

Appendix B: Background to the audits and methodology

The National Institute for Cardiovascular Outcomes Research (NICOR) oversees the collection and reporting of data

The National Cardiac Audit Programme (NCAP) brings together six separate cardiovascular audit programmes. The datasets were developed by the relevant professional societies. Over time, it was decided to combine efforts and to collect data at an individual patient level within the same informatics system. In 2000, data for the Heart Attack audit (MINAP) was collected on a national level through the Central Cardiac Audit Database (CCAD). The other sub-specialties followed.

The combined database provides a means of evaluating the services needed to provide these treatments and to see how each hospital's performance compares against a range of benchmarks or with the results of other centres where the treatment is provided.

In 2011, responsibility for the maintenance of the data system was brought together in the National Institute for Cardiovascular Outcomes Research (NICOR), which now collects and manages the data from hospitals. The NICOR Stakeholder Group oversees the audit programme and has representation from patients and the public, commissioners and regulators, as well as the professional societies.

There has been a major advance in audit methodology and statistical analysis, with robust approaches to data quality, risk adjustment methodology, pre-defined planning of statistical analyses and reporting. NICOR has consistently been transparent in publishing its approaches in the different audits but the new harmonised NCAP programme will enable application of consistent methodology across all outputs.

Each audit has its own expert group to guide its work, including deciding on the data that can be included

The expert groups are made up of clinicians linked to professional societies, allied health professionals, patient representatives and, where appropriate, commissioners and regulators. These groups identify the key questions that can provide reassurance about quality of care and reveal where that quality can be improved. Quality standards are either selected from national or international guidelines or from a consensus of the expert group. The datasets are currently designed around the most common forms of heart disease, so information is not gathered on all heart conditions or treatments. The expert groups will review the datasets each year and consider new questions as well as other audit methods to gather information on different aspects of care.

The data in all six audits covers England and Wales and in some cases also Scotland, Northern Ireland and the Republic of Ireland

All the national professional societies share the aim of collecting data for all patients treated in the UK. Where possible, this report includes data for the whole of the UK but in some cases the geographic coverage is limited to patients in England and Wales. The aspiration for future years, subject to discussions between the relevant funding bodies, is that all data covers the whole of the UK and also includes patients treated by private sector providers.

The anonymous data on each patient treated at UK hospitals are analysed and feedback is provided to these healthcare providers so that they can review their own performance. However, as the data are also useful to patients and the public, as well as to commissioners of healthcare, this report provides information for all relevant groups.

The audit teams seek to include as many relevant patients as possible so as to understand how variations in treatment might arise

To provide the best means of comparing the performance of hospitals, it is important to collect data on as many patients as possible, and to apply a consistent approach to data collection in all of the participating hospitals. Although snapshot audits and case sampling have their roles, the need to develop and apply risk models to allow a better understanding of the variation in healthcare delivery depends on a comprehensive collection of the entire spectrum of the way that patients present with different conditions.

Hospital administration statistics, because they were designed to gather administrative rather than clinical data, do not collect all the variables needed to appropriately detect the extent of variations and identify factors that explain these variations. Although others have compared hospitals using such data, the clinical community believes it is important to try and take account as much as possible of variation due to patient and hospital characteristics, which can only be collected through clinical datasets. Systems such as Hospital Episode Statistics (HES) and Patient Episode Database for Wales (PEDW) contain some coding inaccuracies and lack the richness of clinical information that is needed to create useful risk models.

'Quality' in healthcare can be difficult to define. Patients want the best outcomes possible, in terms of improved quality of life and reduction in complications related to their disease and/or

the treatments provided, as well as improved survival.

However, patients, their relatives and carers do not expect 'survival at all costs'. Judgments have to be made about the potential benefits (and possible unwanted effects) of every clinical intervention in each case. So for some patients, after due deliberation and discussion, it might be decided that it is inappropriate to undertake a specific therapy. Moreover, some cannot tolerate drugs or do not want to undergo certain treatments for their own reasons. Understanding variation in the delivery of healthcare therefore has to take account of these and other such factors.

The national datasets are designed to interrogate a number of factors:

- **Structure** – which organisations and what staff are available to deliver healthcare?
- **Process** – how well are the components of care provided?
- **Appropriateness** – did specific patients get the appropriate evidence-based treatment?
- **Outcomes** – what is the end result of the care provided?

This report provides information at an aggregate national and hospital level rather than an individual patient level. In other words, this is not a review of individual cases, but rather a consideration, for each hospital, of the sum of care provided to all the patients that were managed there. However, we do highlight individual stories where excellent care was delivered and include some patient experience reports. Although there are formal methods to evaluate patient-reported outcomes and experiences, these are not included in this year's report.

The inclusion of all relevant patients can be challenging due to multiple morbidities and the subtleties of disease diagnosis

While NCAP has been designed to capture as many of the relevant patients as possible, this can be a challenge. This is especially so where inclusion in the audit is based upon a clinical diagnosis rather than the performance of a particular intervention. Some patients may not feature in the audit at all as their primary diagnosis will be for another, non-cardiovascular condition, while in the case of others the correct diagnosis may require careful interpretation of the clinical history and of relevant investigations.

