

**HOSPITAL RE-ADMISSION RATES: USER
GUIDE – FULL REPORT**

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National Centre for Health Outcomes Development

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UNIT OF HEALTH-CARE EPIDEMIOLOGY

UNIVERSITY OF OXFORD

REPORT MR7



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**UHCE OXFORD REPORT: CALCULATING RE-ADMISSION
RATES TO COMPARE HOSPITAL PERFORMANCE
A GUIDE TO METHODOLOGY**

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EXECUTIVE SUMMARY

This user guide summarises the results of the emergency re-admission rate methodological studies carried out by the Oxford University part of the National Centre for Health Outcomes Development from 2001-2004.

The main objective of the NCHOD work has been to identify indicators that could be useful in comparing hospital performance. Work has also been done on comparing performance over time.

To enable the making of hospital comparisons, NCHOD has specified re-admission indicators based on:

- individual conditions or diseases
- individual operations
- sub-sets of the activities of clinical specialties

1. INTRODUCTION

Purpose

The purpose of this Guide is to assist information analysts specify outcome indicators relating to re-admission rates. It summarises the work commissioned by the Department of Health and carried out by the National Centre for Health Outcomes Development (NCHOD) from 2001 to 2004.

Background

Re-admission after hospital care may be a consequence of the natural progression of a patient's disease or it may be a consequence of sub-optimal care during the initial admission. Because of the latter possibility, indicators based on re-admission rates are considered to be a potentially useful means of comparing hospital performance and have been recommended in seven of the ten reports on specific conditions published in 1999 by NCHOD, namely for:

- asthma
- acute myocardial infarction
- cataract
- fractured proximal femur
- incontinence
- severe mental illness
- stroke.

Re-admission rates are used as clinical indicators and in star ratings. Those produced have included indicators for emergency re-admission within 30 days of an admission:

- in which a hysterectomy was performed
- in which a hip replacement operation was performed
- for fractured hip
- for stroke
- of an older person (also 0-7 and 7-28 day re-admissions for this group of patients)
- of a child.

NCHOD work

The main objective of the NCHOD work on re-admission measures has been to identify indicators that could be useful in comparing hospital performance. Work has also been done on comparing performance over time, but this guide does not address specific issues arising from it. To enable the making of hospital comparisons, NCHOD has specified re-admission indicators based on:

- individual conditions or diseases (see Section 2)
- individual operations (see Section 3)
- sub-sets of the activities of clinical specialties (see Section 4).

Guidance common to all approaches

Guidance about indicator specification common to all three approaches is shown below.

Re-admission rates should be calculated on the basis of re-admissions that have been recorded as ‘immediate’ (which we term ‘emergency’ in this report). It is when a re-admission is unexpected that it should be considered as an adverse, emergency event. If elective admissions have been properly coded, they are assumed to occur as a planned sequence of care.

For most work to date, the first emergency re-admission after an index admission has been specified as the basis of the numerator for the rate. Alternative measures for chronic conditions are considered in the section on condition-specific measures.

Continuous in-patient spells (CIPS), relating to the duration of stay in a hospital, should be used rather than finished consultant episodes (FCE) because:

- they obviate having to handle transfers between FCEs in an analysis
- they are a more clinically relevant measure than FCEs
- any FCE other than the last does not result in discharge from hospital and therefore cannot itself result in re-admission.

Elective (with and without day cases) and emergency index admissions should be analysed separately because the rate of adverse events is significantly greater following emergency index admissions as shown in Exhibit 1.

If a patient dies during the index admission or during the time over which the indicator is being derived (eg within 30 days of discharge for ‘within 30-day’ re-admission rates), this index admission should be excluded from the analysis.

Same day emergency re-admissions should be included in analyses if the discharge from the index admission was to home. About 5% of all emergency re-admissions occur on the same day as discharge. The diagnoses that were the primary ones for these re-admissions are shown in Exhibit 2. An analysis by NCHOD showed that of 16169 same day emergency re-admissions for which there were data, the destination on discharge was:

- 10192 (63%) to home
- 5471 to another hospital
- 422 to long term care
- 84 self-discharge.

