References


Screening suspected cases for carbapenemase-producing Enterobacteriaceae, inclusion criteria and demand

Sir,

Carbapenems are the last resort antibiotics and the emergence of carbapenemase-producing Enterobacteriaceae (CPE) has engendered national toolkits to limit their spread. These include guidelines from the US Centre of Disease Control2 and the Australian Commission of Safety and Quality in Health Care.3 In December 2013, Public Health England (PHE) produced its Toolkit,4 asking each acute hospital in England to screen and isolate at admission each suspected case for CPE. This is stated as "a patient who, in the last 12 months, has been (a) an inpatient in a hospital abroad or (b) an inpatient in a UK hospital which has problems with spread of carbapenemase-producing Enterobacteriaceae (if known) or (c) is a 'previously' positive case". A suspect case should be isolated and tested with three consecutive tests and de-isolated after the third negative test. However, there has been no estimation of the number of tests and isolation beds that implementing the PHE Toolkit in all English acute hospitals would create.

We compare the number of tests and isolation beds that would be required if the PHE Toolkit were implemented nationwide vs. an alternative strategy. In this analysis, the above mentioned inclusion criteria (a) and (b) were considered for the PHE Toolkit. Admissions to intensive care, nephrology, cardiothoracic surgery, neurosurgery and oncology were considered for the alternative. The assumption was that due to their medical conditions, these admissions are more likely, than other admissions, to have been previously treated with invasive devices, which is a risk factor for CPE infection.5–7

Estimates were based on available data. The proportion of admissions falling under the PHE Toolkit criteria for testing and isolation was derived from one prevalence survey carried out by a West London Hospital8 in 2014. According to this survey, in the previous 12 months, 2% of the admissions "had received healthcare abroad" and 17.4% "had health care in a London hospital, subsequently identified as a high-risk group" for a total 19.4% suspected cases. The total NHS admissions in 2013–14 were multiplied by 19.4% to provide the suspected cases according to the PHE Toolkit. The same NHS data source provided the number of admissions to the key specialties considered by the alternative screening strategy.

The numbers of tests and isolation days were estimated according to the PHE Toolkit criteria. Each suspected case should have received three consecutive tests at "day 0, day 2 and day 4" and should have remained isolated until the third consecutive negative test. Given the very low prevalence of CPE in the UK, we assume that most suspected cases would have turned out negative, receiving all the three consecutive tests and remaining isolated for the five days required for the tests.
The average isolation beds per day was obtained by dividing the total isolation days by 365 (days in a year).

Table 1 Demand in tests and isolation beds for CPE screening, NHS, 2013–14.

<table>
<thead>
<tr>
<th>Inclusion criteria</th>
<th>Suspected cases per year</th>
<th>Tests per year</th>
<th>Isolation days per year</th>
<th>Daily average isolation beds required</th>
<th>Proportion of total daily bed capacity in the NHS</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHE Toolkit</td>
<td>2,999,639</td>
<td>5,999,278</td>
<td>8,998,917</td>
<td>24,655</td>
<td>5.89%</td>
</tr>
<tr>
<td>Admissions to specialties:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intensive Care Units (ICU)</td>
<td>13,763</td>
<td>27,526</td>
<td>41,289</td>
<td>113</td>
<td>0.03%</td>
</tr>
<tr>
<td>ICU + Nephrology (N)</td>
<td>149,266</td>
<td>298,532</td>
<td>447,798</td>
<td>1227</td>
<td>0.29%</td>
</tr>
<tr>
<td>ICU + Neurosurgery (NS)</td>
<td>233,007</td>
<td>466,014</td>
<td>699,021</td>
<td>1915</td>
<td>0.46%</td>
</tr>
<tr>
<td>ICU + N + NS + Cardiothoracic Surgery (CS)</td>
<td>295,357</td>
<td>590,714</td>
<td>886,071</td>
<td>2428</td>
<td>0.58%</td>
</tr>
<tr>
<td>ICU + N + NS + CS + Oncology</td>
<td>914,589</td>
<td>1,829,178</td>
<td>2,743,767</td>
<td>7517</td>
<td>1.80%</td>
</tr>
</tbody>
</table>

* The average isolation beds per day was obtained by dividing the total isolation days by 365 (days in a year).

However, not all suspected cases would have remained hospitalised for the required five days. The hospital average and median length of stay in 2013–14 were five days and one day respectively, meaning that half of the patients were discharged after one day. Therefore, the demand for tests and isolation days was based on the assumption that half of the suspected cases would have received one test and would have contributed to one isolation day, with the other half receiving three tests and remaining isolated for five days. The total number of isolation days were divided by 365 (days in a year) to provide the required average daily number of isolation beds.

Table 1 provides the expected number of tests and isolation beds that would have been required in 2013–14 if the screening had been implemented nationwide. The PHE Toolkit would have identified about 3 million suspected cases, requiring a total of 6 million tests and a daily average of 24,655 isolation beds. The second to the fifth row of Table 1 shows the demand in tests and isolation beds for the alternative strategy, starting with just the ICU admissions, adding up the Nephrology ones, and so on until all the key specialties were included. Depending on the number of specialties to be included, the annual number of suspected cases would have varied between 13,763 and 0.9 million, requiring between 27,526 and 1.8 million tests per year, and needing a daily average between 113 and 7517 isolation beds.

