records departments. The possibility of developing a monitoring scheme for long-term drug therapy is being studied. The system must be capable of giving a timely response to enquiry. Analyses pertaining to the previous quarter year should be available within two months of the end of it.

(3) The system must monitor its own status, with extensive ongoing editing procedures and output of lists of errors for correction. Many types of missing records or parts of records can be detected by an appropriately designed system. Coupled with careful training and supervision of records staff engaged on data collection, these measures can go far to reduce error and under-reporting to manageable proportions.

(4) Introduction of new techniques of data preparation would reduce costs and permit dispersal of the whole process of data acquisition into hospitals. Optical character recognition and punched paper tape were both thought to offer greater flexibility and lower cost than the traditional punched card. Plain language could be input and automatic encoding would become a practical possibility, thus improving reliability and probably also reducing costs still further.

A system has now been developed incorporating these principles, and has been successfully operated on a pilot basis for general hospital inpatient data. It is expected that it will be implemented throughout the region in the very near future (Unit of Clinical Epidemiology and Oxford Record Linkage Study 1971).

The scope for further development of such systems in the Health Service is very great and the potential has hardly yet been tapped. The technical ability to link records is now fairly well established both for the cumulative person record, and for family record linkage (Baldwin 1972).

Exploitation of linked files is now becoming worthwhile, but the already high demand for unlinked information must be satisfied in order to justify the system over the long period required to reap the eventual benefits of linkage.

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Hospital Admissions Following Common Surgical Operations

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We now have a magnetic tape file containing numerical particulars of hospital discharges and deaths in Oxford City and County for the five years 1963–67. This is in 'linked' form so that information on successive events happening to the same patient is brought together in sequence on the file. It relates to 90,000 inpatients who between them have experienced 135,000 hospital discharges, drawn from an area whose population is about 800,000. By scanning the tape by computer, defined cohorts of patients can be followed and their hospital readmissions occurring within the five years counted and tabulated. In a population of this size, patients with common conditions who are followed for several years are likely to have appreciable numbers of readmissions purely by chance, that is if each patient stands the same chance of admission as someone of the same age and sex in the general population. The observed number of readmissions for any cause is therefore of importance only if it significantly differs from the expected number. I have looked at the observed and expected numbers of readmissions by cause following five common surgical operations and indicate here some preliminary findings.

Table 1
Number of operations and man-years of observation after operation, Oxford City and County, 1963–67

	GRO code of operations (1956)	*No. of operations*	*Man-years of observation*
Tonsillectomy and adenoidectomy	261–263	6,823	17,823
Appendicectomy	441	3,099	7,783
Hysterectomy	722–724	2,539	6,198
Inguinal herniorrhaphy	402	2,279	5,602
Cholecystectomy	521	955	2,275

The operations are listed in Table 1. Assuming that the operations are evenly spaced and that each patient is followed to the end of 1967, the average length of observation per patient is 2½ years. The actual man-years of observation at all ages, which take into account deaths occurring before the end of 1967 but which disregard the unknown effects of migration, were calculated by computer and are given in the last column of Table 1.

To obtain the expected number of readmissions after operation for any diagnostic cause, it was

Table 2
Hospital readmissions after tonsillectomy and adenoidectomy, Oxford City and County, 1963–67

		Readmissions			
		Males		*Females*	
ICD (7th revision)	*Diagnosis*	*Observed*	*Expected*	*Observed*	*Expected*
391	Otitis media	79 (64)●	17·8	65 (53)	12·4
396	Other diseases of ear and mastoid process	7 (7)	1·4	8 (7)	1·3
513	Chronic sinusitis	20 (18)	3·7	9 (8)	1·9
550–551	Appendicitis	18 (18)	17·5	21 (20)	18·5
800–949	Injuries	105	112·0	43	53·9
	All causes	606	676·7	463	523·8

● The figures in brackets after the observed readmissions are the numbers of patients who experienced these readmissions

necessary to calculate an annual admission rate for this cause in the general population of the area. This annual admission rate was obtained by dividing the number of discharges from hospital in residents of the area, which are all reported to the Oxford Record Linkage Study, by an estimate of the population of the area derived from census data. The expected number of readmissions after operation is the product of this admission rate and the man-years of observation in the patients who have undergone operation. The calculations were done separately by sex and by 10-year age groups, and the expectations at each age were then added to give a total expectation for each sex.

Table 2 shows for each sex the observed and expected numbers of readmissions after tonsillectomy and adenoidectomy, for certain selected causes for which the numbers were meaningful. Because a patient may have several hospital admissions for the same cause, figures of admissions alone can be misleading and the numbers of patients are therefore given in brackets after the number of observed readmissions. The most marked finding was an excess of readmissions for otitis media. The 117 patients concerned constituted 1·7% of the 6,823 patients undergoing these operations. Twenty-six patients were readmitted with chronic sinusitis and 14 patients with other diseases of the ear and mastoid process: for these three diagnostic codes the relative excess of readmissions (i.e. observed/expected) was of the same order, about 5 to 1. The nature of these cases is not clear, but for technical reasons it has not yet been possible to examine the case-histories of the patients. By contrast, the number of readmissions for appendicitis and for injuries are within chance limits. Tonsillectomy is so common a cause of hospitalization in children and young adults that a patient discharged after it has a *less* than normal chance of subsequent hospitalization when all causes are taken together.

Readmissions after appendicectomy were unremarkable except for symptoms referable to the abdomen and lower gastrointestinal system (ICD 785): in males, 18 readmissions were observed in 18 patients compared with 4·8 readmissions expected for this cause. After hysterectomy, pulmonary embolism and infarction (ICD 465) and other venous embolism and thrombosis (ICD 466) were especially common. Taking both codes together, 18 readmissions occurred in 15 patients compared with 2·9 readmissions expected. Readmission for chronic cystic disease of the breast (ICD 620) occurred in excess after both hysterectomy (14 readmissions in 14 patients, 5·6 readmissions expected), and cholecystectomy in females (6 readmissions in 5 patients, 0·85 readmissions expected). Readmissions for varicose veins (ICD 460) also occurred in excess after cholecystectomy in females. Conditions such as cystic disease of the breast and varicose veins are often symptomless and it is possible that they may be discovered only as a result of a thorough examination at operation. The patient may then be advised to have them treated and be put on the hospital waiting list for readmission. After inguinal herniorrhaphy in males, readmissions for hydrocele (ICD 613) were unusually common (10 readmissions in 10 patients, 1·7 readmissions expected).

This follow-up study has shown a handful of results of clinical rather than epidemiological interest, since they mostly demonstrate sequences of events which are known to the surgeons concerned. Ultimately, the biggest reward of such studies is the ability to detect unsuspected associations between diseases widely separated in time, suggesting a common etiology. By the end of 1971 we will in Oxford have a linked file of hospital discharges and deaths covering the 8 years 1963–70. In addition, we have been recording and linking discharges and deaths in Reading and West Berkshire since 1966. This will provide five years' observation in an additional area of equivalent size. Perhaps the modest results of this five-year follow-up study may foreshadow a richer harvest when information over a longer time-span is available.