

[Appendices only](#)

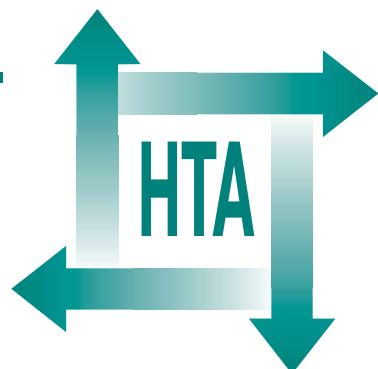
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Potential use of routine databases in health technology assessment

J Raftery, P Roderick and A Stevens

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Health Technology Assessment
NHS R&D HTA Programme



More than 10 years		
Other (state)		
On death/mental incapacitation embryo(s):		
Allowed to perish	Yes	No
Continue in storage for use of above purposes		
Continue in storage for other purposes (specify)		
Any other conditions of storage (specify)		

Intensive Care National Audit and Research Centre (ICNARC)

Description

ICNARC was established following the success of the Intensive Care Society's UK Acute Physiology and Chronic Health Evaluation (APACHE II) study that assessed patient outcomes from 26 ICUs. Formed in January 1994, the objectives of ICNARC were to assemble, maintain and develop a national, observational database for the purpose of evaluating outcomes from ICUs and high dependency units (HDUs) in England, Wales and Northern Ireland (Scotland has initiated its own intensive care audit). Participation with the audit is voluntary and recruitment is estimated to be around 50% of Trusts with ICU.

ICNARC provides a national comparative audit of patient outcomes through its case programme. The ICNARC Case Mix Programme Dataset Specification (ICMPDS) was developed and used from 1995 (see 'Coding systems' below). Whilst the Case Mix Programme Database (CMPD) currently holds data on approximately 90,000 admissions from 135 adult units, its analysis is based on validated data for 46,587 admissions from 91 units (Annual Report 2000).

ICNARC have Medical Research Council (MRC) funding to develop and validate an optimal risk adjustment method in intensive care using data from the CMPD. They have also received an NHS R&D HTA grant to evaluate the cost-effectiveness of pulmonary artery flotation catheters.

Data

Participating units must send up to three members to attend a 2-day training course covering all aspects of data collection and data definitions. Following training, the unit undergoes a 6-week pilot data collection period. If no problems are encountered, the unit continues the collection of data (the Centre also provides ongoing data collection support and re-training on a regular basis).

Participating units abstract all physiological and laboratory data from the ICU/HDU charts and

submit to ICNARC every 6 months. Within 4 weeks from receipt of the data, ICNARC sends the unit a Data Validation Report (DVR) on the completeness and accuracy of the data. Invalid or incomplete data items are updated and resubmitted to ICNARC where a revised DVR is produced. This is an iterative process, which in some cases requires four or more DVRs.

Once the data have been fully validated, they are incorporated into the CMPD and ICNARC produces a Data Analysis Report (DAR) covering data accuracy, case mix, outcome and unit activity. The average length of time taken to produce the final report from the first submission of data is reported to be 37 weeks for first cycles of data.

The data are collected under nine main headings (admission identifiers, past medical history, reason for admission, MPM II₀ – admission model, physiology, MPM II₂₄ – 24-hour model, other conditions, unit outcome and hospital outcome). See pp. 106–8 for full list.

A considerable number of data items are collected to facilitate the calculation of a range of case-mix adjustment measures. It is hoped to ascertain the most viable case-mix adjustment measure for the comparative audit of ICUs and consequently cease the collection of data items for all other case-mix adjustment measures. When the number of data items recorded is reduced, there are plans to collect other information for a variety of research projects.

Coding systems

The database employs a unique five-tiered, hierarchical structured coding system empirically developed and tested by ICNARC, known as the ICNARC Case Mix Programme Dataset Specification (ICMPDS). The tiers include type surgical (reason for surgery)/non-surgical, body system (e.g. respiratory), anatomical site (e.g. lung), physiological/pathological process (e.g. infection) and condition (e.g. pneumonia).

The ICNARC codes can be mapped to Read codes, and then mapped to ICD-9CM.

