HES FOR PHYSICIANS

A guide to the use of information derived from Hospital Episode Statistics

Royal College of Physicians, London

Unit of Health-Care Epidemiology, University of Oxford

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Routine hospital statistics

Routine hospital statistics are of interest to physicians as they provide information about clinical activity and the quality of care. As the data are extracted from patients' notes, they may also reflect the quality of clinical record keeping.

Hospital Episode Statistics (HES) are a rich source of information about all patients treated as hospital in-patients in England. Similar information about Welsh patients is available from the Patient Episode Database Wales (PEDW). Data in these systems are captured as individual records on patient administration systems in NHS trusts. They are then transferred to national data warehouses. The current arrangements will change in England with the implementation of the Secondary Uses Service.

The current and new arrangements are described in Annex A.

The data collected by these systems relate to:

- Patients including age, sex, NHS number and location of residence
- Administrative details such as NHS trust; GP; referral, admission and discharge date; method and source of admission; discharge method and destination
- Clinical details including diagnoses, operative procedures, consultant and specialty.

Definitions and coding structures for the key items of interest to physicians are in Annex B.

Although the HES dataset is standard, the way in which the database is structured varies between the different information providers. The basic counting unit for calculation is the finished consultant episode (FCE), the total time a patient spends under the care of an individual consultant. FCEs can be aggregated into:

- Hospital spells, the total time a patient spends in one hospital
- Trust spells, the total time a patient spends in the hospitals of one trust
- Continuous in-patient spells, the total continuous time a patient spends in hospital regardless of which trust.

Using the NHS number and other factors it is possible to link all the FCEs or spells that a patient had in a year together so that measures such as re-admission rates can be calculated. The most advanced databases can now link HES data over five years allowing for the sophisticated analysis of chronic diseases. It is also possible to link mortality data collected by death certification with HES data so that case fatality rates can be calculated on the basis of deaths occurring anywhere not solely on those in hospital.

Details of how the components of HES are linked are in Annex C

Quality of the data

Information derived from HES is frequently criticised for the quality of data used. Its reliability should be thought of in terms of usage. Fields that are widely used are more reliable than those which are not. Analysis of the steps in data collection from patient to database shows that the link most susceptible to error is that of the recording and thus coding of the clinical information held in the patient record. Physicians thus have a major responsibility in ensuring that their data are accurate.

The results of work, done by The Royal College of Physicians *i*Lab, looking at the quality of data about individual consultants are in Annex D.

Specification of measures derivable from HES

The number of admissions may either form the numerator or denominator of a measure. It is thus very important in any analysis to understand how admissions have been specified and the key data items involved are:

- Method of admission
- Diagnosis
- Operative procedure.

When using HES data, comparisons may be made over time or between entities such as:

- Consultant
- Trust
- Hospital
- Specialty
- Population.

Details about the specification of admissions and entities for comparisons are in Annex E.

The common measures derived from HES are:

- Admission rates
- Re-admission rates
- Case fatality rates
- Length of stay
- Waiting times (which are not addressed in this guide).

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The interpretation of HES information requires the consideration of confounding factors. The main ones are:

- Age and sex-mix of the patients
- Social deprivation
- Case-mix including severity.

Details about the specification of HES measures and their confounders are in Annex F.

Exemplar studies

To illustrate the points made about the specification of the statistical measures, Annex G contains exemplar studies:

- Study 1. Annual admission and person-based rates for asthma emergency admissions using FCEs and spells, and asthma as the primary diagnosis or recorded anywhere on the record.
- Study 2. Diagnostic codes most commonly recorded on medical emergency admissions and the proportion of admissions in which the diagnosis was the primary diagnosis.
- Study 3. For six conditions in which the diagnosis was recorded as the primary one in at least one FCE of a spell, the frequency with which this occurred in the first and last FCEs of a spell.
- Study 4. Co-morbidities commonly associated with medical emergency admissions for six primary diagnoses.

- Study 5. Correlation between 0-30 and 0-90 day case fatality rates for medical emergency admissions for six primary diagnoses.
- Study 6. Effect of social deprivation on age/sex standardised case fatality rates for medical emergency admissions for six primary diagnoses.

Major publishers of HES information

The major national publishers of information from HES are:
- Health and Social Care Information Centre
- Public health observatories
- Healthcare Commission (formerly Commission for Health Improvement and Commission for Healthcare Audit and Inspection)
- Research organisations
- Private sector organisations.

Details about the products of these organisations are in Annex H.

Sources of assistance with using HES data

The potential providers of information to consultants about their own clinical activity are:
- Trusts which in addition to their own resources may have contracts with external bodies which provide analyses
- Consultant Enquiry System set up Department of Health and now part of the Health and Social Care Information Centre
- HES Enquiry Service provided by Northgate Information Solutions under a national contract
- Public health observatories.

Assistance in specifying and interpreting HES analyses can be obtained from:
- Unit of Health-Care Epidemiology, University of Oxford website
- Royal College of Physicians *i*Lab.

Details about the assistance available to physicians are in Annex I.

An example of the output from the Consultant Enquiry System is in Annex J.

Aids to using HES available from the Unit of Health-Care Epidemiology website are in Annex K.

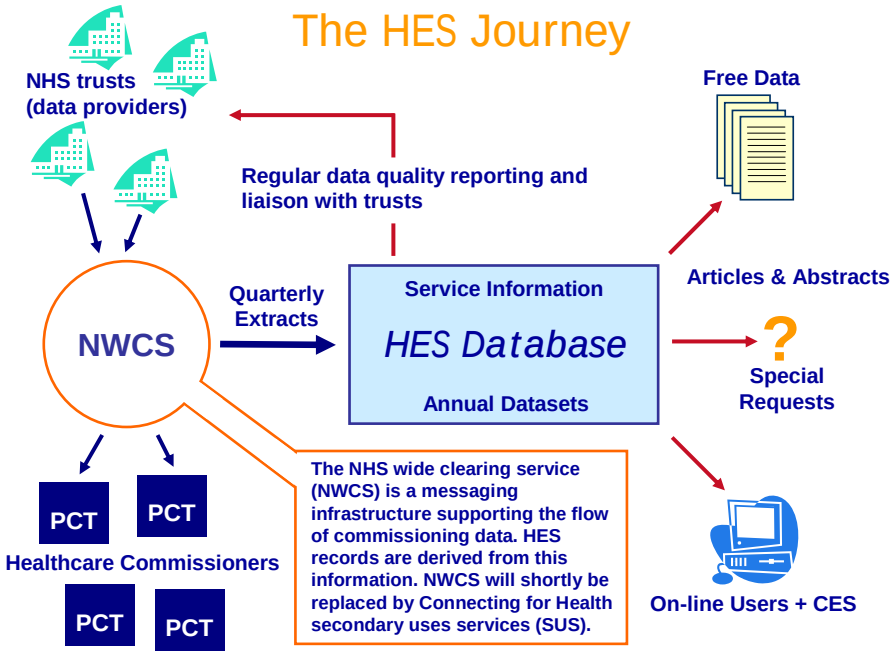
Details of contributors, contacts and funding are in Annex L.

ANNEX A: ARRANGEMENTS FOR PRODUCING HES DATA

The current flow of HES data from the NHS trusts to the NHS-wide Clearing Service (NWCS) is shown in the Exhibit. The Clearing Service transfers quarterly extracts to the HES database which provides the information required through a number of mechanisms.

NWCS is to be replaced by the Secondary User Service (SUS) as part of the NHS Programme for IT being implemented by NHS Connecting for Health. It is anticipated that SUS will provide analytical services that will replace the current Consultant Enquiry System.

Exhibit: Flow of data into and from the HES database



ANNEX B: KEY DATA ITEM DEFINITIONS AND CLASSIFICATIONS

Overview

This Annex contains the definitions and classifications for the following data items:

- Method and source of admission
- Method and destination on discharge
- Diagnosis
- Operative procedure
- Specialty
- Consultant.

Method of admission

This code identifies how the patient was admitted to hospital. The classification is:

- Elective:
  - from waiting list
  - book
  - planned
- Emergency:
  - via A&E services of hospital
  - via GP
  - via bed bureau
  - via consultant out-patient clinic
  - other means, including via A&E services of another hospital
- Transfer from another hospital provider other than in an emergency
- Other codes including those relating to maternity for mother and baby.

Discharge method

This code defines the circumstances under which a patient left hospital. The classification is:

- Discharged on clinical advice or with clinical consent
- Self discharged or discharged by a relative or advocate
- Died
- Other codes include discharged by mental health review tribunal, Home Secretary or court and stillborn baby.

Source of admission and destination on discharge

These codes identify:

- Where the patient was immediately prior to admission
- Where the patient was due to go on leaving hospital.

The classification is:

- Usual place of residence including no fixed abode
- Temporary place of residence when usually resident elsewhere (hotel, college)
- Other NHS hospital provider:
  - ward for general patients, young physically disabled or A&E services
  - ward for maternity patient or neonates
  - ward for patients who are mentally ill or who have learning difficulties
  - high security psychiatric accommodation

- NHS run nursing home, residential care home or group home
- Other codes including babies born on way to hospital, non-NHS run hospital, non-NHS run hospice.

Diagnosis

There are 14 fields available for diagnosis codes in each FCE and the first field contains the primary diagnosis code. The codes are defined in the International Statistical Classification of Diseases, Injuries and Causes of Death (ICD-10). Diagnosis codes start with a letter and are followed by two or three digits. The third digit identifies variations on a main two digit diagnosis code.

Operative procedure

There are 12 fields available for operative procedure codes in each FCE. The most resource intensive or main procedure is coded in the first position. The codes are defined in the Tabular List of the Classification of Surgical Operations and Procedures. The current version is OPCS-4. Procedure codes start with a letter and are followed by two or three digits. The third digit identifies variations on a main two digit procedure code.

Specialty

The specialty fields are:
- Main specialty, that under which the consultant is contracted
- Treatment specialty, that in which the consultant was working during period of care.

