What level of on-call cover is required to allow trainees to meet minimum faculty requirements?

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ABSTRACT

Background: We investigated whether trainees' out-of-hours experience in Wales is sufficient to allow them to meet Faculty training requirements. We also determined how much time on call, covering what population, allows trainees to meet these requirements.

Methods: Using Welsh on-call audit data, we inferred the number of calls that trainees would receive during training and compared this with requirements for on-call experience. We generalized the analysis to examine the effect of changes in the population size covered and the length of time on call on the likelihood of trainees meeting minimum requirements.

Results: Trainees in Wales can expect to achieve most on-call faculty requirements. However, the expected number of contacts with the Health Protection Agency, 0.95 (95% confidence interval (CI): 0.024–5.281), and Environmental Health, 1.90 (95% CI: 0.230–6.848), imply that trainees may have difficulty achieving requirement 2.4. For different requirements at a set population size, widely disparate lengths of time are necessary to be 95% certain of achievement.

Conclusions: Most on-call requirements can be readily achieved in Wales, but contact with other professional groups (requirement 2.4) cannot be guaranteed. Further analysis suggests that requirement 2.4 is unlikely to be achieved except at unrealistic times on the on-call rota covering unrealistic populations.

Keywords: education, employment and skills

Background

In August 2006, the Faculty of Public Health released guidance on the health protection experience that trainees are required to demonstrate that they are competent to perform on-call cover as a consultant in public health. It is not known what level of public-health experience out of hours (in terms of the length of time on call and the size of the population covered) is adequate to allow trainees to meet requirements.

The National Public Health Service for Wales (NPHS) covers calls concerning health protection issues in Wales. The first response component of this rota is staffed by trainees from the Welsh Public Health training scheme, on a 1-week-in-8 basis. The on-call cover is from 5 to 10 p.m. on week nights and from 9 a.m. to 10 p.m. on Saturdays and Sundays; banding for trainees is 1A; at the time of the audit, there were nine trainees on the rota. The total population covered by individuals on call is just under three million.

We used data from a service audit performed by the NPHS to answer two research questions.

First, we wished to know whether the out-of-hours experience given to trainees in Wales is likely to be sufficient to allow them to meet Faculty requirements. Second, we wished to address a more general question: what amount of time on call, covering what size of population, is likely to allow trainees to meet the Faculty requirements?
Table 1 Out-of-hours minimum requirements from Faculty of Public Health

<table>
<thead>
<tr>
<th>Requirement number</th>
<th>Experience requirement</th>
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</thead>
<tbody>
<tr>
<td>2.1</td>
<td>Fifty separate days of out-of-hours duties</td>
</tr>
<tr>
<td>2.2</td>
<td>Involved in assessment of 20 enquiries out of hours</td>
</tr>
<tr>
<td>2.4</td>
<td>Experience of working out of hours with HPA, microbiology and EHOs in any locality</td>
</tr>
<tr>
<td>2.6</td>
<td>Dealt with one case of meningococcal infection out of hours</td>
</tr>
</tbody>
</table>

Dealt with two separate categories below out of hours:
- Meningococcal disease and meningitis.
- Gastrointestinal infections, including E. coli O157.
- Respiratory infection, including Legionella and TB
- Blood-borne viruses (HBV, HCV, HIV)
- Infections requiring prophylaxis/advice (e.g. pertussis, hepatitis A)
- Most common chemical/environmental hazards (asbestos, CO, smoke, mercury, ammonia, chlorine)
- Other hazards with increased local/regional occurrence

These questions are of interest to those involved in structuring public-health training in the UK and are particularly pertinent at a time when many public-health training schemes are considering the question of how long trainees should spend on the on-call rota during their training.

Methods

We identified the requirements from the 2006 Faculty of Public Health document that related to out-of-hours training. The Faculty requirements that contain an out-of-hours component are 2.1, 2.2, 2.4 and 2.6; their content is summarized in Table 1.

We have assumed that the daytime health-protection attachments undertaken by trainees will provide sufficient exposure for trainees to require only the minimum experience in out-of-hours situations. To simplify our analysis, we made a number of assumptions on the basis of these requirements. In requirement 2.1, when examining the number of days that trainees in Wales are on call, we assumed that a day equated to a minimum of 13 h on call. In requirement 2.4, we assumed that the wording 'experience of working with' implied a minimum of one call for each of the three professional groups (Health Protection Agency, microbiology and Environmental Health). In requirement 2.6, we assumed that the first part of the requirement would have been achieved (in other words that the trainee would have seen a case of meningococcal infection), and thus we were able to simplify the second part of the requirement to assuming that trainees would require one call relating to the bottom six categories. Clearly with this assumption, in a situation where the first part of the requirement is not met, the second part will not be met either.