As the NHS data does not provide the national availability of isolation beds, we have estimated the proportion of the total available beds that would have been occupied by the suspected cases. In 2013–14, there was a daily average of 418,323 overnight beds in all acute hospitals, with a daily average occupancy rate of 88%. The isolation beds would have accounted to 5.9% of the total NHS bed capacity if the PHE Toolkit had been applied, versus 0.03%–1.8% for the alternative screening.

These results suggest that screening the admissions to specialties at risk have several advantages. Even including all the specialties considered in this analysis, the alternative strategy would have accounted for less than one-third of the demand required by the PHE Toolkit criteria. It is conceivable that targeting key specialties at risk would have also generated higher detection and lower false positivity rates because of their likely higher CPE prevalence. Screening admissions to key specialties are also clearer in terms of defining suspected cases and are more flexible in terms of expanding the number of specialties to be included according to capacity.

The limitations are inevitable and help to identify the gaps. These include only one prevalence survey to estimate the size of the target groups envisaged by the PHR Toolkit. No CPE prevalence rates by specialty to estimate the incremental diagnostic yield compared with the PHE Toolkit criteria. No percentile distributions of the length stay to provide a better estimate of the demand in tests and isolation beds. No national estimates of available isolation beds and no test turnaround time to check capacity. However, notwithstanding these limitations, the estimates are based on reasonable assumptions and are unlikely to be very far off-track. With due modifications, the method used in this analysis can provide a sound basis to estimate the demand for CPE screening in other countries.

Conflicts of interest

The authors do not have conflicts of interest.

Acknowledgment

The research was funded by the National Institute for Health Research Health Protection Research Unit (NIHR HPRU) in Healthcare Associated Infection and Antimicrobial Resistance at Imperial College London in partnership with Public Health England (PHE). The views expressed are those of the author(s) and not necessarily those of the NHS, the NIHR, the Department of Health or Public Health England.

References

3. Australian Commission on Safety and Quality in Health Care. Recommendations for the control of multi-drug resistant
Response to Hepatitis B virus vaccine in young adults with perinatally acquired HIV infection

Dear Editor,

We read with interest the article by Rowley et al.1 in this journal, in which they described the determinants of serological response to booster vaccination with hepatitis B virus (HBV) vaccine in HIV-infected non-responders. We now describe data to complement their study, in which we investigated the influence of vaccine dosing interval and other immunological determinants of response to the primary series of HBV vaccine in HIV-infected adolescents and young adults.

HBV infection is a major public health problem worldwide, despite the availability of an effective vaccine. Individuals with HIV are at greater risk of acquiring HBV and HIV/HBV co-infection has worse outcomes than HBV mono-infection.2 HBV vaccination is not currently included in the routine UK childhood immunisation schedule. The 2013 British HIV Association (BHIVA) guidelines recommend HBV vaccination of all HIV-infected individuals with 4 doses of double-dose vaccine (40mcg per dose) at 0, 1, 2, and 6 months with a check of the antibody level 4–8 weeks after the 4th dose.3 A successful vaccine response is indicated by an HBV surface Ag-specific antibody level >10 IU/L, and a level >100 IU/L is considered ideal.4 Previous recommendations5 advocated either a 3-dose schedule at 0, 1 and 6 months or a 4-dose schedule at 0, 1, 2, 12 months using a standard dose (20mcg per dose). Successfully achieving these specific dosing intervals requires optimal attendance, and is a challenge for adolescents and young adults where clinic attendance maybe less regular than for younger children or older adults.1 Pragmatic management of such erratic attenders has been to offer opportunistic vaccination at irregular intervals; however effects on vaccine

Vella Venanzio*
Myriam Gharbi
Luke S.P. Moore
Health Protection Research Unit in Healthcare Associated Infections and Antimicrobial Resistance, Imperial College London, Hammersmith Campus, Du Cane Road, London W12 ONN, United Kingdom

Julie Robotham
Modelling and Economics Unit, Public Health England, London NW9 5EQ, United Kingdom

E-mail address: Julie.Robotham@phe.gov.uk (J. Robotham)

Frances Davies
Eimear Brannigan
Tracey Galletly
Imperial College Healthcare NHS Trust, Hammersmith Hospital, Du Cane Road, London W12 0HS, United Kingdom

E-mail addresses: frances.davies@imperial.nhs.uk (F. Davies), eimear.brannigan@imperial.nhs.uk (E. Brannigan), Tracey.Galletly@imperial.nhs.uk (T. Galletly)

Alison H. Holmes
Health Protection Research Unit in Healthcare Associated Infections and Antimicrobial Resistance, Imperial College London, Hammersmith Campus, Du Cane Road, London W12 ONN, United Kingdom

E-mail address: alison.holmes@imperial.ac.uk (A.H. Holmes)

*Corresponding author. Imperial College, Department of Infectious Diseases and Immunity, 8th floor Commonwealth Building, Hammersmith Hospital, Du Cane Road, London W12 0NN, United Kingdom. Tel.: +44 (0)2033132732; fax: +44 (0)2083833394.

E-mail addresses: v.venanzio@imperial.ac.uk (V. Venanzio), m.gharbi@imperial.ac.uk (M. Gharbi), l.moore@imperial.ac.uk (L.S.P. Moore)

Accepted 3 June 2015

http://dx.doi.org/10.1016/j.jinf.2015.06.002

© 2015 The British Infection Association. Published by Elsevier Ltd. All rights reserved.