In the classification, the following specialties are of interest to physicians. Those in italics relate to the treatment specialty only:
- 300. General medicine
- 301. Gastroenterology
- 302. Endocrinology
- 303. Clinical haematology
- 304. Clinical physiology (not a treatment specialty)
- 305. Clinical pharmacology
- *306. Hepatology*
- *307. Diabetic medicine*
- *308. Bone and marrow transplantation*
- *309. Haemophilia*
- 310. Audiological medicine
- 311. Clinical genetics
- 312. Clinical cytogenetics and molecular genetics (not a treatment specialty)
- 313. Clinical immunology and allergy
- 314. Rehabilitation
- 315. Palliative medicine
- *316. Clinical immunology*
- *317. Allergy*
- *318. Intermediate care*
- *319. Respite care*
- 320. Cardiology
- *322. Clinical microbiology*
- 330. Dermatology

- 340. Thoracic medicine
- *341. Sleep studies*
- 350. Infectious diseases
- 352. Tropical medicine
- 360. Genito-urinary medicine
- 361. Nephrology
- 370. Medical oncology
- 371. Nuclear medicine (not a treatment specialty)
- 400. Neurology
- 401. Clinical neurophysiology (not a treatment specialty)
- 410. Rheumatology
- 430. Geriatric medicine.

Consultant

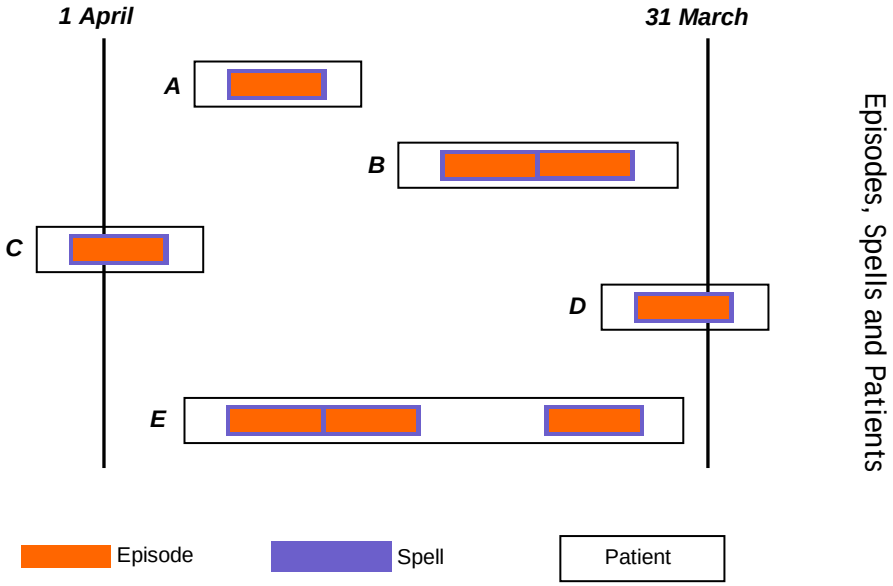
This field contains the GMC code for the consultant and identifies him/her as an individual.

ANNEX C: EPISODES AND SPELLS

Introduction

Each HES record contains details of a single consultant episode. This is a period of admitted patient care overseen by a consultant or other suitably qualified healthcare professional such as a midwife. HES records are assembled into annual datasets covering financial years (1 April to 31 March), according to the episode end date. The Exhibit illustrates how these episode records form building blocks that permit analysis of patient care over time, with five patient experiences, labelled A to E.

Exhibit: HES building blocks permitting analyses over time



Patient experience A

In the majority of cases, a stay in hospital will be fully described by a single HES record. The episode start and end dates will therefore equal the admission and discharge dates. If the admission was a day case, all four dates will be the same.

Patient experience B

During the stay in hospital, this patient was transferred to another consultant. The spell is therefore described by two HES records (one for each consultant episode). A transfer of consultant responsibility is far more likely to occur where the admission was an emergency. During the 2003/2004 financial year, 31% of emergency admissions and 4% of ordinary elective admissions consisted of more than one episode. In a small number of cases, the patient will be transferred to another trust. This means that there will be two separate trust spells although only one spell of continuous hospital care.

Patients C and D.

These examples illustrate the problem of 'fitting' records of treatment into a financial year (i.e. to ensure that analyses of activity performed on different years data are comparable, and to avoid counting a record that straddles two years twice). Record C**,** which has an end date falling within the year of interest and is thus a finished consultant episode, will usually be counted. Conversely, record D with an end date in the following year will be counted then.

In order to maintain a record of all episodes that started in one year but finished in a later year, a special HES record, the unfinished consultant episode (D in respect of the year shown), can be identified. There are problems associated with including records of unfinished episodes, and nearly all analyses of HES data are based solely on FCEs.

Patient E.

This example shows a patient with a period of treatment consisting of a two episode spell followed by a separate single episode spell (i.e. having been discharged at the end of the first spell, the patient was re-admitted later during the same year). Analysis of 'care pathways' such as this is now facilitated by a unique patient identifier that enables all records for a given patient to be linked together.

Advanced databases

Although the HES dataset is standard, the way in which the database is structured varies between the different information providers. Using the NHS number and other factors it is possible to link all the FCEs or spells that a patient had in a year together so that measures such as re-admission rates can be calculated. The most advanced databases can now link HES data over five years allowing for the sophisticated analysis of chronic diseases. It is also possible to link mortality data collected by ONS through death certification with HES data so that case fatality rates can be calculated on the basis of deaths occurring anywhere not solely on those in hospital.

Plans are also in place for adding data about other patient contacts such as out-patient and accident and emergency attendances to the HES database.

In interpreting the analyses from the national data providers it is essential to know the level of linkage of the data. The most sophisticated databases such as those at Oxford and at Northgate Information Solutions can link:

- FCEs into the various types of spell
- FCEs and spells across years
- Deaths as recorded by death certification to FCEs.

Summary

When interpreting HES information, physicians must know:

- ***Unit of counting (FCE or which type of spell) used***
- ***Whether HES data are linked and, if so, for how many years***
- ***Whether ONS death certification data are linked with HES.***

ANNEX D: QUALITY OF HES DATA ISSUES ADDRESSED BY ROYAL COLLEGE OF PHYSICIANS *i*Lab

The following are issues which arose when exploring in detail the activity data of individual consultant physicians held in their name on either HES (English consultants) or PEDW (Welsh consultants). There are several factors which need to be considered prior to their wider interpretation:

- Views expressed are those of clinicians in their discussions with *i*Lab staff (i.e. a clinician and an information analyst with experience of HES/PEDW). Interpreting these views therefore as "correct" or "incorrect" should be done with caution. However, as a representation of attitudes towards consultant-level routine data from the clinical perspective, they remain an accurate record of issues to address.
- Reasons for deviation of data from the expected were often traceable back to local circumstance. However, for this very reason some anomalies were not possible to find answers to. In such cases, clinicians were encouraged to further investigate upon their return from the *i*Lab.
- Attempts to quantify these data should also be performed with caution. Once encountered, some issues were possible to search across all presentations for. The frequency of occurrence of other issues was such that specific mention is made of this below. However their significance for one clinician may not have constituted a problem for another and may not have been mentioned or noted, despite being present. The issues outlined below are therefore not meant as a record of all issues quantified by consultant, but rather a selection of some of the problems encountered.
- Similarly, since *i*Lab sessions were conducted over a seven month period, presentations evolved over time and the surrounding issues along with them. The fact that these issues were recorded by the clinical research fellow means that the presence of observer bias must also be considered.
- Some data quality issues unearthed came from retrospective analysis of five years' worth of data. Correspondingly some of these issues had clearly been rectified within this time period. They were recorded however, due to the possibility of the same problem existing in other hospital departments, not represented in the intervention group sample.
- Where activity has been under-estimated or over-estimated due to mis-allocation it stands to reason that in many cases this will reflect the converse for another colleague for whom the activity has also been mis-allocated. Where possible, categorisation of such issues reflects the perspective of the *i*Lab visiting clinician.
- Due to interplay between concepts and categories, some issues described may be assigned to more than one category, or appear in only one despite considerable overlap.

These data were categorised where possible into areas previously described as pertaining to data quality, some of which were more relevant to the subject matter than others. The table below details these categories, each of which was based around a question or questions posed of the data.

CATEGORY			
Question(s) posed			
	Sub-category		
		• Examples	Notes

A. ACCURACY			
Is the information free from error and inaccuracy?			
A.1	**Consultant code**		
		• Transposed numbers of GMC code leading to "unknown" consultant on database • Consultant's initials inaccurately recorded locally resulting in the appearance of two consultants on HES rather than one • Activity was recorded against one consultant code several months prior to starting work at the trust • Several occasions of consultant activity being recorded beyond the date of retirement or moving to another trust, sometimes in excess of a year • Consultant code inaccurately recorded (two digits transposed) led to comparisons against wrong clinician (from another trust/specialty) • In one trust, large amounts of day case activity were being coded against an invalid (C9999998) code[1]	All material inaccuracies were fed back locally to trusts (via consultants) and where appropriate directly to HES or PEDW
A.2	**Length of stay (LOS)**		
		• More than 120 cases with non-acute LOS exceeding 365 days over a 5 year period, known to be inaccurate. Maximum LOS recorded as 2011 days	Most likely due to failure to "switch off" (i.e. finish) episodes of care at trust level
A.3	**Waiting list figures**		
		• Inaccuracies of waiting list figures were common, affecting more than half of all visiting consultants. These included inaccurate details about consultants working at particular hospitals, missing consultants, inaccurate details of consultant specialty and perceived inaccuracies of actual waiting times. Concerns were expressed that a single figure for waiting times did not reflect the clinical practice of triaging non-urgent referrals according to seriousness of condition.	Although not part of HES/PEDW, these data are assigned to individual consultants, originate from trust information departments and are available to the public[2]
B. COMPLETENESS AND COVERAGE			
Is the information complete? Does it reflect all the activity carried out by staff?			
B.1	**Outpatient data**		
		• The lack of outpatient data was the single most common issue arising from looking at HES/PEDW data. Almost every visiting clinician highlighted the fact that the majority of their specialty work	Clinicians were informed of ongoing plans to make OPD data available in England and

[1] A subsequent query of HES and PEDW revealed a total of 522,436 episodes of care for the financial years 2002/03 and 2003/04 recorded against invalid codes in the Consultant code (CONSULT) field. This excludes codes assigned to practitioners other than consultants working in secondary care (e.g. dentists, GPs, nurses, midwives)

[2] Three sources of information were used: NHS waiting times in England (http://www.nhs.uk/England/AboutTheNHS/WaitingTimes/ConsultantSearch.aspx); the Welsh equivalent (http://www.hsw.wales.nhs.uk/ipd/specproc.htm) and the Dr Foster website (http://www.drfoster.co.uk/localservices/consGuide.asp).