We obtained the information that we needed on how long trainees in Wales are on call from previous on-call rotas. Because they contained evening shifts, we calculated the number of days on call by looking at the number of hours on call for a week on the rota and dividing this by 13 (the length of a weekend day on call in hours). We made the assumption that trainees would be on the on-call rota for 3.5 years. With this information and this assumption, we were able to calculate the number of days that we would expect a trainee in Wales to be on call during their training.

We used audit data from the NPHS to address our main research questions. This audit was carried out from January to July 2007. It looked at all the calls received by public health services out of hours. Data included details of the nature of calls, the timing of calls received, further action taken and contacts with other agencies.

In cases where two calls obviously related to the same case, we removed duplicates from the data set. We classified each call into one of the categories in the second part of requirement 2.6. We also classified each call on the basis of any contacts made with other agencies (no contact; Regional Epidemiologist; Microbiology; Environmental Health). In Wales, contact with a Regional Epidemiologist is considered to be equivalent to contact with the Health Protection Agency (HPA).

When examining requirement 2.6, we only looked at probable or confirmed cases of meningococcal infection.

We calculated the number of calls in the study period of 24 weeks in each of the main categories. These included the total number of calls, the number of calls relating to probable or confirmed meningococcal infection, the number of calls relating to categories other than meningococcal infection from the list in requirement 2.6, the number of calls with contact with the HPA, the number of calls with contact with microbiology and the number of calls with contact with Environmental Health.

We used the Poisson distribution to calculate confidence intervals (CIs) for each of the main categories. Because any calls in the data set that related to the same case were removed, and because no major outbreaks occurred during the period sampled, we considered that the assumptions of independence and uniform distribution of events required for a Poisson approach were reasonable. In order to
investigate this statistically, we used a \( \chi^2 \) test to look at the goodness of fit of the empirical distribution of the total number of calls to a theoretical Poisson distribution with a mean equal to that of the empirical data. We were not able to use this approach for all of the individual categories because of the small numbers involved.

Assuming that the empirical data followed a Poisson distribution, we then calculated 95% CIs for the number of calls in each of the main categories using an exact Poisson method available in the epitools package for R 2.9.1.\(^2\)

We scaled the numbers of calls and associated CIs for the 24-week sample period, in order to provide estimates of the numbers of calls in each category (with 95% CIs) that would be received by a trainee over 3.5 years of training. The lower confidence limit was then compared with the minimum requirement from the faculty to determine whether training in Wales was likely, with a 95% probability, to provide sufficient experience to meet each individual requirement.

To extend the analysis in such a way as to make it relevant to other areas of the UK, we sought to determine the effect of changes in the population covered and lengths of time on the on-call rota. We assumed that changing the population covered or the length of time on call would result in a proportionate change in the number of calls received.

We wished to examine the point at which we could be relatively certain (95%) that trainees would obtain enough experience to meet the minimum requirements. For each of the call types, we calculated the scaling factor that would be required to allow the lower 95% confidence limit to equal the minimum requirement from the faculty.

This scaler was then used to determine the point at which we would expect trainees to meet minimum requirements for different populations and for different lengths of time on the on-call rota.

All statistical analysis was carried out in R, version 2.9.1.

### Results

Over the 24-week study period, there were 87 calls to the NPHS, of which 78 were handled by trainees; a mean number of 3.25 calls to trainees per week. Of these calls, 26 related to probable or confirmed cases of meningococcal disease, whereas 36 related to the other categories in part two of requirement 2.6 (excluding calls relating to the meningococcal infection). One call involved contact with a Regional Epidemiologist (the Welsh equivalent of contact with the HPA); two calls involved contact with Environmental Health; five calls involved contact with microbiologists.

The \( \chi^2 \) goodness-of-fit test comparing the empirical distribution of calls to a theoretical Poisson distribution had a \( P \)-value of 0.77. Together with graphical comparison of the two distributions, this lends support to the use of a Poisson approach to generate CIs.

#### Requirement 2.1

We found that trainees can expect to be on call for the equivalent of eighty-nine 13-h days during their training. This is substantially above the requirement from the faculty of 50 days on call.

#### Requirement 2.2

The results for requirements 2.2, 2.4 and 2.6 are summarized in Table 2.

A typical trainee on the Welsh training scheme can expect to receive 73.94 (95% CI: 58.45–92.28) calls during their training. This is well above the minimum requirement from the faculty of 20 calls, and when the lower CI is used, the value is still well above the minimum requirement.