Emergency re-admission rates should be age/sex standardised. In common with the clinical indicator specifications, indirect standardisation should be used and the indicators standardised for age and sex. Indirect standardisation is to be preferred because it is:

- More robust with small numbers and avoids the distortions caused by direct standardisation based on unstable age-specific rates
- More flexible with respect to future requirements such as standardising for other factors, eg deprivation.

Sources of data used in this guide

Three main sources of data have been used in the preparation of this document:

- English linked HES/ONS deaths file 1998/2000 linked and processed by NCHOD
- Oxford Record Linkage Study (ORLS) file 1996/1998 processed by NCHOD
- English linked HES/ONS deaths file 2000/2001 linked and processed by IBM.

Exhibit 1: Comparison of 28 day emergency re-admission rates following index elective and index emergency admissions analysed by ICD 10 chapter headings

ICD chapter heading	Re-admissions per 100 elective index admissions %	Re-admissions per 100 emergency index admissions %
1 Infectious diseases	3.4	8.8
2 Neoplasms	5.0	17.3
3 Diseases of the blood	4.3	18.3
4 Endocrine & metabolic disorders	3.2	14.2
5 Mental / behavioural disorders	2.6	9.4
6 Diseases of the nervous system	2.1	10.9
7 Diseases of the eye	1.6	7.1
8 Diseases of the ear	1.2	7.5
9 Diseases of the circulatory system	3.9	10.8
10 Diseases of the respiratory system	4.8	12.3
11 Diseases of the digestive system	2.3	10.3
12 Diseases of the skin	1.4	7.8
13 Diseases of musculoskeletal system	2.4	8.4
14 Diseases of the genitourinary system	2.9	10.4
15 Pregnancy and childbirth	4.0	10.3
16 Conditions in perinatal period	2.6	9.5
17 Congenital malformations	2.9	14.8
18 Symptoms, signs, abnormal findings	3.1	10.3
19 Injuries and other external causes	4.2	7.4
20 External causes of morbidity	0.0	0.0
21 Factors influencing health status	2.4	9.1

Information obtained from the 2000/2001 linked HES file processed by IBM

Exhibit 2: Same date emergency re-admissions: total number of emergency re-admissions, and number and percentage that were on the same day as the day of discharge, by principal diagnosis on the emergency re-admission record

Diagnosis	Emergency re-admissions		
	Total	Same date Number	%
All diagnoses	533,729	24,095	4.5
R69. Unknown and unspecified	16,359	1,330	8.1
R10. Abdominal and pelvic pain	16,089	790	4.9
R07. Throat and chest pain	14,549	505	3.5
O20. Haemorrhage early pregnancy	6,858	355	5.2
I20. Angina pectoris	13,558	314	2.3
N39. Other disorders urinary system	6,405	313	4.9
S72. Fractured femur	3,855	297	7.7
J06. Acute URTI	3,805	293	7.7
B34. Viral infection unspecified site	3,105	290	9.3
J21. Acute bronchiolitis	2,384	287	12.0
J44. Other COPD	16,448	285	1.7
J22. Acute unspecified LRTI	7,415	277	3.7
C91. Lymphoid leukaemia	4,741	259	5.5
A08. Viral intestinal infections	1,831	245	13.4
R56. Convulsions not classified	2,910	244	8.4
K52. Other non-infective gastroenteritis	4,514	241	5.3
I50. Heart failure	8,567	228	2.7
J18. Pneumonia unspecified	5,109	228	4.5
I21. Acute myocardial infarction	6,556	227	3.5
O03. Spontaneous abortion	2,500	216	8.6
R04. Haemorrhage from respiratory passages	2,844	212	7.5
R06. Abnormalities of breathing	5,137	212	4.1
G40. Epilepsy	3,959	208	5.3

Information obtained from the 2000/2001 HES file processed by IBM

2. CONDITION-SPECIFIC INDICATORS

Issues

For condition-specific indicators the issues that need to be considered, relating to the selection of index admissions, are:

- *Definition of the characteristics of an index admission.*
- *Position of the diagnosis on the HES record. Do you include:*
 - *all admissions with the diagnosis regardless of its position on the record*
 - *only those admissions in which the diagnosis is the principal one.*