		(and in some cases the majority of their work) occurred in the outpatient department • More than one clinician expressed the view that they would not have taken part in the iLab project had they known their recorded activity was limited to inpatients and daycases only	Wales, however the level of detail desired by clinicians is likely to exceed the amount currently submitted centrally
B.2	**Activity of non-consultant clinicians**		
		• Several consultants reported activity led by nurse consultants with no input from physicians, examples being ward-based deep vein thrombosis (DVT) clinics, dermatology clinics and in one case responsibility for a rehabilitation ward. In some cases this activity was recorded against a named physician, in others it was not recorded • The activity of junior members of staff and non-career grade staff (i.e. associate specialists) was highlighted as being absent from the database • Other members of the clinical team thought to be implicated in the resourcing of team care (e.g. physiotherapists) were highlighted as being absent from the database	These issues surround the long-standing use of a GMC number representing a "consultant team" of carers, with overall responsibility lying with the consultant themselves. However, several consultants expressed the perceived inappropriateness of using such a measure for comparisons, especially in cases where there is no consultant input into a patient's care
B.3	**Ward referrals (inter-specialty requests for inpatient consultation)**		
		• Several consultants highlighted ward referrals as an area of activity not captured (locally or nationally), despite occupying a regular amount of time each week • In one case this involved the regular performing of an expensive procedure • In medical specialties with few inpatient beds (e.g. neurology), the majority of a consultant's inpatient workload may be taken up by attending and treating patients on other wards, nominally under the care of another consultant • A more formalised arrangement in clinical practice is "shared care" (i.e. when two clinicians from different specialties care for the same patient). One clinician reported three sessions per week devoted to "joint ward rounds" for patients nominally under the care of another physician • One consultant reported mounting pressure for beds leading to ward rounds in the A&E department. Activity by his consultant team which resulted in discharge from A&E did not appear in hospital activity data	"Ward referrals" in hospital occur when a patient under the care of one specialty team require input from a different specialty team. The latter will most often visit the former's ward to provide care, although outpatient attendances are another means for seeing patients.
B.4	**Ward attenders**		
		• More than one consultant mentioned activity occurring on wards classed neither as inpatient nor daycase. • In some specialties (e.g. haematology) such "drop in" facilities for patients may constitute considerable workload occurring regularly • Some trusts did not record such activity, while others coded such activity as daycases	
B.5	**Community activity**		
		• Community rehabilitation medicine work not represented for one consultant. Activity known to be recorded but not entered onto local PAS	PAS: Patient administration system

C. VALIDITY			
Are the data items valid? Is information "within range" of that expected?			
		Note: Over half the consultant interviews (57%) highlighted issues falling into this category, as described below	
C.1	**Invalid or incomplete coding**		
		• High rates of R69 or R69X codes compared to national figure for the consultant's specialty (consultant or one of their colleagues). This was seen in approximately 20% of cases. The highest rate seen was 65% of all activity recorded by a PCT for a geriatrician's work. • In one case no hospital identifier code was submitted with data • For one consultant a large number of "planned" admissions were submitted with a length of stay equalling zero[3] • In one case no specialty code had been submitted (MAINSPEF or TRETSPEF; see note associated with E.1)	1. R69X is a diagnostic code assigned by HES when a field is left blank or contains an invalid code. R69 is a valid ICD-10 code which signifies "*Unknown and unspecified causes of morbidity*". It is very occasionally submitted by a trust if no diagnosis can be ascertained from the medical record. 2. The definition of a planned admission involves an overnight stay
C.2	**Clinically perceived inappropriate coding of primary diagnoses / procedures**		
		• In two cases, descriptive "Z" codes were used as primary diagnosis for large number of episodes. In one of these cases (rehabilitation medicine) almost all activity was coded thus. • There were several examples of clinicians feeling particular codes were inappropriately used as a primary diagnosis, for example senility and obesity • Clinicians highlighted on several occasions that they disagreed with the ICD-10 diagnosis chosen for particular high-volume cases, suggesting a more "clinically appropriate" code in most cases • In many cases, clinicians believed coding could have been performed to a more detailed level (i.e. they saw an over-reliance on "not elsewhere classified" or "not otherwise specified" codes) • Similarly, a large number of dermatology daycase biopsies were coded without the site of biopsy recorded • Conversely, there were examples of negative test results being coded with a definitive diagnosis (the commonest example being negative DVT scans coded as a "specified soft tissue disorder" rather than a symptom code • More than one clinician highlighted shortcomings in ICD-10 for reflecting current practice. For example, a large amount of gastroenterology work concerning Barratt's oesophagus was described as closely as possible with the ICD-10 code "ulcer of oesophagus" • Coding overlap was highlighted for cardiology procedures (angiocardiography) using OPCS-4 (e.g. ten different types of angiography had been recorded where a clinical distinction could be made between only four or five procedures)	It must be stated once again that these views are simply the **clinical perspective** on the clinical coding of activity. More than establishing right or wrong practices these views serve to highlight the effect local policy and interpretation of coding rules can have on national statistics at a consultant level – and the need for dialogue between clinicians and clinical coding staff to overcome these.

[3] During the iterative process of consultant presentations, it became apparent that simplifying admission method categories into clinically intuitive "Emergency" vs. "Planned" vs. "Daycase" admissions would be beneficial. Therefore, for the purposes of iLab presentations, "Planned" admissions included episodes which had an admission method (ADMIMETH) of either 11 (waiting list), 12 (booked) or 13 (planned)

D. TIMELINESS			
Is the information available at the right time?			
D.1	**Delayed refresh data leading to coding anomalies**		
		Note: In order to provide clinicians with the most recent and clinically relevant data for discussion, provisional data was used whenever made available. Using such data prior to the annual refresh (see notes below) however led to the following noticeable problems	
		• Artificially high R69X rates for 2003/04 (financial year) data were seen in all visiting consultants up to the HES annual refresh in December 2004 (affecting approximately 75% of consultants) • For a number of consultants total levels of activity were markedly reduced for 2003/04 data, prior to the refresh • Similarly for one Welsh consultant visiting in November 2004, there was no activity yet recorded for the final quarter of the 2003/04 financial year • Conversely for one consultant the presence of many duplicate episodes (subsequently cleansed out in the annual refresh) resulted in artificially high activity levels when visiting in October 2004	The availability of fully operational data from HES/PEDW depended on the timing of the "annual refresh" of data, whereby all fields are updated following final submissions from all trusts in the UK. For the 2003/04 financial year (i.e. up to 31st March 04) this occurred in December 2004
E. RELEVANCE FOR PURPOSE			
Is the information contextually appropriate in the eyes of the consultant? Does it reflect clinical practice? Is it relevant for supporting the appraisal & revalidation processes?			
		Note: Overall, this category and the following one (F) accounted for the majority of data quality issues identified from the clinical perspective when discussing HES/PEDW data. Almost every session raised issues falling into these two categories, with the vast majority of consultants' data contributing to multiple sub-categories	
E.1	**Use of specialty code**		
		• For the majority of consultants engaged in both emergency and non-emergency activity the use of the specialty code (see note) was perceived as not accurately reflecting clinical practice. For many specialists, all their activity was coded under General Medicine. For the remainder of physicians (save from three) all their activity was coded under a medical specialty code, despite large amounts of General Medicine activity • For a small number of consultants their specialty was not represented on HES/PEDW (e.g. hepatology, acute medicine), and activity was coded under an alternative (e.g. gastroenterology, general medicine) • For two consultants five years of activity was coded with a specialty function code of General Medicine, but the main specialty activity varied, being split between General Medicine and another code (Cardiology/Thoracic medicine in these two cases) • Use of specialty codes varied greatly from one trust to another, markedly reducing the validity of specialty comparisons at a national level	The Data Dictionary states that a physician engaged in any unselected emergency work should have a "main specialty" (i.e. contracted) code (MAINSPEF) of General Medicine. A separate data item (TRETSPEF) is the "Specialty function code" (i.e. the specialty best describing that under which the patient was treated), which may be expected therefore to vary more than the "main specialty" code. For all but three of the consultants in the study, both these fields contained the same information, and in this table are referred to simply as "Specialty Code"

E.2	**Use of admission method code**		
		• In several cases the use of a particular admission method code was not perceived to reflect clinical practice or definitions given in the data dictionary.[4] Examples included: o "Planned" or daycase activity being coded in bulk as emergencies (e.g. iron/pamidronate infusions) o Daycases with LOS=0 being coded as "planned" (i.e. overnight stay) admissions. In one example all occurrences of the same activity were coded differently by two hospitals within one trust (i.e. one coded as daycases while the other coded as "planned" admissions) o Daycase chemotherapy being coded in bulk as emergency admissions o Patients attending a hospital ward (either as part of a planned attendance for treatment or for clinical advice) being coded as daycase admissions (e.g. daily nurse-administered anticoagulant injections for deep vein thrombosis; haematology "drop in" ward attenders)	Although not as varied as the use of the specialty code, there were a number of differences in coding practices concerning admission method from one trust to another. Some of these appeared to be due in part to new staff activities and services not able to be coded using current methods. As a result, in other trusts such activity was not being submitted centrally (see Section B.2)
E.3	**Team working**		
		• Several physicians highlighted progressive changes in working practices which have led to departmental team-based care (i.e. responsibility for clinical decisions concerning one patient episode being shared among more than one consultant). o In more than one case activity was collected at this team level, and simply divided equally among the consultants involved, irrespective of where responsibility for care lay o In more than one case a paired team of consultants had the vast majority of activity recorded against one consultant • A group of physicians working as a team in one trust did not record transfers of care between them • In one case a senior member of the nursing staff instigated transfers of care by allocating activity to a team of consultants in order to even workload on a ward • The responsibility for patients on intensive care or high dependency units is inevitably shared between the admitting consultant and the intensivist or intensivists staffing the unit	1. Similar to the issues raised in B.2, the attachment of GMC code to episodes of care represents overall responsibility for a patient's care during that episode. However, there is currently no means for assigning more than one consultant to one episode of care in order to reflect team working or shared care 2. It is possible to record the presence of a patient on an intensive care or high dependency unit by use of an Augmented Care Period (ACP) "tail". However, ACP data are often incomplete[5], and take no account of team working on the unit itself
E.4	**Benchmarking against colleagues**		
		• Some consultants expressed a difficulty identifying peers with the same specialty interest or equivalent caseload for benchmarking purposes • Benchmarking without knowledge of workforce data (i.e. differences in staffing rotas from one hospital to another) was seen by clinicians as reducing the validity of comparisons (see also Section F.1) • Benchmarking outside of any one hospital was perceived as invalid by many clinicians due to: o differences in admission policies between hospitals/trusts (regarding routes of admission	1. This first issue was especially pertinent for clinicians whose specialty was not represented on HES/PEDW. However, general problems with use of the specialty code (see section E.1) also augmented this problem 2. Since completion of the study, linked

