Since conjugate vaccines induce T cell dependency and thereby prime for a secondary immune response, immunised infants may be protected against *H influenzae* type b irrespective of the concentration of circulating antibodies. In our study five infants had natural rises in their antibody concentrations in the absence of clinical disease. These and other results[4] suggest that infants are primed by immunisation for a mature for age response to either the organism or cross reactive antigen.

In an open controlled prospective trial in the Oxford region we have shown the vaccine to be highly protective.[5] Nationwide postmarketing surveillance (in collaboration with the British Paediatric Surveillance Unit) is examining the long term efficacy of the conjugate vaccine given to children at 2, 3, and 4 months without a booster dose in their second year.

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1 Howard AJ, Dunkin KT, Musser JM, Palmer SR. Epidemiology of Haemophilus influenzae type b disease in Wales. *BMJ* 1991;**303**:441-5.
2 Booy R, Taylor SA, Dobson SRM, Isaacs D, Sleight G, Aitken S, *et al.* Immunogenicity and safety of PRP-T conjugate vaccine given according to the British accelerated immunisation schedule. *Arch Dis Child* 1992;**67**:475-8.
3 Tudor-Williams G, Frankland J, Isaacs D, Mayon-White RT, Macfarlane JA, Rees DG, *et al.* Haemophilus influenaze type b conjugate vaccine trial in Oxford: implications for the UK. *Arch Dis Child* 1989;**64**:520-4.
4 Madore DV, Johnson CL, Phipps DC, Pennridge Pediatric Associates, Popejoy LA, Eby R, *et al.* Safety and immunologic response to Haemophilus influenzae type b oligosaccharide—CRM 197 conjugate vaccine in 1-to-6 month old infants. *Pediatrics* 1990;**85**:331-7.
5 Booy R, Moxon ER, MacFarlane JA, Mayon-White RT, Slack MPE. Efficacy of Haemophilus influenzae type B conjugate vaccine in Oxford region. [Letter] *Lancet* 1992;**340**:847.

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Clinical coding: completeness and accuracy when doctors take it on

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To allow decentralisation of coding the Central Middlesex Hospital NHS Trust has purchased a hospital wide information technology system. We conducted a study to evaluate completeness and accuracy of clinical coding in the paediatric department before and after its installation.

Materials and methods, and results

Medical records of children admitted to the paediatric ward between 1 September and 31 October 1990 and 1991 were reviewed, respectively six months before and six months after coding was decentralised and responsibility transferred to medical staff. Diagnoses independent of that registered in hospital records were allocated by CY for 1990 and HD for 1991. Twenty from each year were checked by both of us; in these cases attributed codes agreed. Diagnoses were then compared with those allocated by coding clerks (1990) or those entered by medical staff on the computer (1991).

A total of 152 children were admitted in 1990 and 167 in 1991; notes of 127 (84%) and 117 (70%) respectively were reviewed. Thirty seven (29%) had been coded in 1990, and all 117 in 1991. Twenty (54%) of the 1990 and 99 (85%) of the 1991 diagnoses were accurate. Twelve (32%) were partially correct (correct but inexact) in 1990 compared with 17 (15%) in 1991. Five (14%) in 1990 and one (1%) in 1991 were classified as incorrect. Attributing more than one diagnosis was commoner in 1991 (table).

Study samples and results

	1990		1991
No of admissions	152		167
No (%) analysed	127 (84)		117 (70)
No (%) coded	37 (29)	$p<0.001$	117 (100)
No accurate	20	$p<0.001$	99
No partial	12		17
No inaccurate	5		1

No with diagnosis	1990 Coded	1990 Assessed by reviewer (No of diagnoses)	1991 Coded	1991 Assessed by reviewer (No of diagnoses)
1	29	54	80	74
2	8	51	31	37
3	0	13	4	5
4	0	9	2	1

Comment

Although only 70% of admissions in 1991 were analysed compared with 84% of admissions in 1990, the large difference in coding levels could not be ascribed to this. Overall coding level in the children's ward in 1991 was 95% (Central Middlesex Hospital information department). The low level of coding in 1990 and its inaccuracy would prevent rational planning. The accuracy of coding in 1990 before medical staff took on responsibility for coding (20/37; 54%) was slightly worse than that reported by Smith (71%).[1] There were many reasons for the improvement. Medical staff are aware of the importance of accurate coding, and information technology has simplified the process as it is performed contemporaneously on the ward. It can also be attributed to greater clinical knowledge of medical staff.

The transfer of responsibility required motivating medical staff to change. There was initially reluctance and resentment, yet after training these problems resolved. Two problems emerged: the rapid turnover in children's wards, and training new or locum staff. To overcome the first problem the process had to respond rapidly. This was accomplished by using a second copy of the admission sheet to record diagnoses and procedures. These are taken on ward rounds to allow initial coding at the bedside. Information is transferred to the computer at the end of the ward round, obviating the need for notes, which are not always to hand. The second problem was solved by a program that provided a list of uncoded admissions. Even with that system uncoded admissions occasionally accumulated, particularly in neonatology. At those times a concerted effort by the whole team was required to bring the coding up to date.

Each department or hospital will need to develop its own solutions. We have used a large and comprehensive hospital system whereas others have designed their own for departmental use.[2] Small may be beautiful, but we have shown that with energy and enthusiasm a department can exploit the possibilities of a much larger system and yet have "ownership." It is not our aim to supplant coding officers; their skills are needed to improve coding details. It must be recognised that fewer may be needed.

We conclude that participation of doctors in coding leads to greater accuracy, the benefit of case review, and creation of an accurate database for audit, research, and planning.

1 Smith MW. Hospital dischage diagnoses: how accurate are they and their ICD codes? *N Z Med J* 1989;**102**:507-8.
2 Smith AP. How to do it: design a clinical information system. *BMJ* 1992;**305**: 415-7.

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