The issues that need to be considered, relating to the first emergency re-admissions to be included in the numerator, are:

- *Time interval from end of index admission to start of first emergency re-admission.*
- *Presence and position of diagnosis on the re-admission record. Do you include:*
 - *all emergency re-admissions regardless of cause*
 - *only those with the diagnosis given as the principal one*
 - *only those with the diagnosis anywhere on the record?*

For chronic conditions such as asthma or severe mental illness with multiple re-admissions, consideration should be given to using measures such as:

- *Time spent in emergency admissions per year, to give insight into the likely severity of the condition causing the re-admission*
- *Number of emergency admissions per year.*

Defining characteristics of index admission

The 'index' admission is usually taken to be the first admission with the defining characteristics in a time period for an individual. For many analyses the time period is a year but linked files may contain many years worth of data available for analysis. In the context of a multi-year file, consideration should be given to whether analyses use index admission defined as the first admission for an individual:

- in each separate year, giving the possibility of an individual having more than one index admission fairly close together in time but in different calendar years
- in the whole time period
- following an admission free period eg disregarding, as an index admission, any admission that occurs within 30, 90 or 365 days as a previous index admission.

Some index admissions (such as an admission for complications after an operation), although the first in a specified time period, may in fact be re-admissions from an initial admission in a previous time period.

Commonly, re-admissions may:

- follow a single event such as an admission for elective surgery
- be part of a pattern of care for a chronic condition such as asthma.

Defining characteristics of index admissions may include:

- patient's demographic characteristics such as age and sex
- emergency or elective admission
- diagnoses
- organisational characteristics such as hospital and specialty.

Position of diagnosis on the HES record of an index admission

The extent to which the diagnosis is recorded in the position for principal diagnosis, rather than elsewhere on the record, will differ according to the condition under investigation. Exhibit 3 shows for three diagnoses the proportion of CIPS that had a single FCE and the extent to which the condition was recorded as the first diagnosis in either the first or last FCE of multiple-FCE CIPS.

There is considerable variation between conditions. For the three conditions in Exhibit 3 the diagnosis was first in the first FCE of over 80 % of emergency CIPS, while only 6% of elective admissions with asthma have the diagnosis in this position.

One convention is to designate the principal diagnosis of the first FCE as the principal diagnosis of the spell. Another is to consider the principal diagnosis on the last FCE as the principal diagnosis of the spell. The decision needs to be informed, for any given clinical condition, by information about how commonly the diagnosis differs according to whether the first or last FCE is chosen, and, when they differ, whether there is a sound clinical reason for selecting the first or last. Further work is required on how to handle continuous spells with multiple FCEs and multiple diagnoses, and whether the diagnosis under study should be selected if it occurs in the first, last or any FCE. We recommend that reference tables are produced from HES for each diagnosis, as a routine, to show the various combinations of 'position of diagnosis' on HES records.

Factors to be considered in deciding whether to include as index admissions all records with the diagnosis or only those with the diagnosis in the first position in either the first or last FCE are:

- Relative clinical importance of other diagnoses recorded in the main position compared to the diagnosis under study.
- Whether the diagnosis, such as asthma, is a common co-morbidity.
- Possibility of an event such as a stroke, acute MI or fractured proximal femur occurring in hospital rather than being present at start of the admission.
- Possibility of an event, such as a stroke, being the most important diagnosis in an initial FCE but other diagnoses, such as pneumonia, being important in later FCEs.
- Possible variability between hospitals of identifying the first diagnosis in a FCE.

Time interval from discharge to emergency re-admission

The clinically appropriate time interval between discharge and emergency re-admission will differ between diagnoses. Exhibit 4 shows for index emergency admissions of three diagnoses the standardised re-admission ratios (with 95% confidence limits) for three

time periods. Current clinical indicators usually use 30-day re-admission data but it can be seen that the 60-89 day SRR was significantly raised for the emergency index admissions for all three conditions.

Clinicians find it difficult to relate care given in an index admission to events occurring more than three months after. It is thus unusual to use indicators over time periods longer than 90 days to compare hospital performance.

