Community Medicine
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Vol. 10, No. 1, pp. 40–47
Printed in Great Britain

The role of information flow between health professionals and the Child Health Computer System in the uptake of measles immunisation

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Summary

This study examines the relationship between use by health professionals of the standard Child Health Computer System in its role of scheduling and monitoring immunisation, and the apparent uptake rate of measles immunisation. Records held by the computer, health authority clinic and general practitioner on a sample of children born in 1981 in Maidstone Health Authority were searched separately to identify anomalies and their possible effects on the uptake rate, estimated by the computer system as 74 per cent.

Nine reasons for non-uptake among those recorded on the computer file as unimmunised were studied. Previous measles disease applied to 35 per cent of unimmunised children, non-recording for children who were in fact immunised applied to 15 per cent, non-uptake of earlier immunisations to 24 per cent, withdrawal of consent for measles immunisation to 37 per cent, and unrecorded change of address to 15 per cent.

The computer system should have continued to schedule immunisation appointments despite non-uptake of earlier immunisations and despite reports of measles disease. Notification by health professionals of uptake of immunisations and of measles disease needs to be greatly improved. Notification of changes of address, especially where this involves movements in or out of the district, are essential to identify the eligible population correctly.

We believe that given these improvements in the transfer of information between health professionals, parents and the computer system, an uptake rate of 90 per cent is feasible.

Introduction

Computers have been used by the National Health Service for over 20 years to varying degrees in the provision of immunisation services for children. In the Immunisation and Vaccination module of the Standard Health Child Computer System, children are assigned to treatment centres. When they reach appropriate ages, appointment cards are sent to their parents for immunisation, with further reminders when necessary. This system has been shown to improve uptake rates, particularly for measles immunisation in

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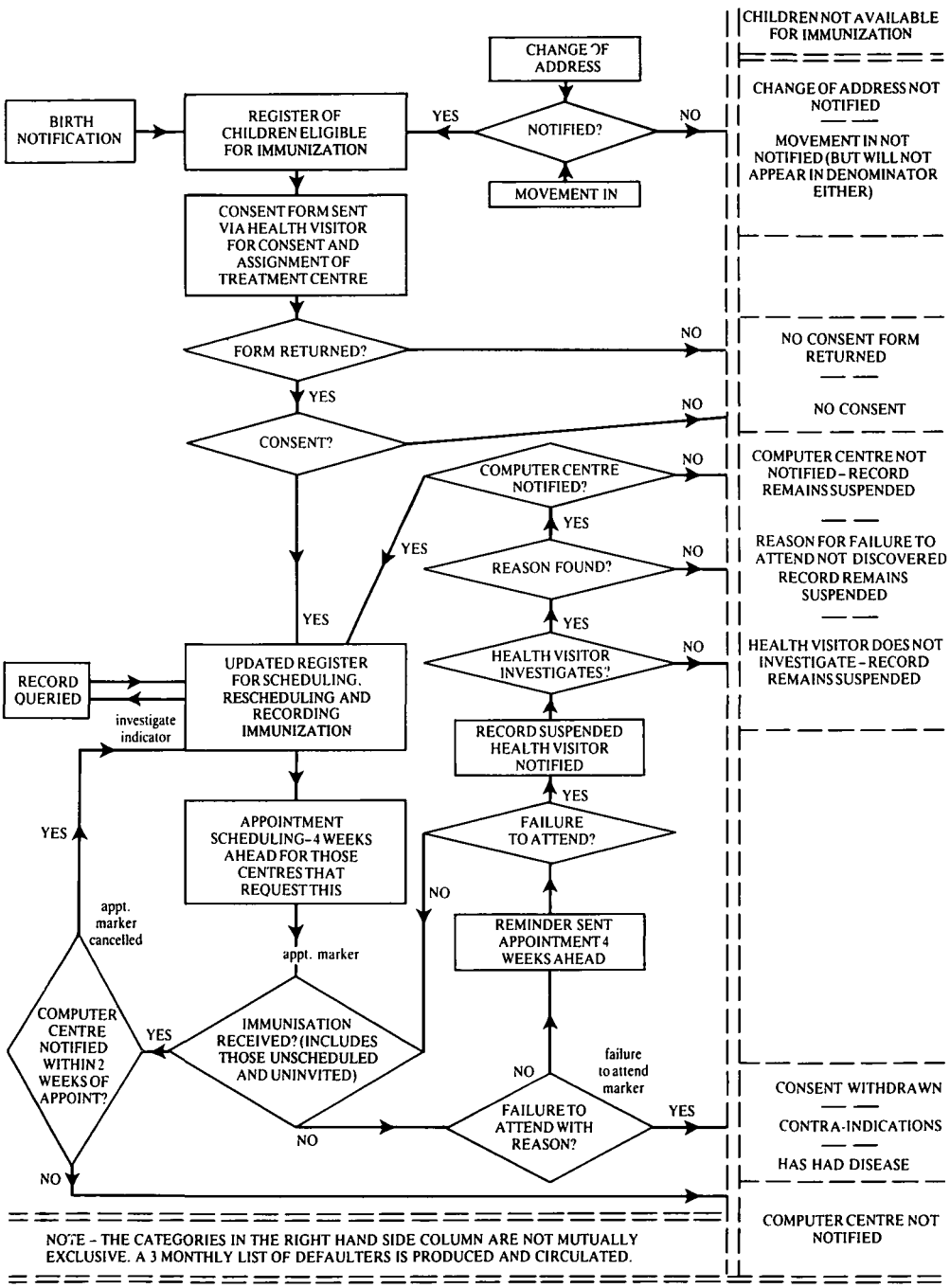

