Improving the coverage of neonatal BCG vaccination

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Abstract

Background It is recommended that neonates at higher risk of contracting tuberculosis (such as in certain ethnic groups) should be vaccinated with BCG as soon as possible after birth. In Milton Keynes, during the late 1980s, there was anecdotal evidence to suggest that many higher-risk cases were not receiving BCG vaccination. The objectives of the study were to audit the neonatal BCG vaccination programme and to develop a system for improving and monitoring coverage.

Method Two main sources of data were used: the obstetric computer, which gave the denominator of women considered to be in a higher-risk group, and the community child health computer, which gave the numerator of BCG vaccinations given. A case note audit was used to check the quality of these data. A computer-generated reminder was used to make sure that the antenatal assessment of risk was known about immediately after delivery.

Results Estimated vaccine coverage rose from about 20 per cent (1988-1990) to 78 per cent by 1993. The audit suggested that about 8 per cent of vaccinations were not being recorded and 9 per cent were given unnecessarily. In addition, about 2 per cent were picked up postnatally and 1 per cent were missed completely.

Conclusion Improved coverage and adequate monitoring can be achieved using the two computerized systems. This method has applications to other conditions where antenatal assessment can predict risk for a neonate, such as Hepatitis B or sickle cell disease.

Keywords: BCG, tuberculosis, antenatal, neonatal, computer, audit

Introduction

BCG has always been a controversial vaccine, but appears to be effective in the UK.¹ The current national guidance is that it should be given to selected neonates who are at higher risk of coming into contact with cases of tuberculosis in childhood, and to all other children at school (between the ages of 10 and 13 years),² although practice varies across the country.³

The definition of a higher-risk group is difficult; three main criteria are often used:¹²³

1. Ethnic group, such as those from the Indian subcontinent who may have continued contact with those from an area of high prevalence. Apart from the difficulties in defining ethnicity, defining countries with high prevalence leads to a complicated list,⁶ and a more pragmatic approach (Asia, Africa, South and Central America) is now used⁷ in Milton Keynes.

2. Contacts of cases of tuberculosis: although closeness of contact and time since contact can be difficult to define.

3. Deprived (white) population: a very difficult group to define. In Milton Keynes the local BCG Working Group has defined all homeless people and travellers as higher risk.⁶⁷

The assessment of risk (and therefore need for neonatal BCG) for all deliveries in Milton Keynes is undertaken by midwives in the antenatal clinic when details such as ethnicity, family history and past medical history are taken. This is prompted by a question in the patient-held antenatal records.

Selective policies for neonatal vaccination are difficult to manage⁸ because only a small proportion of deliveries require action. Coverage is also difficult to monitor because the denominator (those at higher risk) is often unknown and the numerator (vaccinations given) may be poorly recorded.

Anecdotal evidence (from health visitors and paediatricians) in the late 1980s had suggested that many higher-risk neonates were not receiving BCG...
FIGURE 1. Neonatal BCG vaccination in Milton Keynes. *May be deferred (e.g. by accelerated childhood vaccination schedule) and done by the TB Control Service.
vaccination in Milton Keynes. In June 1991 the installation of a new computer in the obstetric department gave the opportunity to enter onto the computer whether the neonate was likely to be in a higher-risk group and a local policy was defined. This served two purposes (see Fig. 1):

1. When the details of delivery were entered onto the computer, a form requesting BCG vaccination was automatically printed out. This reminded staff to give BCG and to return the form to the community child health department, where it was entered onto their computer.

2. A list of those at higher risk was now stored in the obstetric computer and could be compared with data from the community child health computer to estimate vaccine coverage. Thus it should be possible both to improve coverage and monitor it. We describe our evaluation of the system.

Methods

Subjects

Milton Keynes (population 190,000) has about 3000 deliveries a year, nearly all in the district hospital. The 1991 Census found 5-4 per cent of the population were in ethnic groups other than white, the main population considered to be at higher risk from tuberculosis.

Vaccination coverage

The denominator before 1991 was estimated from the proportion of people in ethnic groups other than white from the 1991 Census applied to the total number of births. The numerator was estimated from the number of vaccinations given recorded on the community child health computer.

Since 1991 the higher-risk group (denominator) has been derived from the obstetric computer list plus those given BCG vaccination not on that list.

<table>
<thead>
<tr>
<th>Year</th>
<th>BCG vaccinations given to neonates</th>
<th>Estimated higher-risk population</th>
<th>Estimated vaccine coverage (%)</th>
<th>95% CI (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1988</td>
<td>42</td>
<td>176</td>
<td>23.9</td>
<td>17.7–30.3</td>
</tr>
<tr>
<td>1989</td>
<td>31</td>
<td>169</td>
<td>18.3</td>
<td>12.5–24.2</td>
</tr>
<tr>
<td>1990</td>
<td>33</td>
<td>171</td>
<td>19.3</td>
<td>13.4–25.2</td>
</tr>
<tr>
<td>1991</td>
<td>140</td>
<td>Introduction of new computer</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>1992</td>
<td>234</td>
<td>445</td>
<td>52.6</td>
<td>47.9–57.2</td>
</tr>
<tr>
<td>1993</td>
<td>354</td>
<td>457</td>
<td>77.5</td>
<td>73.6–81.3</td>
</tr>
</tbody>
</table>

The hospital pharmacy supplied us with the numbers of vials of BCG vaccine they dispensed over this time.