Position of diagnosis on the HES record of the emergency re-admission

There are considerable differences between conditions with respect to the frequency with which an emergency re-admission has the diagnosis coded as a cause. Exhibit 5 shows, for some of the conditions studied in the ten condition-specific reports, the proportion of emergency re-admissions in which the diagnosis studied as an index admission condition was on the re-admission record.

All three diagnoses were infrequently coded on the 90-day emergency re-admission records with stroke, the condition with the highest rate, being present on only 22% of records. For condition-specific indicators it is generally best to include all re-admissions regardless of cause.

Examples of specifications

Three conditions that NCHOD have addressed in depth are acute myocardial infarction, fractured proximal femur and stroke.

For fractured proximal femur:

- ICD-10 codes used are S72.0, 72.1, 72.2 and 72.9.
- Only emergency index admissions are included.
- Only patients aged 65 years and over are included.
- Time interval from discharge to re-admission is 90 days.
- First emergency re-admissions, regardless of cause, are included.

The majority (94%) of emergency index admissions for fractured proximal femur have the condition coded as the first diagnosis in the first FCE of a CIPS. An analysis of the other conditions that were coded as first diagnosis in the first FCE has showed that none of them were probably more clinically serious than fractured proximal femur. With respect to position on the record, two approaches have been taken, namely using as index admissions:

- all admissions with a diagnosis recorded anywhere on the record
- only those admissions with diagnosis recorded as first diagnosis on the first FCE.

For acute myocardial infarction (AMI):

- ICD-10 codes used are I21-22.
- Emergency admissions are included, except those when the patient was discharged home in three days or less; these are assumed not to have had an AMI confirmed.

- Time interval from index admission to emergency re-admission is 90 days.
- First emergency re-admissions, regardless of cause, are included.

The majority (85%) of emergency admissions for AMI have the condition coded as the first diagnosis in the first FCE. An analysis of the other conditions that were coded as first in the first FCE has showed that none of them were probably more clinically serious than AMI. With respect to position on the record, two approaches have been taken, using as index admissions:

- all admissions with a diagnosis recorded anywhere on the record
- only those admissions with diagnosis recorded as first diagnosis on the first FCE.

For stroke:

- ICD-10 codes used are I61-64.
- Only emergency index admissions are included.
- Time interval from index admission to emergency re-admission is 90 days.
- First emergency re-admissions, regardless of cause, are included.

The majority (81%) of emergency admissions for stroke have the condition coded as the first diagnosis in first FCE. An analysis of the other conditions that were coded as first in the first FCE has showed that none of them were probably more clinically serious than stroke. With respect to position on the record, two approaches have been taken, using as index admissions:

- all admissions with a diagnosis recorded anywhere on the record
- only those admissions with diagnosis recorded as first diagnosis on the first FCE.

Alternative re-admission measures

Chronic conditions such as asthma and diabetes and severe mental illness may have multiple admissions over several years and without a multi-years linked file it is impossible to identify the first-ever admission. Asthma and diabetes are common conditions and are frequently coded as co-morbidities to other primary diagnoses thus increasing the difficulty of specifying which admissions to include as index cases in re-admission analyses.

With these conditions, the traditional emergency re-admission measurement using first emergency re-admission after an index case may not be the best means of measuring the re-admission experience. Initial work on asthma and diabetes suggest that measures relating to the number of days admitted in a year may be more useful.

This initial work will be built on in 2004 now that the Oxford English linked file is available and arrangements have been set up to work with the Royal College of Physicians.