[4] Data Dictionaries can be found on the internet: HES (http://www.connectingforhealth.nhs.uk/datastandards/datadictionary); PEDW (http://datadict.hsw.wales.nhs.uk/Current/htm/hh_start.htm [NHS internet only])

[5] See http://www.hesonline.org.uk/Ease/servlet/ContentServer?siteID=1937&categoryID=176 for more details

		and age cut-off policies) which may affect casemix o different coding practices (administrative and/or clinical) between hospitals/trusts o different discharge policies between hospitals/trusts (see also section F.3) • Various limitations concerning comparisons of mortality rates using HES/PEDW were expressed: o During the study mortality rates were for inpatient deaths only, not taking into account varying discharge policies, local hospice facilities, hospital-based palliative care services or social services for care of the terminally ill at home o Varying admission policies (e.g. multiple re-admissions reducing overall mortality rates when measured by number of episodes; see also issues highlighted in section E.2) o Problems comparing mortality rates to national figures using specialty code (see section E.1) o Similarly, problems comparing mortality rates by individual without adjusting for casemix (especially large numbers of elderly patients or cancer cases) o HES/PEDW do not contain enough measures of casemix to ensure comparisons of like with like o Problems with incorrect allocation of activity to consultants (see sections E.5 and E.6) o Several consultants expressed surprise at their mortality rates, ascertaining from local audits and personal data collection than they were in reality higher than rates recorded on HES/PEDW	mortality data has become available through HES which will address the first issue concerning mortality rate comparisons. These data are currently not available down to consultant level, but the iLab is working with HES to enable such comparisons
E.5	**Under-estimation of activity levels**		
		• Incomplete recording of procedures performed was the single most common reason for perceived under-estimation of activity, affecting the majority of consultants. Some examples of procedures carried out in large numbers but not seen or significantly under-represented on HES/PEDW included: o Endoscopic procedures (gastroscopy, colonoscopy, bronchoscopy) o Insertion or replacement of central lines o Synacthen test daycase procedures o Haemodialysis o Liver biopsies o Lumbar punctures o Chest drains and pleural aspirates o Bone marrow aspirates o Transoesophageal echocardiograms (performed as daycase by consultant cardiologist) o General ICU procedures, including tracheostomy (there were often large numbers of ICU patients with no procedures recorded despite LOS>1) o Examples of large numbers of daycase attenders (>100) with no procedure recorded for the episode o Comments were also made about the sporadic coding of minor procedures such as bladder catheterisation, infusion of therapeutic substances and transfusion (where either large numbers or none at all were expected by clinicians)	1. For the various reasons described, this sub-category was one of the commonest reason clinicians felt HES/PEDW data did not reflect their clinical practice. This sub-category does not take into account activity omitted as described in sections B.1 to B.5 2. It is conceivable that some of the missing procedure activity has been coded as outpatient activity, thereby not appearing in the HES/PEDW dataset. This is especially true of gastroenterology endoscopic procedures, although consensus over such policy appeared to vary between trusts 3. Similarly, the appearance of small numbers of minor procedures for many consultants suggested a lack of consensus over what constitutes a "codable" procedure 4. Misallocation of procedures was commonly identified by searching for all instances of a particular procedure across all

		• Misallocation of procedures was the second most common reason for an individual's activity being under-represented on HES/PEDW, affecting approximately half of the consultants. Examples included: o Gastrointestinal endoscopic procedures o Bronchoscopies o In one case sleep studies performed by four consultants but all episodes allocated to just one • Misallocation of activity in general resulting from failure to document transfers of care affected several consultants. Specific causes identified included: o Large numbers of discharges from coronary care unit (CCU) under care of admitting (non-cardiologist) consultant o Daily ward return being completed using inaccurate on-call rota information o Large amounts of ICU activity being absent from database for one intensivist o All cystic fibrosis activity being coded to one (paediatric) consultant despite transfers to respiratory consultants occurring regularly o Presence of activity coded against clinically inactive academic staff • Unexplained causes of missing data were seen with a small number of consultants. In one case activity did not appear on HES until nine months after the clinician commenced work. In another case all members of a haematology department were without daycase activity, despite regular occurrences of day care	procedure codes for the entire trust. Consultants were able to identify those clinicians likely or unlikely to be performing such procedures. The most likely cause of misallocation was thought to be undocumented transfer of care (affecting inpatient procedures especially) 5. Misallocation of procedures or activity in general due to inaccurate or undocumented transfers of care for one consultant resulted in over-estimation of activity for another consultant (see section E.6)
E.6	**Over-estimation of activity levels**		
		• Misallocation of procedures as described in E.5 (note 4) was an obvious cause for clinicians being credited with too much activity. o Almost every visiting clinician had small numbers of procedures (generally <5) recorded against their name which they knew to be an inaccurate representation of their activity o Several consultants had large numbers of endoscopic procedures their consultant team did not perform, coded against their name o One intensivist had in excess of 160 liver transplant operations recorded against their name as a primary procedure over a five year period, in addition to a selection of other major surgical procedures. This was also the case for other intensive care consultants working on the same unit • Similarly misallocation of activity in general resulting from failure to document transfers of care (as described in E.5) was another reason for over-estimation of activity levels. o This occurred in more than one case when a clinician was nominally the receiving consultant for emergency admissions, but did not assume responsibility for the patient's subsequent care o Transfers of care from areas of high dependence (ICU/HDU) back to the care of ward physicians were found to be poorly documented in one case o A consultant working in a large specialist centre had the activity of a "visiting" clinician from another locality coded against their name	1. Over-estimation of activity was highlighted frequently (in approximately 50% of visits), although the problem was not as common as under-estimation. This may have been because the latter is more obvious when missing from one consultant's data, but less so when wrongly allocated to a larger number of consultants. 2. Although some examples of over-estimation occurred as a direct result of the under-estimation examples given in section E.5, there were also unique examples as described 3. Due to the fact that only one consultant can be represented on HES/PEDW for any single episode, activity falsely recorded against one consultant can therefore not appear against the consultant actually responsible for that episode of care

		• There was one example of a general over-estimation of activity following the institution of an electronic patient record (EPR). This was thought to be due to a number of incorrect/"accidental" transfers of care being recorded which were subsequently not possible to rectify • An issue overlapping with the those in section B.2, on more than one occasion activity was inappropriately coded to a consultant due to the responsible clinician (e.g. nurse consultant, associate specialist) not being represented on the database • On one occasion a consultant worked abroad with the armed forces for several extended periods, during which time their UK work was covered by a locum consultant. However, activity was assigned to the first consultant despite being absent from the UK • The issue of recording the activity of locums arose on several occasions. Often when locum consultants were known to be working in the trust during a particular time period their activity did not appear, but was presumed allocated to another clinician or clinicians	
F. DISTORTING FACTORS			
Are there local factors or likely artefacts which explain apparent anomalies or differences in the data?			
		Note: Although not concerned specifically with data quality, the issues in this category arose in almost every session. As described in category E, consultants felt that examining activity data without awareness of these underlying factors could easily lead to misinterpretation, especially when benchmarking one clinician's activity against another. As with category E, the majority of consultants' data contributed to multiple sub-categories.	
F.1	**Working patterns**		
		• Large discrepancies in levels of activity were often seen, with working patterns cited as the commonest reason by more than three quarters of all visiting consultants. Specific reasons, largely resulting in an altered frequency of on call (emergency) activity included: o Policy change of rota pattern o Leave (annual / sickness / maternity) of consultant or colleagues o Irregular on call patterns crossing temporal boundaries (e.g. three months acute work followed by six months ward work) o Appointment of new consultants onto the rota o Temporary non-clinical duties or job sharing o Shifts in responsibility away from clinical work (e.g. medical director role) • The activity of associate specialists and juniors could also be seen to distort activity levels. Since all activity is coded to a named consultant, the number of experienced team members working with that consultant affects the amount of activity recorded	HES/PEDW are not currently linked to workforce data
F.2	**Changes in local coding practices**		
		• Local changes in administrative coding practices were seen to cause abrupt changes in activity data in a number of trusts. Examples included: o Altering the main/treatment specialty of consultants (e.g. from a medical specialty code to General Medicine; from one medical specialty code to another)	

		o Altering the recorded admission code (e.g. from daycase to "planned" admissions, regular attenders or emergencies; see also section E.2) o Excluding activity from the current dataset (e.g. coding endoscopies as outpatient procedures) o Genuine "up-coding" due to increased rigour of coding practices following audit	
F.3	**Changes in referral / booking / admission practices**		
		• Varying age-related admission policies were cited by several clinicians as a reason for apparent discrepancies in activity (see also Section E.4). In one trust, two hospitals had different policies for admission to the Medicine for the Elderly department • The influence of hospital targets was cited as a reason for reduced inter-specialty transfers of care of inpatients (since patients were advised to seek an 'urgent' referral from their GP instead) • Seasonal activity elsewhere in the hospital (e.g. 'winter bed crisis') was seen to reduce overall planned activity in one hospital • A period of striving to reduce the number of admissions from A&E in one trust made obvious changes to activity levels • A general shift of services to the outpatient department was seen to cause a gradual decline in activity • The geographical moving of services within a trust or between trusts was seen to affect activity	
F.4	**Changes in clinical practice**		
		• The advent of new treatments was seen to affect activity (e.g. faster treatments reducing planned admissions, new treatments increasing daycase activity) • The running of clinical trial in a department was seen on more than one occasion to dramatically increase activity levels • The running of a screening programme was seen on one occasion to dramatically increase activity levels • The opening of new facilities and recruiting of additional staff inevitably increased overall activity	
F.5	**Factors affecting overall lengths of stay**		
		• Factors which may distort the mean length of stay to be longer than expected included: o Reduced provision of social services ("bed blocking") o A perceived increase in the age of patients and complexity of caseload o Provision of services for investigative procedures (i.e. inpatient waiting time vs. sent home to reattend for investigation) o Failure to capture transfers of care (for length of episode by individual clinician) o Opening of new facilities (e.g. stroke rehab unit) o Bed shortages for "step down" from intensive care or high dependency units • Factors which may distort the mean length of stay to be shorter than expected included: o Referral policy to tertiary care centres o Better access to intermediate care facilities o Admissions for procedures where patients are warned they may have to stay in overnight (e.g. liver biopsy). Despite the great majority being discharged after the procedure (i.e. treated as a daycase), such admissions coded as "planned" admissions, thereby large numbers with LOS=0 reducing overall mean LOS o Increasing numbers of internal transfers of care	