For example, diagnosing NSTEMI (lower-risk heart attacks) is difficult and requires judgement. In this type of heart attack the ECG may be entirely normal and the diagnosis may require the identification of elevated levels of certain bio-markers of heart muscle damage (for example, troponin) in the blood stream. However, while an elevated troponin blood level is necessary for the diagnosis, it is not sufficient; many other common clinical conditions (for example, anaemia, severe infection, heart

rhythm disturbances) may also cause release of troponin from the heart. Therefore, an over-reliance on the blood troponin concentration may lead to incorrect diagnosis. Cardiologists and nurse specialists have a key role in interpretation of such tests.

The same is true for heart failure. While the audit collects information on patients with a primary diagnosis of heart failure, there will be other patients with heart failure in the hospital (whose primary admission reason was not for heart failure) or in the community who are not included. Moreover, there are different causes and forms of heart failure, for which clinical pathways will differ, as will the level of evidence available around the optimal therapeutic options.

The audits use various statistical methods to increase the robustness of comparisons between hospitals and operators

When making comparisons between hospitals or between clinicians, it is important to take into account those hospital and patient factors that influence outcome, and the characteristics of the patients receiving care (such as age and pre-existing comorbidity). Clinical pathways are complex. Many patients can be treated in their local hospitals by their local specialists and clinical teams, but some patients need to be transferred to specialist centres where different equipment and skills are available. In addition, although the main characteristics of patients can be defined and categorised, such grading systems cannot take account of every feature. To overcome these issues, researchers use statistical methods to take account of the most common variations. This is the process of 'risk adjustment'. Even these statistical models have limits, and although they can help explain some of the variation in the delivery of care or outcomes, not all the variation can be explained and this may be due to a host of other complex issues that are not measurable. This is particularly important to appreciate when interpreting tables, graphs or plots.

At the very highest level, when one is trying to determine whether care is delivered at an unacceptable level, or whether care is unusually good, statistical methods are used to identify 'outlying' institutions or operators – those whose performance seems to be measurably and significantly different from that expected. However, it is very important to understand the limitations of statistical analysis. An outlier might not actually be performing any worse than others, but may just be dealing with sicker patients or very rare conditions. Even so, such analysis is important as it can contribute to discussions about where performance may be sub-optimal and where improvements could be made. It is also important to recognise that the quality of care covers a whole range of processes and although audit programmes highlight areas where care might be improved, it is not appropriate to concentrate on a single metric. The quality of care as a whole should be evaluated.

Statistical robustness relies on hospitals providing all applicable data on all the patients with the relevant conditions

Each audit aims to capture a carefully defined set of data that is applicable to each patient admitted with the condition of interest. To comment on performance, it is necessary to examine how care is delivered to all patients and not just to selected subsets. This raises the challenge of 'case ascertainment', whereby some method is needed to identify whether a hospital is providing information on all the patients they treat with these conditions. There are different methods of doing this. There is considerable variation between hospitals, and the NCAP programme is working to harmonise this across the separate domains to ensure data capture is as complete as possible.

Another problem relates to the completeness of the dataset for each patient. In the past this has only become recognised as an issue when the relevant final analyses are being performed. The accuracy of data is also important and there are a number of methods that can be used to establish the validity of the information provided. The NCAP is actively working to ensure a more consistent approach across the country.

Some national and international audit programmes only allow participating hospitals to use a single web-based data collection system, but a decision was previously made that NICOR should be able to accept data from whatever IT system each hospital had acquired or designed. For those who collect data through the central web-based systems, data collection is contemporary, but other hospitals only download data in batches once they have applied their own validation processes. Although the latter are important, it is essential for all participants to understand the timetable for data collection, data cleaning and analysis and to ensure that data are supplied to NICOR accurately and on time. NCAP is working on processes to improve these issues.

Recognising these aspects of data quality are particularly important to understand when considering the outcomes of the various analyses so as to ensure that the results are not misunderstood. It is the responsibility of the participating hospitals to ensure the quality of the data to NICOR is as good as possible – with a focus on case ascertainment, data accuracy, completeness and validity.

This requires hospitals to provide the clinical teams with the appropriate IT and audit team support to ensure optimal data quality. NICOR provides various tools to support data quality on entry and prior to publication. Historically, these have varied within each specialty but work continues to identify tools that work well and to standardise these across each of the clinical domains.

There are a number of other cardiovascular-related datasets and analyses that fall outside the scope of this report

In addition to NCAP, NICOR also gathers data on patients undergoing transcatheter aortic valve implantation (TAVI) and other new technologies, but as this programme is currently outside the scope of the NCAP programme only minimal detail is provided in this report.

Two other non-NICOR national cardiovascular data collection programmes are:

- the [National Audit of Cardiac Rehabilitation](#), coordinated by the British Association for Cardiac Rehabilitation and sponsored by the British Heart Foundation
- the [National Audit of Pulmonary Hypertension](#), delivered by NHS Digital, commissioned by NHS England and supported by NHS Scotland, NHS Wales (GIG Cymru), the Pulmonary Hypertension Association (PHA-UK) and the National Pulmonary Hypertension Centres of United Kingdom and Ireland Physicians' Committee.

Data are also collected separately by the [NHS Blood and Transplant \(NHS BT\) Service](#) on patients treated with cardiac transplantation and ventricular assist devices.

Finally, it is also worth noting that just because something is measurable does not necessarily mean it is an important determinant of healthcare quality. Equally, not everything that is important can be measured. So things like improved patient understanding, a willingness to listen, compassion and friendliness are all considered to contribute to optimal healthcare but are often intangible. Although methods are being developed to measure these elements of care, the NCAP programme does not currently utilise these.