Exhibit 3: Position of diagnosis code on the FCE and within the CIPS for index emergency admissions - number and percentage of CIPS with just one FCE; and number and percentage of FCEs, including the diagnosis, where the diagnosis was the first diagnosis on either the first or the last FCE

Diagnosis	CIPS		First in first FCE		First in last FCE	
	No	% 1 FCE	Number	%	Number	%
Acute MI	173197	70	147620	85	151642	88
Fractured femur	102820	76	96796	94	88061	86
Stroke	183996	62	148263	81	147818	80

Information obtained from 1998/2000 NCHOD English file

Exhibit 4: Standardised Re-admission Ratios* for index emergency admissions for each of three diagnoses

Diagnosis	0-29 day SRR (CI)	30-59 day SRR (CI)	60-89 day SRR (CI)
Acute MI	1645 (1531-1762)	685 (607-768)	401 (340-468)
Fractured femur	481 (429-535)	223 (187-262)	162 (131-196)
Stroke	669 (603-739)	350 (300-403)	243 (201-289)

*Ratio relative to the emergency admission rate in the general population of the same age and sex (general population = 100)

Information obtained from 1996/1998 ORLS file

Exhibit 5: Percentage of emergency re-admissions within 30 and 90 days of discharge for each diagnosis that had the diagnosis coded on the record following index emergency admissions

Diagnosis	Emergency re-admissions with diagnosis coded as diagnosis (%)			
	0-29 days		0-89 days	
	Anywhere on record	Absent	Anywhere on record	Absent
Acute MI	28	72	8	92
Fractured femur	9	91	9	91
Stroke	30	70	22	78

Information obtained from the 1996/1998 ORLS file

3. OPERATIVE PROCEDURE INDICATORS

Issues

For indicators of operative procedures, the issues that need to be considered, relating to the selection of index admissions, are:

- *Definition of the characteristics of an index admission.*
- *Decisions about inclusion as an index admission when there are two or more operations in a CIPS. Do you include:*
 - *all admissions with the procedure, including those where there are other operations as well*
 - *only those admissions in which the procedure is the only one*
 - *only those admissions where the operation is the first or principal one?*

The issues that need to be considered, relating to the first emergency re-admissions to be included in the numerator, are:

- *Time interval from end of an index admission to start of the first emergency re-admission.*
- *Cause of emergency re-admission. Do you include:*
 - *all emergency re-admissions regardless of cause*
 - *only those emergency re-admissions with a clinical diagnosis relevant to the operation?*

Defining characteristics of index admission

The 'index' admission is usually taken to be the first admission with the defining characteristics in a time period for an individual. Defining characteristics may include:

- patient's demographic characteristics such as age and sex
- emergency or elective admission
- operative codes
- diagnoses
- organisational characteristics such as hospital and specialty.

Operations such as coronary artery by-pass grafting (CABG) and cataract frequently have more than one operative code to describe them. In an analysis of the Oxford NCHOD English file:

- 31% of CABG admissions had one, 66% two, and 3% three or more relevant codes.
- 10% of cataract admissions had one and 90 % had two or more relevant codes.

The complex operations that are described by multiple codes must only be counted as one operation.

Operations may be associated with diagnoses with very different prognoses and it may be important to specify a procedure indicator using specific diagnosis codes.

Multiple operations in a CIPS

Problems arise when there is more than one operation recorded in a CIPS as to whether to include it as an index admission. When there is more than one operative procedure, one of them is designated as the principal operation. However, in some cases the principal procedure is interpreted as the first one performed rather than the clinically most important.

An analysis, using the Oxford English file, showed that in 6% of records with CABG, it was not recorded as the principal operation. Further analysis of these records showed:

- 86% of these cases had a principal operation code relating to plastic repair of mitral valve or aortic valve, undertaken on the same day as the CABG procedure.
- 14% of these cases had a principal procedure coded as contrast radiology of the heart, usually undertaken on a day before the CABG procedure.

Operations such as appendicectomy and cholecystectomy may be carried out as secondary procedures at the same operation in which a more major operation is undertaken. Analyses of the Oxford English file have shown:

- In 9% of appendicectomy CIPS, the operation code was not designated as the principal one and a review of the principal codes showed them to be usually operations done on the same day and clinically more important than appendicectomy.
- In 6% of cholecystectomy CIPS, the operation code was not designated as the principal one and a review of the principal codes showed them to be usually operations done on the same day and clinically more important than cholecystectomy.

Decisions about the inclusion as index cases of CIPS with multiple procedures can only be taken:

- Following careful analysis of what the other procedures were and when they occurred in relation to the procedure being investigated.
- Clinical advice about the relative seriousness of the different procedures.