ANNEX E: SPECIFICATION OF ADMISSIONS AND COMPARISON ENTITIES

Specification of admission

The number of admissions may be either form the numerator or denominator of a measure. It is thus very important in any analysis to understand how an admission was specified. The key data items involved are (see Annex B for definitions and classifications):

- Method of admission
- Diagnosis
- Operative procedure.

In addition to checking whether an admission is defined in terms of FCE or spells (see Annex C), it is essential to know the *method of admission*, primarily in terms of ordinary elective, day case, emergency or transfer from another hospital. Outcomes such as death differ markedly for the different types of admission.

Many patients admitted by physicians have multiple *diagnoses*. For each admission a primary diagnosis is designated relating to the main condition treated or investigated. When interpreting diagnosis-specific information (See Study 1 and Study 2 in Annex G) it is essential to know whether the admissions comprise:

- All records with the diagnosis or
- Only those records when the diagnosis is the primary one.

A set of diagnoses is recorded for each FCE, and the first diagnostic code on the record is designated the primary diagnosis. When there is a spell with multiple FCEs (see Study 3 in Annex G) the primary diagnosis of the whole spell may be defined as either:

- First on record in first FCE or
- First on record in last FCE
- First on record in either first or last FCE.

Although analyses of *operative procedures* are of greater interest to surgeons, physicians may also wish to use them. A set of operative procedures are recorded for each FCE, one of which is the main operation. It is the most resource intensive and the code should be recorded in the first position on the record. When there is a spell with multiple FCEs, the convention is to define the main operation as the first in the first FCE in which an operative procedure was recorded. When interpreting information about operations it is essential to know whether the admissions comprise:

- All records with the operative procedure code, or
- Only those records in which the operation code is the main one.

When interpreting HES information, physicians must know:

- ***How the admissions are defined in terms of method of admission***
- ***For diagnosis-based analyses, whether the admissions contain all those with the diagnosis recorded or only those when it is the primary diagnosis***
- ***For operative procedure-based analyses, whether the admissions contain all those with the procedure recorded or only those when it is the main one.***

Entities to be compared

Comparisons may be made over time or using entities such as:

- Consultant
- Trust
- Hospital
- Specialty
- Population.

HES statistics were originally hospital-based but most national comparative information is now on the basis of *trusts* which frequently contain more than one *hospital*. Each hospital has a unique code so it is still possible to derive hospital-based information.

The *specialty* codes used in HES are shown in Annex B. Specialty may not a particularly useful grouping for physicians as in dealing with medical emergencies, patients are now frequently managed by teams and may be transferred between consultants depending on their need for specialist expertise. Thus for analyses of medical emergency admissions, it is common to include the admissions of all the medical specialties that take unselected medical emergencies.

The HES data set does not record individual *consultant* information, rather the work of the consultant team. This is particularly pertinent to analyses of operative procedures as the consultant recorded in HES may not have carried out the operation.

Populations are frequently used as denominators in measures derived from HES. They may be local authority populations based on wards which are relatively stable or based on health service organisational boundaries which are constantly changing.

When interpreting HES information, physicians must know:

- ***If spells are used, whether they are trust or hospital ones***
- ***What specialties have been included in an analysis***
- ***What populations have been used.***

ANNEX F: COMMON STATISTICAL MEASURES AND THEIR CONFOUNDERS

Common measures derived from HES

The common measures derived from HES are:

- Admission rates
- Re-admission rates
- Case fatality rates
- Length of stay
- Waiting times (not addressed in this document).

With respect to *admission rates*, the advent of linked files makes it possible to derive:

- Admission-based admission rates when persons admitted several times in a year are counted as many times as they have admissions
- Person-based admission rates where a person admitted several times in a time period such as a year is only counted once.

In interpreting admission rates, physicians need to know how the admissions have been specified (See Study 1 in Annex G) and whether a rate relates to admissions or persons.

The *re-admission measures* currently used nationally relate to the occurrence of a first emergency re-admission for any cause following a defined period after an initial admission. Although useful as an outcome measure following a one-off event such as an operation, it is not particularly relevant to chronic diseases. Working is in progress to develop more appropriate re-admission measures for chronic diseases involving determination of the total time spent in hospital during a specified time period.

In interpreting published re-admission rates, physicians need to know how the admissions have been specified, the time period from the end of the initial admission to the start of the re-admission and whether:

- Re-admissions counted in the analysis were all admissions occurring in a time period or only emergency re-admissions
- Patients who died in the initial admission or in the specified time period were excluded from the analysis
- Same day re-admissions were included in the analysis
- Whether all re-admissions for all causes were included or only those with specific diagnoses recorded either as the primary diagnosis or anywhere on the record.

In most analyses the re-admissions included in the measure are emergency ones with any diagnosis. Patients who died should normally be excluded.

About 5% of emergency re-admissions are recorded as starting the same day as the initial admission finished. There are doubts about whether these are genuine re-admissions and some analysts exclude them. It is essential that physicians when interpreting re-admission rates know how same day re-admissions have been handled.

For most re-admission analyses, all first emergency re-admissions are included regardless of diagnosis. However, there may be occasions when an analysis has been done using only emergency re-admissions with a specific diagnosis, either recorded as the primary one or anywhere on the record.

For *case fatality measures*, in addition to reviewing how the admissions have been specified, physicians need to know:

- Time interval from the start of an initial admission to death
- Whether all deaths have been included (available from databases with death certificates linked to HES) or only those occurring in hospital
- Whether deaths from all causes are included in the analysis or only those with specific diagnoses recorded on the death certificate.

Most case fatality analyses are calculated for 30 days following the start of admission. However, for conditions such as stroke the standardised mortality ratio is raised for more than a year and longer periods such as 90 days may be more appropriate for the calculation of case fatality in these circumstances. It is useful to review how closely different rates are correlated (See Study 5 in Annex G). For most case fatality analyses, deaths from all causes are included.

For *length of stay* measures, it is essential to know whether the analysis is based on FCEs or spells and which type of spell (hospital, trust or continuous).

When interpreting HES information, physicians must know:

- ***For admission rates, whether they are admission-based or person-based.***
- ***For re-admission rates:***
  - ***what the time period is***
  - ***whether all emergency re-admissions or only those with specific diagnoses are included***
  - ***whether patients who died were excluded***
  - ***whether same day re-admissions are included.***
- ***For case fatality rates:***
  - ***what the time period is***
  - ***whether all deaths occurring in the time period are included or only those in hospital***
  - ***whether all deaths or only those from specific causes are included.***
- ***For length of stay measures whether FCEs or spells have been used.***

Confounders

Confounding factors which need to be considered in interpretation of measures derived from HES are:

- Age and sex mix of the patients
- Social deprivation
- Case mix including severity.

The age and sex mix of groups of patients or populations being analysed will differ and thus make a difference to an analysis. When HES measures are used to compare clinical activity they should be *age/sex* standardised. The method used nationally for the Health Commission indicators and the Information Centre's Compendium is indirect standardisation.

The effect of social class on measures derived from HES has been studied for many years. This has been replaced by new factors and the effect of *social deprivation* on HES measures can now be studied using techniques such as the Index of Multiple Deprivation (See Study 6 in Annex G).

Case-mix adjustment in the public sector HES databases is currently limited to stratifying data by Healthcare Resource Groups (HRG). These have been developed specifically for financial initiatives such as the current 'Payment by results'. At present HES does not contain a measure of patient severity that is useful for clinical purposes. It is very difficult to adjust for the multiple diagnoses that frequently occur in emergency medical admissions (See Study 4 in Annex G).

When interpreting HES information, physicians must know:

- ***Whether the data have been age/sex standardised and, if so, how***
- ***If social deprivation factors been accounted for***
- ***Have attempts been made to adjust for case-mix and, if so, how.***

ANNEX G: EXEMPLAR STUDIES USING HES DATA

This Annex contains analyses which exemplify the advice given in Annex E and Annex F.

Study 1 shows annual admission and person-based rates for asthma emergency admissions using:

- FCEs and spells
- Asthma as the primary diagnosis or recorded anywhere on the record.

Study 2 shows the diagnostic codes most commonly recorded on medical emergency admissions and the proportion of admissions in which the diagnosis was the primary diagnosis.

Study 3 shows for six conditions in which the diagnosis was recorded as the primary one in at least one FCE of a spell, the frequency with which this occurred in the first and last FCEs of a spell.

Study 4 shows the co-morbidities commonly associated with medical emergency admissions for six primary diagnoses.

Study 5 shows the correlation between 0-30 and 0-90 day case fatality rates for medical emergency admissions for six primary diagnoses.

Study 6 shows the effect of social deprivation on age/sex standardised case fatality rates for medical emergency admissions for six primary diagnoses.

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Study 1: Annual rates of asthma emergency admissions

Purpose

This analysis shows annual admission-based and person-based rates for asthma emergency admissions using:

- FCEs and spells
- Asthma as the primary diagnosis or recorded anywhere on the record.