Fig. 1. The child immunisation and vaccination system in SE Thames Regional Health Authority.

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England and Wales.[1] However, various possible problems have been identified.[2] These may include features of the computer programs which process the available data. However, they also include the lack of or inaccuracy of appropriate data which provide input to the programs. This study set out to explore such problems systematically and to assess their impact on the uptake rate for measles immunisation in Maidstone Health Authority. At the time this study was planned, this uptake rate stood at 71 per cent for the most recent birth cohort. Although this is considerably higher than for the nation as a whole, it must still be judged inadequate when compared with the recommended target of 90 per cent.[3]

Figure 1 illustrates the functioning of the Child Health Computer System with regard to measles immunisation. Several links in this chain may break down; namely lack of notification of a change of address, or of a child whose family has just moved into the health district; the lack of parental consent to be assigned to a treatment centre for immunisation purposes; withdrawal of consent for immunisation; non-notification of immunisation; inappropriate reasons for non-immunisation accepted by the computer system, or continuing suspension of the child's record by the computer system until a reason for non-uptake of previous immunisation has been provided. Our study investigated all these links in the chain by comparing records held by the computer, health authority clinic and general practitioner on each member of a sample consisting of both immunised and non-immunised children. We report on aspects directly related to the reported uptake rate, and also on various differences in information held by the computer system when compared with information held by health professionals concerning the immunisation status of children.

Methods

The sample

In December 1984, a list was provided by the South East Thames regional computer of all children born in 1981 and currently recorded as resident in the Maidstone District Health Authority; hence all children were at least three years of age, and it may be assumed that of those not immunised at that time against measles, a negligible proportion would become immunised during the next six months.[4] Over the first six months of 1985, records held by the computer, by the assigned clinic, and by the general practitioner on each child were searched separately using a structured questionnaire to answer the following nine questions:

1. Is the child's current address different from that recorded on the computer file? (According to the clinic or GP.)
2. Did the child move into the district after birth?
3. Was the consent form received by the Computer Centre?
4. Was a consent to measles immunisation ever given or withdrawn?
5. Were there any contraindications to measles immunisation, and if so, what? (Recorded by the clinic or GP.)
6. Has the child had measles and if so, at what age?
7. Has the child received measles immunisation?
8. Has the child completed the diphtheria, tetanus and polio immunisation courses?