Completeness and accuracy

Approximately 50% of Trusts with ICUs participate in ICNARC. Of the 91 participating units reported on, the completeness of notifications is reported to be 100% based on chronological ICU admission data so that any missing admissions are immediately picked up in internal validation checks.

The completeness of data items is also reported to be very high. Overall, the completeness varies between 95 and 100% for admission variables, between 90 and 100% for outcome variables and between 40 and 50% for physiology variables (Annual Report, 2000). The low figures are for physiological variables, which are not routinely tested in all admissions – ICNARC does not encourage unnecessary haematological/biochemical investigations.

The ICMPDS contains internal validity checks which are incorporated into data entry software to ensure data are validated at the point of data entry.

Following submission to ICNARC, data undergo an automated validation process that searches for a number of illogicalities. The computer software also searches for inconsistencies which may be possible, but are nevertheless unlikely (e.g. a planned admission at 2 a.m.). Such inconsistencies are flagged for further verification.

Every 6 months, data collection for a sample of 20 records (randomly selected by ICNARC) is repeated, allowing an assessment of reliability (this is voluntary rather than mandatory).

External validation checks are also carried out. ICNARC holds the UK APACHE II study dataset, which was a study carried out between 1988 and 1990 and holding over 10,000 patient records. This information is compared to the current database. There are also plans to compare information with the intensive care Global International Database, should this be introduced.

Uses

Long-term plans exist to use the database for a range of HT assessments and to collect more specific intervention data items for project funded research (e.g. data on the use of pulmonary artery flotation catheters funded by an NHS R&D HTA grant but not yet reported by 2001).

The CMPD is primarily used for comparative audit between units. The reports (which are

confidential) include mortality comparisons within ICU/HDU and within the hospital stay. Mortality is carefully defined by ICNARC owing to the necessity for legal definitions, particularly in relation to organ harvesting. Inter-unit mortality comparisons require risk adjustment, which in turn requires a range of relevant clinical data, which ICNARC collects. Observed in-hospital mortality by unit is compared with expected mortality using the UK APACHE II equation, with summary results published in the annual report.

Diffusion of techniques within ICU and HDU can be picked up in aggregate in ICNARC reports but incomplete coverage limits the use of ICNARC for diffusion studies. The relative newness of ICNARC has prevented its use for diffusion in time.

Equity analysis is made possible by the postcoding of patients in ICNARC but is limited by coverage of ICUs and HDUs. No analyses of equity have been located.

ICNARC provides the only data on resource use as ICU and HDU use is not captured elsewhere (HES does not identify ICU, ITU or HDU). ICNARC data, by providing length of stay data and also details of interventions, could be used to estimate costs. However, no cost studies have been located.

Funding

ICNARC's total budget was £320,000 in 1998–99. This includes not only the cost of the database but also the comparative audit service. ICNARC is self-funded through charges to units using the service.

Access

ICNARC has entered into a series of legal agreements with each participating ICU to ensure the participating unit is not identified. In addition, ICNARC is registered with the Data Protection Act, ensuring the confidentiality of patients. Access to a subset of the data is possible, as long as the sources of data are kept confidential. To request data, a formal research proposal must be submitted to ICNARC. Each proposal is assessed on its own merits. Charges for data analysis requests are based on a daily rate.

Contact details

Intensive Care National Audit and Research Centre
Tavistock House
Tavistock Square
London
WC1H 9HR

Tel.: 020 7388 2856
Fax: 020 7388 3759
E-mail: icnarc@icnarc.org
Website: <http://www.icnarc.org>

Publications

Annual Report from the Case Mix Programme Database, 2000. London: ICNARC; 2000 (also available for 1998 and 1999).

ICNARC. Proposal for audit of intensive care and high dependency care. London: ICNARC; 1997.

Jones J, Rowan K. Is there a relationship between the volume of work carried out in intensive care and its outcome? *Int J Technol Assess Health Care* 1995;11:762–9.