Methods

The study used linked files for England for the year 2001 of both FCEs and spells. The asthma codes used were ICD-10 J45 and 46 and emergency admissions and both sexes were included in the analysis. The primary diagnosis was recorded as the first diagnostic code in a FCE or the first code in the last FCE of a spell.

Results

The Table shows the annual person and admission-based counts for asthma emergency admissions for 2001 using FCEs and spells and with the diagnosis as the primary one or recorded anywhere on the record. The ratio of admissions to people was also calculated.

Discussion

The counts of asthma emergencies varied enormously depending on the specification of admission used. The highest was 229,181 for admissions as FCEs with the diagnosis recorded anywhere and the lowest 49,373 for persons using spells with the diagnosis recorded as the primary one. The person to admission ratio varied from 1.17 for spells with asthma as the primary diagnosis to 1.48 for FCEs with the diagnosis recorded anywhere.

Table: Asthma emergency admission rates per annum and admissions:person ratios for England 2001

Measure	Spells	FCE
Admissions-primary diagnosis	57,959	68,999
Admissions- diagnosis anywhere	183,348	229,181
Persons-primary diagnosis	49,373	49,976
Persons-diagnosis anywhere	153,847	154,876
Ratio admissions:person (primary)	1.17:1	1.38:1
Ratio admissions:person (anywhere)	1.19:1	1.48:1

Study 2: Frequency with which a diagnosis is the primary one

Purpose

This analysis shows the diagnostic codes most commonly recorded on medical emergency records and the frequency with which they were coded as the primary diagnosis.

Methods

The study used a linked file of spells for England for the years 1999-2001. Only emergency admissions to a medical specialty were included. The primary diagnosis was recorded as the first code in the last or only FCE of a spell.

Results

The Table shows the average annual number of spells with the diagnosis anywhere on the record and the proportion of these spells in which the diagnosis was recorded as the primary diagnosis.

Discussion

The common medical emergency diagnoses which are most frequently recorded as the main diagnosis are acute myocardial infarct (87%) and stroke (76%).

Table: Emergency admissions commonest codes and frequency with which primary diagnosis

Condition and code	Annual number	% Primary diagnosis
I10 Essential hypertension	250,601	2
I25 Chronic ischaemic heart	223,817	7
I20 Angina pectoris	177,272	52
I50 Heart failure	170,428	37
I48 Atrial fibrillation/flutter	167,780	26
J44 Other COPD	160,374	53
E11 Non-insulin diabetes	141,893	6
J45 Asthma	99,174	27
N39 Other dis urinary system	89,396	40
J22 Unspecified acute LRI	88,838	59
J18 Pneumonia unspecified	88,521	67
I21 Acute myocardial infarct	70,505	87
E78 Lipoprotein disorders	59,910	<1
E10 Insulin diabetes	55,394	23
D64 Other anaemias	54,481	22
K92 Other dis digestive system	50,254	41
G40 Epilepsy	46,334	43
M79 Other soft tissue disorder	44,270	67
L03 Cellulitis	43,671	62
I64 Stroke	40,855	76

Study 3: Proportion of first and last FCEs in a spell that had a diagnosis coded as the primary one for six conditions

Purpose

The analysis shows for six conditions in which the diagnosis was recorded as the primary one in at least one FCE of a spell, the frequency with which this occurred in the first and last FCEs of a spell.

Methods

The study used a linked file of spells for England for the years 1999-2001. Only emergency admissions to a medical specialty were included. The primary diagnosis was recorded as the first code in a FCE.

Results

The Table shows for spells in which a diagnosis has been recorded as the primary one in at least one FCE, the frequency with which this occurs in a first or last FCE.

Discussion

For five of the diagnoses it makes little difference whether the primary diagnosis is defined as the first in the first FCE or the first in the last FCE. However, for acute myocardial infarction there was a difference of 5%.

Table: Spells in which a diagnosis is the primary one on at least one FCE: frequency with which this occurs in first and last FCE

Code and condition	FCE with diagnosis recorded as primary	
	First	Last
	%	%
120 Angina pectoris	96	97
121 Acute myocardial infarction	93	98
150 Heart failure	95	96
161-64 Stroke	92	91
J40-44 Chronic bronchitis/COPD	96	99
J45-46 Asthma	98	99

Study 4: Frequency of co-morbidities in emergency medical admissions for six primary diagnoses

Purpose

This analysis shows the co-morbidities commonly associated with emergency admissions to medical specialties for six diagnoses when these are recorded as the primary diagnosis.

Methods

The study used a linked file of spells for England for the years 1999-2001. Only emergency admissions to a medical specialty were included. The primary diagnosis was recorded as the first code in the last or only FCE of a spell.

Results

The Table shows for medical emergency admissions the common co-morbidities associated with six primary diagnoses.

Discussion

All six primary diagnoses had high levels of co-morbidity, although the chest diseases had considerably less than the cardiovascular conditions.

Table: Most common co-morbidities for six primary diagnoses

		Frequency of other diagnostic codes					
Primary diagnosis	**Spells Number**	**E11 %**	**E78 %**	**I10 %**	**I25 %**	**148 %**	**150 %**
I20	92,733	9.7	11.2	20.9	36.5	6.6	6.6
I21	61,149	9.2	10.6	18.0	12.5	7.8	13.6
I50	63,745	13.3	2.1	15.2	30.6	22.0	-
I61-64	65,717	9.1	3.2	24.0	9.3	13.3	4.5
J40-44	89,462	5.5	<1.0	8.7	11.4	7.0	12.0
J45-46	30,660	2.9	<1.0	4.6	2.7	1.3	1.8

Key to diagnostic codes
E11. Non-insulin dependent diabetes
E78. Disorders of lipoprotein metabolism and other lipidaemias
I10. Essential hypertension
I20. Angina pectoris
I21. Acute myocardial infarction
I25. Chronic ischaemic heart disease
I48. Atrial fibrillation and flutter
I50. Heart failure
I61-64. Stroke
J40-44. Chronic bronchitis/COPD
J45-46. Asthma

Study 5: Comparison of case fatality rates for emergency admission for six primary diagnoses

Purpose

These analyses show the correlation between 0-30 and 0-90 day case fatality rates for medical emergency admissions for six different primary diagnoses.

Methods

The study used a linked file of spells for England for the years 1999-2001. Only emergency admissions to a medical specialty were included. The primary diagnosis was recorded as the first code in the last or only FCE of a spell.

Both 0-29 and 0-89 day age/sex standardised values were calculated for six diagnosis-specific CFRs for the NHS trusts in England.

In order to determine the extent of similarity between the diagnosis-specific standardised CFRs for 0-29 and 0-89 day mortality, scatter plots were done with an ordinary least squares (OLS) regression model fitted to the data using Microsoft Excel chart trendline function. The intercept term represents the difference in the magnitude of the SCFRs, whilst the slope represents the similarity in terms of the relationship between the SCFRs of the two indicators.

The R^2 value quantifies the degree of fit overall for each model, and multiplying by 100 allows this value to be interpreted as a percentage. The square root of the R^2 gives the correlation between the two indicators.

Results

The R^2 values were as follows:

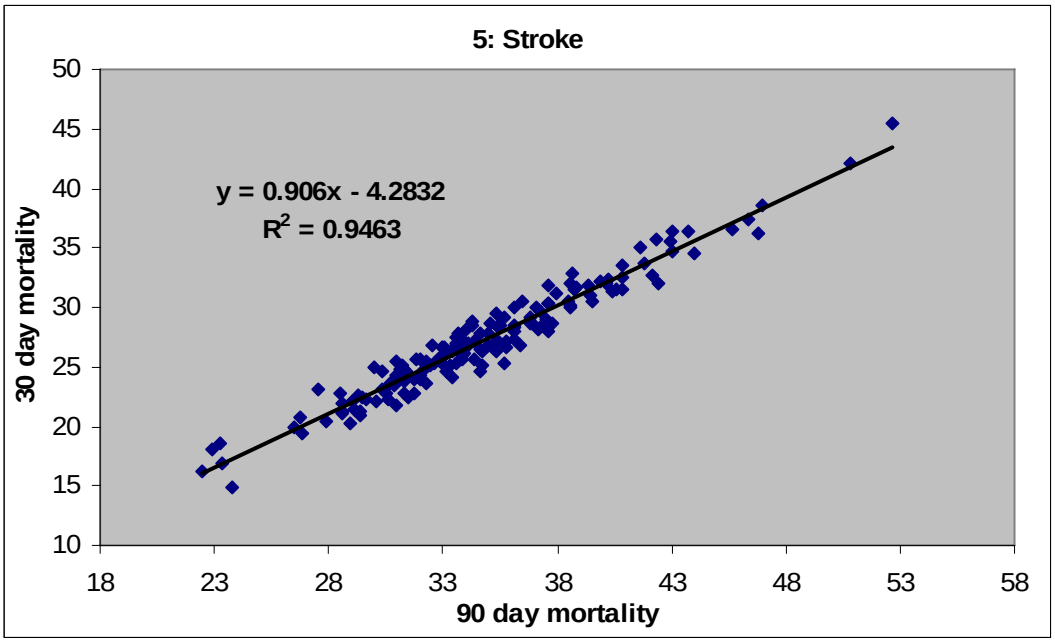
- stroke 0.95
- acute myocardial infarction 0.93
- heart failure 0.91
- COPD 0.87
- asthma 0.63
- angina 0.54.

The two graphs show the correlation for the condition with the closest fit (stroke) and that with the worst (angina).

