPPs, may have had their hepatitis B immunity checked because of guidance received from the UK Health Departments in 1993 and 1996 [HSG(93)40 and EL(96)77] [12,13]. Results of consultants not performing EPPs and GPs were therefore analysed and showed no significant differences for having received a hepatitis B booster, having had a blood anti-HBs test and having appropriately managed their last blood exposure incident (Table 3).

**Discussion**

The principal findings of the study were as follows.

1. GPs and general practice nurses were statistically no less likely than consultants or community nurses to have had a primary course of three hepatitis B vaccinations. This result directly contradicts the findings of Wood in 1989 [1] and Kinnersley in 1990 [2] and shows that 11 years on, GPs in this area have organized a primary course of vaccinations for themselves.

2. GPs were significantly less likely than consultants to have received a hepatitis B booster vaccination after their primary course of three vaccinations. This is an important finding because there are 30,685 GPs in England who are potentially affected by this result [14]. Also, 44% of GPs in this study had suffered a blood exposure incident (Table 2), and could as a result have caught hepatitis B. However, the European Consensus Group in 2000 suggested that a booster dose might be unnecessary in immunocompetent individuals who have responded to a primary course [15].

3. General practitioners were, however, statistically less likely than consultants to have had their blood anti-HBs level checked 2–4 months after their last hepatitis B vaccination. Thus, many GPs in this study remain unaware if they are immunocompetent even if they have been vaccinated.

4. Health care workers without access to an OHS (GPs and GP nurses), were statistically less likely to have received a hepatitis B booster and a blood anti-HBs test than health care workers with access to an OHS (consultants and community nurses). This fact supports Stuart and colleagues’ work in 1988, in which offers from an OHS doubled the rate of uptake of immunizations [5].

5. General practice nurses were statistically less likely than community nurses to fill in a blood exposure incident form after a blood exposure incident at work and those health care workers without access to an OHS were also statistically less likely to have filled in a blood exposure incident form.

In 1999, Leliopoulou et al. [16] showed that nurses in high-risk groups were more concerned about needle-stick injury than nurses in low risk groups. Here, however, primary care nurses, who appear to be more at risk, seem the least concerned.

The most likely reason for NHS Trust staff, in this study, managing blood exposure incidents better than primary care staff is the existence of an established blood exposure incident protocol used by Trust staff.

NHS Trust community nurses in this study filled in a blood exposure incident form in 91% of incidents and had blood taken from themselves in 74% of incidents (Table 2), which is a more reassuring result than that obtained by Burke and Madan [9]. Consultants’ results for appropriate management of last blood exposure incident are better than those reported for doctors by Burke and Madan, although still far from ideal (Table 2).

GP and general practice nurses, but also consultants, need re-educating about the risks from blood exposure incidents and the protocols to follow.

6. A subgroup of community nurses (health visitors) did not perceive there to be a risk of catching hepatitis B in their job. While the risk to health visitors may be low, it does exist, and this group should be educated further about the risks in their field of work.

7. In three occupational groups (GPs, community nurses and general practice nurses), a high proportion of respondents were unsure whether they were immune to catching hepatitis B. This situation could be remedied by an OHS which provided blood
antibody testing after vaccination, along with appropriate communication of results.

8. The majority of respondents in all occupational groups were not offered counselling or advice after a blood exposure incident. This needs to be remedied and should be provided after every incident, ideally by an OHS.

9. A high proportion of health care workers in all occupational groups were of the opinion that they performed EPPs. GPs, community nurses and practice nurses will not perform EPPs. These groups need educating about what constitutes an EPP, such that they do not consider themselves eligible for inappropriate blood tests and follow up.

Strengths of this study were that it had a high response rate from participants and that responses were totally confidential.

Confounding or bias could have weakened this study. The results showing that GPs were less likely than consultants to have had a blood antibody test could have been confounded by differences in length of time in post between the consultants and GPs.

A questionnaire study such as this may suffer from recall bias from the respondents. It is unlikely, however, that one group of doctors or nurses suffered a greater problem with recall than another.

Another source of bias could be that the overall response rate to the questionnaire was higher for consultants and community nurses than it was for GPs and general practice nurses (Table 1). If the most likely reason for non-response was that the health care worker hadn’t had their hepatitis B vaccinations given or appropriately managed their last blood exposure incident, then the results take on an even greater significance. However, without an analysis of final non-responders, which was not undertaken, this is only supposition.

The non-response by some health care workers to the questions about booster hepatitis B vaccinations and blood antibody tests could also have introduced some bias.

Guidance given to consultants performing EPPs [12, 13] may have produced a major biasing effect in this study (Table 3).

This study provides some evidence that primary care health care workers may benefit from the provision of an OHS, especially for:

1. call and recall for hepatitis B vaccinations, especially booster vaccinations;
2. recall for blood anti-HBs testing after hepatitis B vaccinations;
3. a protocol and system for management of blood exposure incidents, involving reporting of blood exposure incidents and the taking of relevant blood samples from the health care worker and source patient.

An OHS with responsibility for primary care should consider calling in all GPs and general practice nurses for a review of their hepatitis B immunity and for education regarding management of blood exposures.

As there are 30 685 GPs and 11 163 whole-time equivalent general practice nurses in England, this has marked workload implications [14].

In the future, a further study could be done, using actual data collected by a primary care OHS, which should be able to give a more definite answer as to how well primary care health care workers have managed their hepatitis B immunizations and blood exposure incidents.

Acknowledgements

The author wishes to acknowledge help with this research from Dr Roseanne MacNamee, Dr Ted Smith and Anjie Cherian, all of The University of Manchester. The author is grateful for grants towards the material costs of this research from Aventis Pasteur MSD and Glaxo Smith Kline.

References

12. UK Health Departments. Protecting Health Care Workers and Patients from Hepatitis B: Recommendations of the