Of the 2356 children in the cohort, 1736 were recorded by the computer as having been immunised against measles (74 per cent). Separate random samples were taken of immunised and non-immunised children, with a greater sampling fraction being applied to the latter. This resulted in a list of 182 immunised and 350 non-immunised children. For each of the nine questions listed above, percentages of children for whom the answer was 'yes' were calculated for immunised and non-immunised children.

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Analysis was subdivided according to the place of immunisation. The computer system recorded the code of the child's assigned 'treatment centre' and the code of the child's general practitioner. Differences between these two codes for a particular child indicated that immunisation was carried out at a health authority clinic, whereas equality of the codes indicated it was carried out by the general practitioner. Results actually varied little according to these two subcategories, and hence we generally report analyses related only to the whole group.

Results and discussion

Of the 532 children in the sample, 216 were scheduled to be immunised by their GP, or GP clinic, and 313 to be immunised by a health authority clinic. Three children, none of whom were recorded on the computer file as immunised, did not have an assigned treatment centre code, and so were excluded from further analysis. The chief results are summarised in Table 1, and are described further below.

Table 1. Potential reasons for non-uptake of immunisation

Reason	Proportion of unimmunised children (N=347)	Potential for change in observed rate of 73·7 per cent	(Proportion of immunised children) (N=182)
Related to information system:			
Change of address during child's first three years (according to clinic or GP)	14	+4·0	(13)
No general consent form for immunisation returned to computer centre	9	+2·3	(2)*
Received immunisation (according to GP or clinic) but not notified to computer	15	+4·3	(n/a)
Did not complete course of triple vaccines (according to computer or clinic)	24	+6·4	(8)**
Not directly related to information system:			
Consent for measles immunisation withdrawn (according to computer)	37	+9·9	(5)**
Consent for all immunisation withdrawn (according to computer)	5	+1·4	(3)
Contraindications recorded (clinic or GP)	29	+7·4	(5)**
Already had measles disease (according to computer, GP or clinic)	35	+9·2	(5)**
Any of these (the above are not mutually exclusive)	88	+23·1	(31)
Other reasons	10	n/a	(2)*

*$P<0·005$; **$P<0·001$. Figures are percentages.

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Change of address

Fourteen per cent of the 347 unimmunised children were found to have a different address recorded by either the clinic or GP from that recorded on the computer file. This applied to a similar proportion of immunised children. It is not known at what age these three-year-old children changed address. If the changes had occurred before the children reached 15 months, parents could have been prevented from receiving appointment cards for immunisation.

Movements into the district

A substantial proportion of all children were recorded as having moved into the district since birth; 7, 18 and 22 per cent according to the computer, clinic and GP records respectively. Thus, a substantial proportion of 'movers in' were recorded on computer file as having always lived in the district. However, the proportions of 'movers in' scarcely varied between immunised and unimmunised children, and so do not support the suggestion resulting from analysis of earlier birth cohorts in Maidstone[2] that such families have lower uptake because of less time to form a relationship with the child health services.

A more serious problem concerns children who move in or out of the district without the computer system being notified of their existence. 'Movers out' should not remain part of the eligible population once they have moved: their continued inclusion inflates the denominator and hence underestimates uptake rate. However, if the computer centre is notified of these 'movers out', their records should not be deleted from the file. They should remain on file with data on when they moved so that uptake rates may be properly calculated with life tables techniques. We have shown elsewhere the bias that may result from non-notification of movers.[4] In a parallel study of immunisation uptake by a later birth cohort, 174 parents were interviewed when their children were 13 months old.[5] Seven months later, 43 of these children were identified by the computer system as not having received measles immunisation. Ten of these children had moved and one had died: such children are likely to constitute a substantial proportion of the 'unimmunised group'.

Consent form received

In the Maidstone Health Authority, a general 'consent' form is generated after registration of the child's birth just for the purpose of assigning children to treatment centres, and then scheduling their immunisations and other routine health service appointments.[2] A consent form was returned to the computer for 98 and 91 per cent of immunised and unimmunised children respectively. We suggest that the computer system should notify health professionals responsible for children whose parents do not return the form so that they can be followed up. Withdrawal of consent for all immunisations occurred in less than 5 per cent of children according to computer records.