Audit

We audited the accuracy of this method for three months (November 1992–January 1993) using a list of deliveries over this period and requesting case notes of all those who were listed by the obstetric computer as needing BCG vaccination.

Missing cases were defined as children who were assessed antenatally and postnatally as not needing BCG, did not receive BCG, but should have done so. They were estimated by two methods: (1) a capture-recapture method using lists of names from the obstetric and child health computers and assessing the numbers common to both lists and unique to each; (2) scanning the list of names of mothers delivering over the three-month period for Asian- and African-sounding names.

Results

Vaccine coverage

Table 1 shows coverage from 1988 to 1993, with a significant increase after the introduction of this system. The hospital pharmacy reported an increase in vials of BCG vaccine dispensed in hospital from 110 in 1990 to 458 in 1991, providing some indirect validation that this increase was not simply due to better reporting.

Audit

There were 753 deliveries, of which 93 (12.4 per cent) were defined as higher risk in the antenatal clinic. Not all notes were found or contained full information: this meant that 80 sets of notes could be assessed for whether BCG had been given, whereas 67 sets of notes could be used to assess higher-risk status.

Six out of 80 (7.5 per cent) had been given BCG vaccine without the information being entered onto the community child health computer. Six out of 67...
Nine per cent) were judged not to be at higher risk comparing information in the notes with the district policy in place at the time. Of the remaining deliveries (660), ten (1.5 per cent) were given BCG. This occurred when the midwives, doing a postnatal assessment before discharge from hospital, felt that the neonate was in a higher-risk group despite the antenatal assessment.

Six hundred and fifty cases remained who had been assessed in both the antenatal clinic and on the postnatal wards as not requiring BCG vaccination and had not received BCG vaccination. Missing cases estimated by capture-recapture suggested that six out of the 650 cases [0.9 per cent; 95 per cent confidence interval (CI) 0.1-12 (0.1-8 per cent)] were neither detected nor vaccinated with BCG when they might have been.

The scan of names proved more difficult because the list was incomplete and the policy extant at the time include a number of European countries (e.g. Ireland) where names could not be separated out easily. Eleven to 24 out of 520 (2.1-4.6 per cent) were considered to be missed cases.

Discussion

The principles of this method are: (1) the assessment of risk in the antenatal clinic and recording it in the written and computerized records; (2) the automatic printing of a request form at delivery for those at higher risk that has a tear-off slip to go to the community child health department; (3) the use of the lists from the obstetric and community child health computers to monitor coverage. By printing a form automatically the computer helps to improve coverage by reminding the staff who was considered to be in a higher-risk group at the antenatal assessment.

The results of the case note audit suggest that using the two computer systems appears to provide an adequate monitoring system as well as improving coverage. The department of public health medicine led this audit, and continue to receive the lists of higher-risk neonates (from the department of obstetrics) and BCGs given (from the department of community child health) so that the coverage can be estimated.

The capture-recapture method will tend to underestimate missing cases because the sources are interdependent. However, the greater ease of use has led to its adoption for routine monitoring, rather than scanning names.

An interesting finding was a higher proportion of neonates requiring vaccination (12.4 per cent) compared with that expected from Census data (5.4 per cent). This may be due to a number of reasons: (1) there are some higher-risk groups who are in the white ethnic group; (2) the Census uses head of household for determining ethnic origin, whereas the Milton Keynes BCG vaccination policy uses ethnic origin of one or both parents to determine whether the neonate was in an higher-risk group; (3) there may be different fertility rates between different ethnic groups. This suggests that Census data are inadequate for estimating the denominator.

This audit has also prompted a change in local policy. The need to define higher-risk groups more clearly was shown by the number of cases missed or given BCG when not in a higher-risk group. As there seemed to be little evidence of attempts to contact mothers if vaccination was not given on the ward, the mechanisms for follow-up of missed cases have been tightened. These mechanisms include better information given to health visitors and general practitioners.

Other researchers have shown that auditing the BCG programme can substantially improve the coverage. The advantage of this method is that it allows continuous monitoring of the programme.

Conclusions

This study has shown this method is both useful in monitoring and successful in improving the coverage of neonatal BCG vaccination. This method could be adapted to other situations (e.g. Hepatitis B or sickle cell disease) where a specific action is required soon after delivery, and those at higher risk can be identified in the antenatal clinic.

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References

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