#### Requirement 2.4

A Welsh trainee can expect to have 0.95 (95% CI: 0.024–5.281) contacts with Regional Epidemiologists (HPA). The minimum requirement from the faculty is one call with such contact, and from our analysis, we would not expect Welsh trainees to achieve this part of the requirement.

Over their training, we would expect a Welsh trainee to have 1.90 (95% CI: 0.230–6.848) contacts with Environmental Health. In this case, the lower confidence limit falls below the minimum requirement of one, and it is, therefore, not 95% certain that a Welsh trainee will achieve this part of the requirement.

The expected number of contacts with microbiologists over the period of training is 4.74 (95% CI: 1.54–11.06). We would therefore expect a Welsh trainee to achieve this

<table>
<thead>
<tr>
<th>Minimum requirement</th>
<th>Number</th>
<th>Lower</th>
<th>Upper</th>
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<tbody>
<tr>
<td>Total</td>
<td>20</td>
<td>73.94</td>
<td>58.45</td>
</tr>
<tr>
<td>Menigo</td>
<td>1</td>
<td>24.65</td>
<td>16.10</td>
</tr>
<tr>
<td>Non-menigo</td>
<td>1</td>
<td>34.13</td>
<td>23.90</td>
</tr>
<tr>
<td>Regional Epidemiologist</td>
<td>1</td>
<td>0.95</td>
<td>0.02</td>
</tr>
<tr>
<td>Environmental Health</td>
<td>1</td>
<td>1.90</td>
<td>0.23</td>
</tr>
<tr>
<td>Microbiologist</td>
<td>1</td>
<td>4.74</td>
<td>1.54</td>
</tr>
</tbody>
</table>
part of the requirement, as the lower 95% confidence limit is above the minimum requirement of 1.

Overall, these results suggest that trainees in Wales will not achieve requirement 2.4.

Require 2.6

The expected number of calls relating to meningococcal disease over the training period was 24.65 (95% CI: 16.10–36.11), with the lower confidence limit well above the minimum required by the faculty (one call out of hours). The expected number of calls in the categories other than meningococcal disease in the second part of requirement 2.6 (non-meninco in Table 2) was 34.13 (95% CI: 23.90–47.24). Taken together, these results suggest that trainees in Wales will achieve requirement 2.6.

The results looking at the relationship of the populations covered and the number of years on call with the lower 95% confidence limit are shown in Fig. 1 and in Table 3.

It is apparent that widely disparate lengths of time are necessary to be 95% certain of achieving different requirements. For example, with a population of three million, the total number of calls is likely to be sufficient after 1.19 years on call (requirement 2.2). Requirement 2.6 would be expected to be achieved in a fraction of a year on call (0.22 years for meningococcal disease component and 0.15 years for the non-meningococcal disease component of the requirement).

For requirement 2.4, the scarcity of contact with the HPA, means that 145 years on call would be required to be 95% sure of meeting the first component. Being 95% certain of achieving the contact with Environmental Health would require 15.14 years on call. The microbiology component of this requirement would be easier to achieve, with 2.26 years required to be 95% certain of achieving it.

Our analysis suggests that for the total number of calls, the number of microbiology calls, the number of meningococcal calls and the number of ‘non-meningococcal calls’ (left-hand side of Fig. 1) can be quite readily achieved with realistic lengths of time on call and with a population the size of Wales. Conversely, it is apparent from the right-hand side of Fig. 1 (y-axis scale adjusted) that very substantial lengths of time or covering of very large populations would be necessary to be 95% sure that trainees will achieve the minimum level of experience necessary for requirement 2.4.

Discussion

Main finding of this study

Out-of-hours training in Public Health in Wales provides sufficient exposure to trainees to allow them to expect to
deal with more than enough calls out of hours. They can also expect to see enough calls related to meningococcal disease and to ‘non-meningococcal disease’. The analysis of the contacts that trainees can expect to have with other professionals suggests that they can expect to have enough contacts with microbiologists, that they may have enough contacts with Environmental Health and that they will not have enough contacts with the HPA.

In addition, the analysis that inferred the population and on-call times that would result in a 95% probability of achievement of the minimum requirements suggests that the number of microbiology, meningococcal and ‘non-meningococcal’ calls, as well as the total number of calls, can be quite readily achieved with the sorts of populations covered on call over reasonable timescales. In contrast, the analysis suggests that trainees will not be 95% certain of having contacts with the HPA and Environmental Health except at unfeasibly large population sizes or impractical lengths of time on call.