Time interval from end of index admission to first emergency re-admission

Exhibit 6 show standardised emergency re-admission ratios (SRRs; with 95% confidence limits) for three time periods for four groups of trauma and orthopaedic operations, calculated from the ORLS file. Current clinical indicators usually use 30-day emergency re-admission data and it can be seen that the 30-59 day SRR was significantly raised for two of the operation groups and the 60-89 day measure raised for one.

Clinicians find it difficult to relate care given in an index admission to events occurring more than three months after. It is thus unusual to use indicators over time periods longer than 90 days to compare hospital performance.

Cause of re-admission

Most of the NCHOD work on emergency re-admission rates has specified the numerator to include first emergency re-admissions regardless of cause.

However it may be desirable to identify separately those emergency re-admissions that have a diagnosis related to complications of the initial surgery. Exhibit 7 shows the causes of emergency re-admission within 0-29 and 30-89 days that might be associated with a hip replacement carried out in index elective or emergency admissions.

For 0-29 day emergency re-admissions following index elective admission the commonest causes were:

- 22% complications of internal prosthetic devices
- 19% complications after surgical operation
- 15% presence of other functional implant
- 12% phlebitis/thrombophlebitis
- 11% complications of procedures.

For 0-29 day emergency re-admissions following index emergency admission the commonest causes were:

- 18% complications of internal prostheses
- 15% presence of other functional implant.

For 30-89 day emergency re-admissions following index elective admission the commonest causes were:

- 13% complications of internal prosthetic devices
- 13% phlebitis/thrombophlebitis.

For 30-89 emergency re-admission following index emergency admission the commonest cause was 14 % complications of internal prosthetic devices.

The proportion of diagnoses that can be related closely to the operation in the index admission is highest for elective admissions and in the 0-29 day time period.

Examples of specifications

Three conditions that NCHOD have addressed in depth are coronary by-pass grafting, hip operations and appendicectomy.

For CABG:

- OPCS codes K40-46 are used and, if there are multiple codes, only one operation is counted, ie the record is counted as one admission in which CABG was performed.
- Admissions with operative codes in addition to K40-46 are included.
- Only elective admissions are included.
- Time interval used is 30 days.
- First emergency re-admissions due to all causes are included.

For appendicectomy:

- OPCS codes H01-03 are used, and if there are multiple codes, only one operation is counted.
- Only emergency admissions are included.
- When operations other than appendicectomy are recorded, clinical advice should be taken about which codes to include.
- Admissions with a diagnosis of cancer are excluded.
- Time interval used is 30 days.
- First emergency re-admissions due to all causes are included.

For hip operations:

- OPCS codes W37-39 and W46-48, and if there are multiple codes, only one operation is counted.
- Emergency and elective admissions are analysed separately.
- When operations other than those for the hip are recorded, clinical advice should be taken about which cases to include. This is particularly important for cases of multiple trauma that should be analysed separately.
- Only patients aged 65 years and over are included.
- Time interval used is 30 days for elective and 90 days for emergency admissions.
- Emergency re-admissions for all causes are included although studies have been done, as shown in Exhibit 7, restricting re-admissions to those with diagnoses directly relevant to the index admission.

Exhibit 6: Standardised Re-admission Ratios* for emergency re-admissions following an index admission for each of four operation groups (Oxford English file)

Operation group	0-29 day SRR (CI)	30-59 day SRR (CI)	60-89 day SRR (CI)
Elective hip	517 (454-585)	156 (121-196)	
Elective knee	424 (351-504)	98 (64-140)	
Emergency hip	641 (553-735)	225 (172-285)	167 (121-220)
Emergency knee	932 (242-2070)	171 (68-321)	

*Ratio relative to the emergency admission rate in the general population of the same age and sex (general population = 100)

Information obtained from the 1996/1998 ORLS file processed by NCHOD Oxford

Exhibit 7: The causes of emergency re-admission within 0-29 days and 30-89 days of discharge after index elective or emergency admission for hip replacement: tabulation of only those reasons for readmission that might be a clinical consequence of operation