Was a consent to measles immunisation ever withdrawn?

Whether or not a general consent form has been returned to the computer centre for a particular child, the computer record may show that consent for a specific immunisation has been withdrawn by the parent. This usually happens when, after discussion between the parent and health professional, it is jointly decided that immunisation is not advisable. The health professionals will then notify the computer centre of withdrawal of consent. This occurred for 5 per cent of immunised children and 37 per cent of unimmunised children. Hence parents of over one-third of unimmunised children must have discussed the matter with health professionals, and this figure represents the potential for persuasion of reluctant parents.

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Among clinic and GP records, consent was a frequent event among immunised children (82 and 63 per cent respectively) and rare among unimmunised children (10 and 13 per cent). This is because consent in such circumstances is normally given only immediately prior to the actual vaccination. The consent rate for immunised children according to GP records varied from 52 per cent where the immunisation was carried out at a health authority clinic to 77 per cent where the treatment centre was actually the GP's own surgery or clinic. In general, a considerable lack of communication on the issue of consent appears to exist.

Contraindications to measles immunisation?

Among unimmunised children, contraindications were mentioned for 26 per cent of children by clinics but only for 6 per cent by GPs (in all 29 per cent from either source). For immunised children these figures were 2 and 3 per cent. Such information was not available from the computer.

In all, 106 contraindications were listed for 98 children from clinic records. In 50 cases, the stated contraindication was that the child had previously had measles. Other popular contraindications were a family history of convulsions (18 cases), allergies of various sorts (often supposedly towards eggs) and eczema (18 cases), and a previous history of convulsions in the child (nine cases).

From GP records, 29 contraindications were listed for 26 children. This relatively low frequency of contraindication reporting by GPs happened equally for groups of children scheduled to be immunised by the GP and the health authority clinic. However, the same contraindications were popular as for clinic records: a family history of convulsions in six cases, allergy in six cases, and previous measles in five cases. The discrepancy in reporting of contraindications by clinic and GP is further shown by the fact that only eight of the 29 contraindications mentioned by the GP were also mentioned by the clinic. None of the contraindications most frequently mentioned are in fact a true barrier according to DHSS recommendations.[3] Further evidence that health professionals are unnecessarily reticent in carrying out immunisation despite supposed contraindications is provided by their responses to a questionnaire, which we report elsewhere.[6]

Measles disease

A total of 131 children were reported to have had measles at some stage by at least one of the three sources. One hundred and twenty-two of these were not immunised (35 per cent of unimmunised children compared with 5 per cent of immunised children).

However, for the 131 cases for whom measles was reported by at least one source, in only 19 of the cases did all three sources agree that the child had had measles, and in only 34 more cases did two of the sources agree. In any case, DHSS guidelines recommend immunisation even in children reported to have had the disease before the age of two years,[3] and many children so reported are not in fact serologically immune.[7] The computer system presently functions so as to suppress appointment scheduling for children notified as having had measles, and we contend that this is inappropriate.

Disagreement also occurred concerning age at which measles occurred; the computer records the age at which the disease was notified rather than the age at which it occurred, and the notification clearly only began to take place after a scheduled appointment for measles immunisation was sent out. Sixty-three out of 64 cases of measles were notified to the computer when the child was 15 months or more. By contrast, 13 cases of measles out of 43 were identified by a health authority clinic as occurring *before* 15 months, and 20 out of 77 cases by GPs. If health professionals would consistently notify dates when measles occurred, the computer system could record this rather than age at notification. Such

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information would help establish whether measles is a reason for, or consequence of, non-immunisation.

Measles immunisation recorded

Of 347 children said not to be immunised according to the computer, 10 per cent and 8 per cent were recorded by the clinic and GP respectively as immunised (15 per cent according to either source). If we assume that reporting of immunisation by any of the three sources indicates that the child really has been immunised, then the uptake rate improves from the computer's estimate of 73·7 per cent to a revised figure of 77·6 per cent.