ICNARC data items

Admission details

ICNARC number
Admission number
ACP local identifier
Postcode
Date of birth
Sex
ACP speciality function code
Date of admission to hospital
Date of admission to unit
Time of admission to unit
Total number of staffed beds in unit at the time of admission
Managed by unit team
Date first managed by unit team
Time first managed by unit team
Planned admission to unit
Admission for pre-surgical preparation
Source of admission to unit
Classification of surgery
Transferring unit admission number
Date of original admission to a unit
Date of original admission to hospital
Location immediately prior to source of admission to unit
Cardiopulmonary resuscitation within 24 hours prior to admission to unit

Past medical history

Evidence available to assess past medical history
Past medical history present
Biopsy proven cirrhosis
Portal hypertension
Hepatic encephalopathy
Very severe cardiovascular disease
Severe respiratory disease
Home ventilation
Chronic renal replacement therapy
AIDS
Steroid treatment
Radiotherapy
Chemotherapy
Metastatic disease
Acute myelogenous leukaemia or acute lymphocytic leukaemia or multiple myeloma
Chronic myelogenous leukaemia or chronic lymphocytic leukaemia
Lymphoma
Congenital immunohumoral or cellular immune deficiency state

Reason for admission

Primary reason for admission to unit
Secondary reason for admission to unit

continued

MPH II₀

Systolic blood pressure at admission to unit
 Heart rate at admission to unit
 Mechanical ventilation at admission to unit
 Coma or deep stupor at admission to unit
 Intracranial mass effects at admission to unit

Physiology

Central temperature:

Lowest
 Highest

Non-central temperature:

Lowest
 Highest

Blood pressure:

Lowest systolic:
 Blood pressure
 Paired diastolic

Highest systolic:
 Blood pressure
 Paired diastolic

Lowest diastolic:
 Blood pressure
 Paired diastolic

Highest diastolic:
 Blood pressure
 Paired diastolic

Heart rate:

Lowest
 Highest

Respiratory rate:

Non-ventilated
 Lowest
 Highest

Ventilated
 Lowest
 Highest

Arterial blood with lowest PaO₂:

PaO₂
 Associated FiO₂
 Associated PaCO₂
 Associated pH/H⁺
 Associated intubation status

Intubated arterial blood gas with highest FiO₂

FiO₂
 Associated PaO₂
 Associated PaCO₂
 Associated pH/H⁺

Arterial blood gas with lowest pH/H⁺:

pH/H⁺
 Associated PaCO₂
 Highest pH/H⁺
 pH/H⁺
 Associated PaCO₂

CPAP administered during the first 24 hours in unit

Serum:	Highest	Lowest
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Bicarbonate
 Sodium
 Potassium
 Urea (highest only)
 Creatinine
 Glucose
 Bilirubin (highest only)

continued

Total calcium		
Ionised calcium		
Albumin	Highest	Lowest
Haematocrit		
Haemoglobin		
White blood cell count		
Platelet count (lowest)		
Prothrombin time (highest)		
Partial thromboplastin time (highest)		
Pupillary reactions		
Sedated or paralysed and selected for whole of first 24 hours in unit		
Glasgow Coma Score:		
Pre-sedation documented		
Pre-sedation total		
Lowest total		
Associated eye component from lowest total		
Associated motor component from lowest total		
Associated verbal component from lowest total		
Associated intubation status from lowest total		
Expected neurological status		
MPM II₂₄		
Infection confirmed in the first 24 hours in unit		
Continuous intravenous vasoactive drug treatment for 1 hour or more in the first hours in unit		
Coma or deep stupor at the 24 hour mark in unit		
Other conditions		
Other condition relevant to this admission 1		
Other condition relevant to this admission 2		
Unit outcome		
Ultimate primary reason for admission to unit		
Surgery up to 1 week before and/or 1 week after admission to unit		
Classification of surgery up to 1 week before and/or 1 week after admission to unit		
ACP maximum number of organ systems supported simultaneously during this unit stay		
ACP number of days of intensive care during this unit stay		
ACP number of days of high dependency care during this unit stay		
ACP main hospital speciality function code		
Treatment withdrawn:		
Date of first decision		
Time of first decision		
Discharge from unit:		
Status at discharge from unit		
Time		
Reason		
Destination		
Transfer unit identifier		
Date of ultimate discharge		
Brainstem death declared:		
Date of declaration		
Time of declaration		
Date body removed from the unit		
Time body removed from unit		
Organ donor		
Death outside unit		
Date of death		
Time of death		
Hospital outcome		
Date of discharge from hospital		
Status at discharge from hospital		
Destination following discharge from hospital		
Date of ultimate discharge from hospital		
Status at ultimate discharge from hospital		