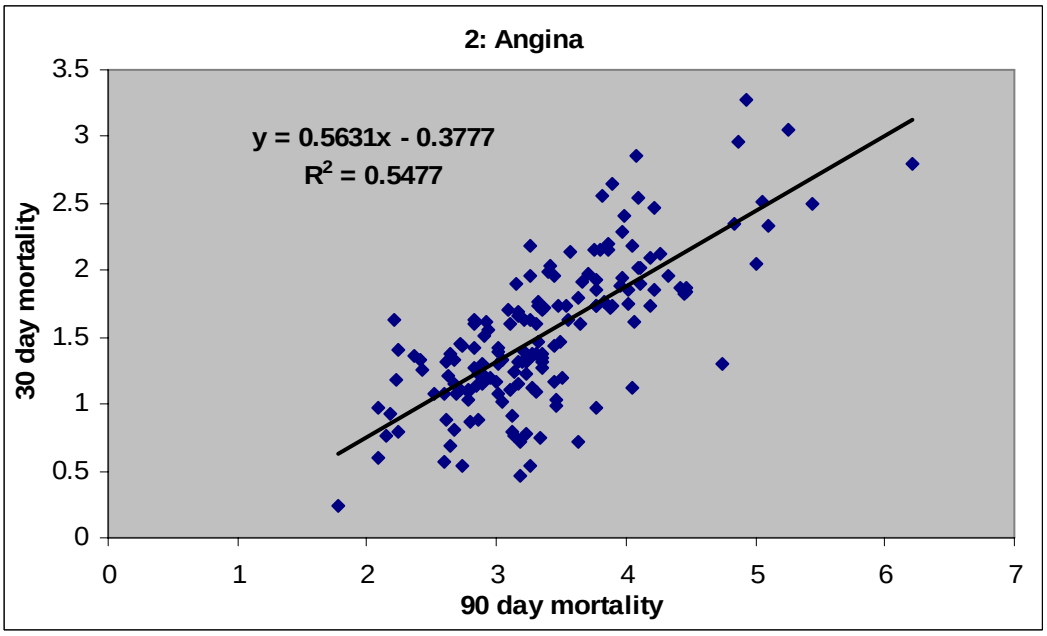
Discussion

The time interval chosen for a case fatality rate measure should be chosen on clinical grounds. For some conditions such as stroke this decision is not critical as there is a very close correlation between 30 and 90 day mortality CFRs when comparing the values for English trusts.

Graph: Stroke correlation between 0-29 and 0-89 day CFR for English trusts



Graph: Angina correlation between 0-29 and 0-89 day CFR for English trusts



Study 6: Effect of social deprivation on case fatality rates

Purpose

These analyses show the effect of social deprivation on age/sex standardised case fatality rates for medical emergency admissions for six primary diagnoses.

Methods

The study used a linked file of spells for England for the years 1999-2001. Only emergency admissions to a medical specialty were included. The primary diagnosis was recorded as the first code in the last or only FCE of a spell.

The Index of Multiple Deprivation 2000 (IMD 2000), assigned for each patient to the patient's address at ward level, was used as the measure of socio-economic status. For each measure, the admissions were grouped into quintiles based on the patients' IMD 2000 score. Case-fatality rates were calculated taking the number of admissions as the denominator and the number of deaths occurring within 30 or 90 days of admissions regardless of the place of death as the numerator. The case-fatality rates for the quintiles were indirectly age- and sex-standardised, taking all admissions for the condition as the standard. Confidence intervals for these rates were calculated (assuming a Poisson distribution for the observed numbers of deaths).

Results

The tables show that there was no significant difference between the multiple deprivation quintiles for standardised case fatality rates (SCFR) for angina, heart failure, stroke or asthma.

There was a significant but small difference between the quintiles for SCFRs for:

- AMI for which the most deprived group (quintile 1) has the highest mortality
- COPD for which the least deprived group (quintile 5) has the highest mortality.

Discussion

When comparing trust performance, mortality indicators which are not significantly affected by social deprivation are likely to be more robust and acceptable to physicians.

Table: Acute myocardial infarction, effect of social deprivation on SCFRs

QUINTILE	Number of admissions	0-29 day deaths Number	0-29 day deaths SCFR (with 95% CI)	0-89 day deaths Number	0-89 day deaths SCFR (with 95% CI)
Quintile 1	56,492	9,224	17.3 (17.0-17.7)	10,799	20.3 (19.9-20.7)
Quintile 2	40,349	6,789	16.6 (16.2-17.0)	7,866	19.3 (18.8-19.7)
Quintile 3	32,400	5,360	16.0 (15.6-16.4)	6,211	18.5 (18.1-19.0)
Quintile 4	25,555	4,175	15.7 (15.3-16.2)	4,900	18.4 (17.9-19.0)
Quintile 5	23,006	3,675	15.4 (14.9-15.9)	4,289	17.9 (17.4-18.4)

Table: Angina, effect of social deprivation on SCFRs

QUINTILE	Number of admissions	0-29 day deaths Number	0-29 day deaths SCFR (with 95% CI)	0-89 day deaths Number	0-89 day deaths SCFR (with 95% CI)
Quintile 1	83,869	1,191	1.6 (1.5-1.7)	2,653	3.5 (3.4-3.7)
Quintile 2	53,812	808	1.5 (1.4-1.6)	1,791	3.3 (3.2-3.5)
Quintile 3	40,685	641	1.5 (1.4-1.6)	1,425	3.3 (3.1-3.5)
Quintile 4	31,263	498	1.5 (1.3-1.6)	1,092	3.2 (3.0-3.4)
Quintile 5	27,901	498	1.6 (1.5-1.8)	1,068	3.4 (3.2-3.7)

Table: Heart failure, effect of social deprivation on SCFRs

QUINTILE	Number of admissions	0-29 day deaths Number	0-29 day deaths SCFR (with 95% CI)	0-89 day deaths Number	0-89 day deaths SCFR (with 95% CI)
Quintile 1	57,244	10,072	18.5 (18.1-18.8)	15,287	28.0 (27.5-28.4)
Quintile 2	38,772	7,398	19.1 (18.6-19.5)	10,949	28.2 (27.7-28.7)
Quintile 3	29,640	5,814	19.2 (18.7-19.7)	8,648	28.6 (28.0-29.2)
Quintile 4	23,764	4,826	19.5 (19.0-20.1)	7,178	29.1 (28.4-29.8)
Quintile 5	21,069	4,245	19.1 (18.6-19.7)	6,358	28.7 (28.0-29.5)

Table: Stroke, effect of social deprivation on SCFRs

QUINTILE	Number of admissions	0-29 day deaths Number	0-29 day deaths SCFR (with 95% CI)	0-89 day deaths Number	0-89 day deaths SCFR (with 95% CI)
Quintile 1	59,524	15,308	27.1 (26.7-27.5)	19,657	35.0 (34.5-35.5)
Quintile 2	41,948	11,644	27.8 (27.2-28.3)	14,882	35.5 (34.9-36.0)
5uintile 3	33,378	9,317	27.3 (26.7-27.8)	11,972	35.0 (34.3-35.6)
Quintile 4	27,618	7,721	26.9 (26.3-27.6)	9,903	34.4 (33.8-35.1)
Quintile 5	26,110	7,342	26.7 (26.1-27.3)	9,436	34.1 (33.5-34.8)

Table: Asthma, effect of social deprivation on SCFRs

QUINTILE	Number of admissions	0-29 day deaths Number	0-29 day deaths SCFR (with 95% CI)	0-89 day deaths Number	0-89 day deaths SCFR (with 95% CI)
Quintile 1	32,306	323	1.1 (0.9-1.2)	596	2.0 (1.8-2.1)
Quintile 2	18,414	166	0.9 (0.8-1.1)	316	1.8 (1.6-2.0)
Quintile 3	12,540	140	1.0 (0.9-1.3)	253	1.9 (1.7-2.2)
Quintile 4	9,373	93	0.9 (0.7-1.1)	164	1.6 (1.3-1.8)
Quintile 5	8,148	87	1.0 (0.8-1.2)	167	1.8 (1.6-2.1)

Table: COPD, effect of social deprivation on SCFRs

QUINTILE	Number of admissions	0-29 day deaths		0-89 day deaths	
		Number	SCFR (with 95% CI)	Number	SCFR (with 95% CI)
Quintile 1	82,920	7,457	9.4 (9.2-9.6)	12,394	15.7 (15.4-15.9)
Quintile 2	42,976	4,402	10.2 (9.9-10.5)	7,080	16.4 (16.0-16.8)
Quintile 3	29,117	3,176	10.5 (10.1-10.9)	5,101	16.8 (16.4-17.3)
Quintile 4	20,920	2,273	10.3 (9.9-10.7)	3,688	16.7 (16.1-17.2)
Quintile 5	16,979	1,938	10.6 (10.1-11.1)	3,072	16.7 (16.2-17.4)

ANNEX H: PUBLISHERS OF HES INFORMATION

The major national publishers of information from HES are:

- Health and Social Care Information Centre
- Public health observatories
- Healthcare Commission (formerly Commission for Health Improvement and Commission for Healthcare Audit and Inspection)
- Research organisations
- Private sector organisations
- Department of Health.

The Information Centre for Health and Social Care (www.ic.nhs.uk), which was launched in April 2005, is now the major publisher of HES information. It has taken over from the Department of Health publication of:

- Annual tabulations derived from HES (available for free download from www.hesonline.nhs.uk)
- Organisational health check (http://www.icservices.nhs.uk/ohc/) tool kit and the web-based performance indicator analysis online (PIANO) system (at nww.piano.nhsia.nhs.uk) also provides a 'Payment by results' toolkit and the Consultant Enquiry System (http://www.ic.nhs.uk/ces).
- Annual Compendium of clinical and health indicators which contains the public health common dataset (accessible from www.nchod.nhs.uk).

In order to supplement the fixed-format tabulations available from www.hesonline.nhs.uk, work is underway to develop an interactive query service that will allow a degree of drill-down into the data. For example, most of the annual tabulations have counts of events for England. The interactive service will provide the opportunity to display figures for a particular diagnosis or operative procedure for individual trusts.

The *public health observatories* have become important publishers of HES data relating to their national roles for specific topics and local health issues and the provision of care. Their web site addresses are:

- East Midlands PHO, www.empho.org.uk
- Eastern Region PHO, www.erpho.org.uk
- London HO, www.lho.org.uk
- North East PHO, www.nepho.org.uk
- North West PHO, www.nwpho.org.uk
- South East PHO, www.sepho.org.uk
- South West PHO, www.swpho.org.uk
- West Midlands PHO, www.wmpho.org.uk
- Yorkshire and Humber PHO, www.yhpho.org.uk
- Wales Centre for Health www.wch.wales.nhs.uk.

For physicians the most visible use of HES data over the last few years has been for performance management. The driving force for this activity has moved from the Department of Health to the *Healthcare Commission*

(www.healthcarecommission.org.uk) which uses HES to support the following functions:

- Assessment of national standards
- Screening, surveillance and inspections of trusts
- Monitoring implementation of national service frameworks
- Investigation of poor performance.