Agreement between the three sources of information is poor. Out of 182 children immunised according to the computer, only 125 (69 per cent) were recorded by the GP as immunised. Among children using the GP clinic or surgery for immunisation, this figure was 79 per cent, but only 60 per cent for children using a health authority clinic. Similar types of disagreement were found in the Childhood Encephalopathy Study.[8] Where such discrepancies abound, the accurate monitoring of uptake rates is inevitably difficult.

Completeness of previous immunisation courses

It is possible that children in the 1981 birth cohort who failed to take up immunisations due in the first year of life had their computer record 'suspended' whereby they did not get scheduled for measles immunisation. According to clinic records, 1 and 11 per cent of children immunised and unimmunised against measles had failed to complete the diphtheria, tetanus and polio course. However, the equivalent figures for computer records were 7 and 23 per cent, suggesting a group of children were wrongly assumed by the computer to have not completed earlier immunisations. A change in the Standard Child Health Computer System has now been implemented so that suspension of appointment scheduling no longer depends on uptake of earlier immunisations. The problem had also been detected in North Bedfordshire in 1983.[9]

Other reasons for non-uptake

Among unimmunised children, various other reasons for non-uptake were recorded for 8 and 1 per cent according to clinics and GPs respectively. Reasons also seem to appear for around 1 per cent of immunised children – perhaps these were reasons for delaying rather than omitting vaccination.

In all, clinic notes recorded 37 reasons for 30 children. Among these reasons it was often stated that the parents were against measles immunisation (10 cases), all immunisation (four cases) or all child health services (three cases). In six cases it was stated that the child experienced frequent infections.

Potential for change in uptake rate

Table 1 summarises the major reasons for non-uptake identified for the 'unimmunised' group: they are not mutually exclusive. It is possible to calculate, for each of these reasons, the level by which uptake rate could potentially be raised from its observed level of 73·7 per cent if the reason were adequately tackled. It is unrealistic to expect that even if all these reasons were appropriately tackled, the potential improvement in uptake rate quoted would actually be realised. However, several areas for improvement have been identified, and we suggest that the target uptake of 90 per cent[3] is feasible in Maidstone.

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Conclusions

Various discrepancies in information held by the computer data files and health professionals' records have been found. Some of these could have a direct bearing on whether immunisation is taken up. Firstly, changes of address including date of change should be promptly notified to the computer system by the general practitioners, health visitors or clinical medical officers. This is especially necessary when children are moving in or out of districts, so that appointment cards for immunisation may be sent to the correct address, if appropriate. Secondly, notification of the measles immunisation could be improved, as could the notification of earlier immunisations, the lack of which used to cause suspension of appointment scheduling for measles immunisation.

Our study has provided some insight into the process whereby decisions to take up measles immunisation are made. For more than one-third of children unimmunised against measles, consent for vaccination had positively been withdrawn. This shows the potential for relevant discussion between health professionals and reluctant parents, but positive attitudes towards measles immunisation by health professionals are clearly required.

Inappropriate contraindications were listed for 29 per cent of unimmunised children. Health professionals should be more fully aware of which of the supposed contraindications to measles immunisation are true barriers, and which are false. In particular, reported measles disease, which appeared a substantial cause of non-immunisation, is not a reason for omitting to immunise. Reports of whether and when measles disease occurred differed so widely between the computer's and health professionals' records that little credence can be given to such reports. The computer system should be programmed to schedule appointments for measles immunisation despite reports of disease.

Finally, we suggest that a target uptake rate of 90 per cent is feasible.

Acknowledgments

We are grateful to Professor W. W. Holland and Dr A. L. Bussey for their support and to Mr S. Saxby for providing data from the South East Thames Regional Computer, and to Miss J. Adams for typing this manuscript. We also thank health professionals for allowing us access to, and providing information on the children's records. This study was funded by the Department of Health and Social Security.

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