In other areas of the UK, trainees may cover smaller populations than that found in Wales, and this will exacerbate the difficulty that trainees may have in achieving requirement 2.4.

What is already known on this topic
In the literature searches that we performed to look for papers addressing the questions considered here, we were unable to identify relevant studies. We believe, therefore, that the question of how feasible it is for trainees to meet on-call requirements out of hours with the experience that they are likely to have on call has not been addressed previously.

What this study adds
The results of this study suggest that some of the out-of-hours on-call requirements from the Faculty can be easily met, that some may be harder in some training schemes and that some are unlikely ever to be met. In particular, it may not be reasonable to expect trainees to achieve the necessary contact with the HPA and EHOs on an ad hoc basis. In view of this fact, it may be that those administering public health training in the UK may wish to further examine requirement 2.4 or to consider other ways in which the requirement may be met; for example, it may be possible to timetable contact with these agencies into a trainee’s daytime health-protection attachment.

Additionally, our study suggests that, where the potential difficulties around achievement of requirement 2.4 overcome, it might be possible for trainees to meet the minimum out-of-hours requirements from the Faculty in a reasonably short time on the on-call rota. This may in turn suggest (again assuming that the issue of the achievement of requirement 2.4 is addressed) either that cost savings could be achieved by reducing the time that trainees spend on on-call rotas or that the minimum requirements from the Faculty may be rather too easy to achieve. Deciding between these two possibilities will depend on further discussion of these issues by those involved in health protection training in the UK.

<table>
<thead>
<tr>
<th>Population (millions)</th>
<th>Years required on call</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Total</td>
</tr>
<tr>
<td>0.5</td>
<td>7.14</td>
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<tr>
<td>1</td>
<td>3.57</td>
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<tr>
<td>1.5</td>
<td>2.38</td>
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<tr>
<td>2</td>
<td>1.78</td>
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<tr>
<td>2.5</td>
<td>1.43</td>
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<td>3</td>
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<td>5</td>
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<td>6</td>
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<td>7</td>
<td>0.51</td>
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<tr>
<td>8</td>
<td>0.45</td>
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<tr>
<td>9</td>
<td>0.40</td>
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<td>10</td>
<td>0.36</td>
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</tbody>
</table>
Limitations of this study

There are a number of limitations this study, which may affect the validity of its conclusions.

The study utilizes audit data collected in Wales for the purpose of managing training and the scheduling of the on-call rota. When individuals were submitting on-call reports, they were not asked specifically about contacts they have had with other professionals or agencies. It may be, therefore, that the number of contacts with microbiologists, Environmental Health and the HPA has been underestimated.

Assigning calls to different categories in the second part of requirement 2.6 was, to a certain extent, a subjective process. There is no apparent guidance in the 2006 document from the faculty that aids in the classification of call types. It may be that classification errors in this area have resulted in counting errors in the number of ‘non-meningococcal disease’ calls.

Likewise, it was not always entirely clear from the audit data whether a call dealt with a whole incident or with a sufficient proportion of an incident to make it useful for training purposes and appropriate for meeting faculty requirements. In all probability, the content of some calls was so minor that its training value may have been negligible, but from the information we had available it was not possible to determine this.

We tried to use a sample period of time there was representative of a trainee’s time on call. The period we analysed contained no major outbreaks and stretched from mid-winter to mid-summer. It may have been unrealistic to include a period without major outbreaks (with an associated increase in call rates), and as a result our analysis may have underestimated call rates.

We have classified a contact with a Regional Epidemiologist in Wales as equivalent to a contact with the HPA. We did not count a contact with a Consultant in Communicable Disease Control (CCDC) as a contact with the HPA. We believe that our approach is the most sensible, but clearly if contact with a CCDC can be counted as contact with the HPA this invalidates our estimates. We were not able to extract information about contacts with CCDCs from our data.

Though we have tested our assumption that the total number of calls followed a Poisson distribution, we did not repeat this test for the individual call types, due to the small numbers involved.

In extending our analysis to infer the population sizes and lengths of on-call cover that would be required to find a 95% chance of achieving competencies, we have assumed that the rota for on call in other areas of the UK is equivalent to that in Wales. In particular, we have assumed that, when a trainee is on call, they will receive all calls to health protection in the first instance—something which we think happens throughout the UK. In some areas, individuals will be on call for more or less hours in a week than is the case in Wales. This may therefore limit the applicability of our analysis to other areas when considering analysis by week. Where substantial differences between regional rotas present, it would be possible to compare more exactly between regions by repeating the analysis for hours on call.

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