Cause of emergency re-admission	Re-admission within							
	0-29 days				30-89 days			
	Index admission		Index admission		Index admission		Index admission	
	Emergency	Elective	Emergency	Elective	Emergency	Elective	Emergency	Elective
	No.	%	No.	%	No.	%	No.	%
• Complications 1	12	6.3	45	18.8	5	4.8	2	2.1
• Complications 2	34	17.8	53	22.1	15	14.3	12	12.8
• Complications 3	12	6.3	11	4.6	5	4.8	2	2.1
• Complications 4	11	5.8	27	11.3	0	0.0	4	4.3
• Complications 5	29	15.2	35	14.6	9	8.6	9	9.6
• Other soft tissue disorders	2	1.0	24	10.0	4	3.8	7	7.4
• Phlebitis/thrombophlebitis	7	3.7	28	11.7	3	2.9	12	12.8
• Pulmonary embolism	4	2.1	15	6.3	3	2.9	0	0.0
• Post-procedural disorders 1	0	0.0	7	2.9	0	0.0	0	0.0
• Post-procedural disorders 2	3	1.6	2	0.8	0	0.0	2	2.1
• Post-procedural disorders 3	5	2.6	5	2.1	0	0.0	0	0.0
• Pneumonia	10	5.2	5	2.1	7	6.7	2	2.1
• Cellulitis	3	0.6	8	3.3	0	0.0	0	0.0
• Other orthopaedic follow-up care	2	1.0	3	1.3	0	0.0	4	4.3
• Rehabilitation care	17	8.9	3	1.3	4	3.8	0	0.0
• Fractured femur	12	6.3	3	1.3	9	8.6	5	5.3
Number of cases overall	191		240		105		61	

Information obtained from the 1996/1998 ORLS file processed by NCHOD Oxford

Complications 1 are abnormal reactions after surgery.

Complications 2 are those of orthopaedic prosthetic devices and implants.

Complications 3 are those of other internal prosthetic devices.

Complications 4 are those of procedures nec.

Complications 5 are those of other functional implants.

Post-procedural 1 are disorders of the circulatory system

Post-procedural 2 are musculoskeletal disorders

Post-procedural 3 are other post-surgical states.

4. SPECIALTY-BASED INDICATORS

Issues

Hospital work is organised on the basis of specialties. Clinicians within a specialty are responsible for their performance and are more likely to relate to outcome indicators relating to their specialty than to those relating to a whole hospital or trust.

Within a specialty there are admissions with high and low risks of emergency re-admission. Emergency re-admission rates calculated for a specialty will be greatly affected by volume of work that is:

- low risk increasing the denominator with no effect on the numerator
- very high risk, such as cancer patients, leading to increases in the numerator with small effect on the denominator.

NCHOD has done some preliminary work to identify groups of patients within specific specialties with:

- *Low risk of emergency re-admission.*
- *Significant risk of emergency re-admission and adequate numbers of admissions and deaths to produce a discriminating comparative indicator.*

Surgical specialties

As yet, NCHOD has done studies only in trauma and orthopaedics.

General principles arising from this and the related work on case fatality rates are:

- Omit admissions with cancer from the index admissions.
- Include admissions which had and did not have operations as index admissions

The decision was made to remove admissions with cancer diagnoses because:

- Cancer diagnoses are associated with a disproportionately high rate of emergency re-admissions following admission and thus may mask other conditions.
- Comparative cancer re-admission performance needs to be based on cancer networks not individual hospitals or trusts.

The decision was made to include admissions in which an operation did not occur because the rate of adverse events following them for some patient groups was as great as or greater than for those in which an operation took place.

The work on trauma and orthopaedics used ORLS data. The results showed that for elective admissions, taking into account the rate and overall number of adverse events, only the following indicator should be considered for comparing trust performance:

- 30-day emergency re-admission rate following hip replacement.

The results showed that for emergency admissions, taking into account the rate and overall number of adverse events, the following indicators should be considered for comparing trust performance:

- 90-day case fatality rate following hip replacement
- 90-day case fatality rate following admission for fractured proximal femur
- 90-day emergency re-admission rate following hip replacement
- 90-day emergency re-admission rate following admission for fractured proximal femur.