Much published *research* uses HES data. Important research databases are those associated with:

- Unit of Health-Care Epidemiology in the University of Oxford. Building on the experience of the Oxford Record Linkage Study, a five year national file of linked HES and mortality data has been developed.
- MRC Health Services Research Collaboration in the University of Bristol.

For many years *private sector organisations* have offered trusts benchmarking services using HES data. More recently, Dr Foster has been publishing a wide range of national guides using HES data that compare services on a national basis and purport to identify good and poor performers. These are frequently published by national newspapers.

The *Department of Health* has ceased to be a major publisher but will be using HES internally for a wide range of purposes including:

- Parliamentary accountability
- Policy development
- Resource allocation
- Public health and planning.

ANNEX I: SOURCES OF ASSISTANCE WITH USING HES DATA

Major sources of assistance with using HES data

The potential providers of information to consultants about their own clinical activity are:

- Trusts which in addition to their own resources may have contracts with external bodies which provide analyses.
- Consultant Enquiry System (CES) set up Department of Health and now part of the Health and Social Care Information Centre
- HES Enquiry Service provided by Northgate Information Solutions under a national contract
- Public health observatories.

In addition to these, assistance in specifying and interpreting analyses can be obtained from:

- Oxford University Unit of Health-Care Epidemiology website (http://www.uhce.ox.ac.uk/)
- Royal College of Physicians *i*Lab (http://hiu.rcplondon.ac.uk/iLab)

Consultant Enquiry System

Consultant Enquiry System (http://www.ic.nhs.uk/ces) is a browser-based toolkit through which physicians can define simple HES analyses. The resulting reports, available in a number of formats, show their own data, the data for their trust (or a user-specified peer group) and also a national comparison. The user may define a selection criteria based on any of the following:

- Primary diagnosis
- Main operative procedure
- Specialty
- Activity period (year or quarter)
- Admission method
- Patient classification (ordinary admission or day case)
- Patient age and gender
- Health resource group (HRG).

The measures available (See Annex J for an example of the output) are:

- Total FCEs
- Number of elective and emergency admissions
- Mean patient age
- Mean length of stay
- Mean waiting time
- Number of deaths occurring in hospital
- Total bed days used in the year
- Number of ordinary, day case and regular attender admissions.

HES Enquiry Service

Northgate Information Solutions, who are currently contracted to provide central database and other IT services in support of HES, are able to provide customised aggregate analyses of HES (tabulations) and may also be able to provide copies of the underlying HES records (data extracts). This facility is designed to satisfy the needs of users who cannot derive the information they require from the standard tables available from HESonline. Northgate databases include files linking death certification and HES data.

The release of data extracts by Northgate is strictly controlled. Requests must be made to the Security and Confidentiality Advisory Group (SCAG), an independent body established to oversee the release of sensitive data. The HES team have some delegated bodies to release data extracts, based on precedents set by previous decisions. These powers are detailed in the HES protocol that can be downloaded along with application forms from www.hesonline.nhs.uk.

Public health observatories

All *public health observatories* have a HES database but the level of help that they are able to give to individual physicians will depend on their service priorities and resource availability. Their web addresses are shown in Annex H.

Unit of Health-Care Epidemiology aids to using HES

Oxford University Unit of Health-Care Epidemiology (www.uhce.ox.ac.uk/hessepho) has an on-line data base of items relevant to the use of HES which are shown in Annex K. They comprise:

- Series of methodological reports including user guides for the determination of case fatality and re-admission rates.
- Series of clinical reports about the indicators for specific conditions.
- Epidembase, a set of tools to assist clinicians specify analyses involving specific diagnoses or operative procedures.

Services offered by RCP *i*Lab

The Royal College of Physicians' Information Laboratory (web site at http://hiu.rcplondon.ac.uk/iLab) was set up to evaluate how HES data could be used to support individual physicians with the processes of appraisal and validation. This involves them in the processes of local data collection and validation and in addressing the data quality issues arising from the review of their information.

The initial work involved setting up a secure environment in which to access HES data and a randomised study of data quality issues. The first objective was to improve patient care and reduce risk by improving the quality of the clinical record, used as the source of routine data, through:

- Increasing clinical interest in the validity and use of routine data
- Supporting physicians in their information needs

- Highlighting existing issues surrounding the collection and clinical validation of routine data at a local level
- Exploring how routine data can most effectively be made available to physicians
- Publicising lessons learnt from the *i*Lab project.

The second objective was to explore the use of HES to support the processes of consultant appraisal and revalidation by:

- Bringing together physicians and information experts
- Engaging physicians in identifying information requirements to support appraisal and revalidation
- Developing queries of HES that address these information requirements
- Defining the processes involved in the development and answering of these queries
- Exploring the most cost-effective means of access to HES.

The results of the randomised study showed that following visits to the *i*Lab, two thirds of physicians stated that they would use some aspect of the data in support of their next consultant appraisal. Face-to-face engagement between physician and information analyst was also successful in improving:

- Perceptions of the usefulness of routine data
- Willingness of physicians to contribute to local data collection and validation
- Likelihood of dialogue between physicians and trust information staff regarding local data.

The data quality issues arising from this study are in Annex D.

Future work will concentrate on widening access to *i*Lab expertise by:

- Developing educational tools, incorporating the lessons learnt to date
- Working with specialty groups to develop specialty-specific analyses.

ANNEX J: OUTPUT FROM CONSULTANT ENQUIRY SYSTEM

Analysis

This analysis accessed through the Consultant Enquiry Service was about admissions with unspecified haematuria (ICD-10 code R31) for the year 2003/04.

Results

Results are given for the consultant, the trust in which the consultant worked and for England.

All admissions	**Consultant**	**Trust**	**National**
Number of admissions	85	566	65,504
Bed-days in year (overnight use only)	59	664	67,213
Mean length of stay (days)	1.8	3.4	3.5
Mean age	66	61	61
Number of deaths	0	1	149

Elective admissions	**Consultant**	**Trust**	**National**
Number of ordinary admissions	10	20	3,948
Number of day cases	52	363	46,098
Number of regular day/night attenders	0	0	12
Bed-days in year (overnight use only)	3	44	9,579
Mean length of stay (days)	0.3	2.2	2.5
Number of deaths	0	0	11
Number of last finished consultant episodes	61	381	49,690
Mean waiting time ordinary admission (days)	91	68	64
Mean waiting time day case (days)	59	45	38

Emergency admissions	**Consultant**	**Trust**	**National**
Number of admissions	23	181	15,152
Bed-days in year (overnight use only)	56	617	55,609
Mean length of stay (days)	2.4	3.6	3.7
Number of deaths	0	1	132
Number of last finished consultant episodes	23	122	11,130

Other admissions	**Consultant**	**Trust**	**National**
Number of admissions	0	2	294
Bed-days in year (overnight use only)	0	3	2,025
Mean length of stay (days)	0	1.5	7.2
Number of deaths	0	0	6
Number of last finished consultant episodes	0	2	248

Explanation of the analyses

Regular day and regular night attenders are elective admissions taking place as part of a planned series in an on-going regime such as renal dialysis.
Bed days are calculated from the number of beds calculated during the year and do not include day cases and regular day/night attenders
Mean length of stay is calculated from the duration of the episode regardless of when it started. The calculation does not include day cases or regular day/night attenders.
Number of deaths includes only those occurring in hospital.
Mean waiting time is the average period between the date of the decision to admit and the eventual date of admission. This calculation does not include planned admissions.

ANNEX K: AIDS TO USING HES AVAILABLE FROM UHCE OXFORD

The Unit of Health-Care Epidemiology, University of Oxford has an on-line data base of items (www.uhce.ox.ac.uk/hessepho) relevant to the use of HES comprising:

- Series of methodological reports including user guides for the determination of case fatality and re-admission rates.
- Series of clinical reports about the indicators for specific conditions.
- Epidembase, a set of tools to assist clinicians specify analyses involving specific diagnoses or operative procedures.

Reports relevant to physicians available from the web site

CR1. Asthma: menu of health outcome indicators
CR4. Diabetes mellitus: menu of health outcome indicators
CR6. Myocardial infarction: menu of health outcome indicators
CR9. Stroke: menu of health outcome indicators
CR10. Urinary incontinence: menu of health outcome indicators
CR11. Stroke: comparison between linked file and national audit measures
CR12. Medical emergencies: case fatality rates
MR2. Hospital admission rates: literature review
MR3. Hospital re-admission rates: literature review
MR4. Mortality rates: literature review
MR5. Case fatality rates: literature review
MR6. Case fatality rates: user guide
MR7. Hospital re-admission rates: user guide
MR8. Hospital admission, case fatality and mortality: Myocardial infarction studies
MR9. Counting the number of diagnosis-specific admissions
MR10. Counting the number of operative procedures
MR11. Hospital re-admission rates: approach to diagnosis-based measures
MR12. Case fatality rates: effect of social deprivation
MR13. Hospital admission rates: effect of social deprivation.

Information available about diagnoses and operative procedures

Epidembase provides information about specific diagnoses and operations.

By entering a three digit diagnostic code and type of admission (elective or emergency) the following information can be obtained:

- Position of diagnostic code on the record
- Numbers of spells, episodes and people
- Diagnoses associated with the diagnosis
- Operations associated with the diagnosis.

By entering a three digit operative procedure code and type of admission (elective or emergency) the following information can be obtained:

- Position of operation code on the record
- Diagnoses associated with the operation
- Operations associated with the operation.

ANNEX L: CONTRIBUTORS, CONTACTS & FUNDING

Contributors & Contacts

This publication "HES for Physicians" has been produced as a collaboration between The Unit of Health-Care Epidemiology (UHCE) at the University of Oxford; the Royal College of Physicians Health Informatics Unit; and the Information Centre for Health and Social Care.

For more information and specific details of authorship, please contact:

Professor Michael Goldacre
Unit of Health-Care Epidemiology (UHCE)
Department of Public Health
Old Road Site
Oxford OX3 7LF
Tel: 01865 226994/5
Email: michael.goldacre@dphpc.ox.ac.uk

Dr Giles P Croft
RCP Information Laboratory
Centre for Health Information, Research & Evaluation (CHIRAL)
School of Medicine
University of Wales Swansea SA2 8PP
Tel: 01792 602134
Email: iLab@swansea.ac.uk

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