Making the most of the Myocardial Ischaemia National Audit Project (MINAP)

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The Myocardial Ischaemia National Audit Project (MINAP) represents one of the largest observational databases of acute coronary syndrome (ACS) events.[1-3] Since its inception in 2000, it has accumulated rich data (including timing and method of admission, emergency and subsequent treatments, and long-term mortality data through linkage to the UK Statistics Authority) for over 650,000 ACS events from all acute hospitals (n=228) in England and Wales (**figure 1**). Initially designed to monitor standards set by the National Service Framework for Coronary Heart Disease[4] with the generation of annual reports of hospital-level ST elevation myocardial infarction (STEMI) performance,[5] the provision of contemporary online performance analyses has facilitated improvements in the care of ACS patients.[6] Moreover, MINAP is more than a resource for the purposes of audit, it is also a key research tool for the evaluation of cardiovascular care and outcomes.[7,8] Although it is primarily focused on clinical need, its research potential has been recognised by several grant-giving bodies, and a committee (the MINAP Academic Group [MAG]) dedicated to overseeing MINAP research has been established.[3] The Clinical Performance Group (University of Leeds), a multi-disciplinary team comprising clinical cardiologists, health service researchers and health economists draws on MINAP data to investigate clinical care at multiple levels (patient, population, process and healthcare professional).

Figure 1. Plot of acute coronary syndrome (ACS) events (black) and acute hospitals that submit data to Myocardial Ischaemia National Audit Project (MINAP, red). MINAP 1st January 2004 to 31st December 2007

Missing data

There are, however, justified concerns with regard to MINAP data relating to data quality and completeness of ascertainment. These concerns reflect, in some cases, difficulties experienced by some hospitals with data collection. Systematic differences between patients with and without information recorded may bias the estimated performance of a hospital. Moreover, reliable inferences of ACS care cannot be made concerning events not submitted to the database. Fortunately, there are many ways of handling missing data (albeit the best solution is to prevent its occurrence!). Our Clinical Performance Group is studying methods (such as data imputation, the substitution of some value for missing data) by which MINAP 'data missingness' biases may be overcome. Preliminary work suggests hospital-level data missingness (such as the failure to submit a particular variable relating to the patient or their management) may relate to early mortality. These inferences are consistent with findings from the Can Rapid Risk Stratification of Unstable Angina Patients Suppress Adverse Outcomes with Early Implementation of the ACC/AHA Guidelines (CRUSADE) National Quality Improvement Initiative[9] and Prospective Registry

Evaluating Myocardial Infarction: Events and Recovery (PREMIER) study.[10] The annual health check undertaken by the Healthcare Commission includes two indicators pertaining to the submission of MINAP data: first, whether a trust has at least 90% completion across the key fields in MINAP, and second, whether it takes part in the annual MINAP data validation exercise.[11] Data missingness may, therefore, be both a performance indicator and a health outcome measure.

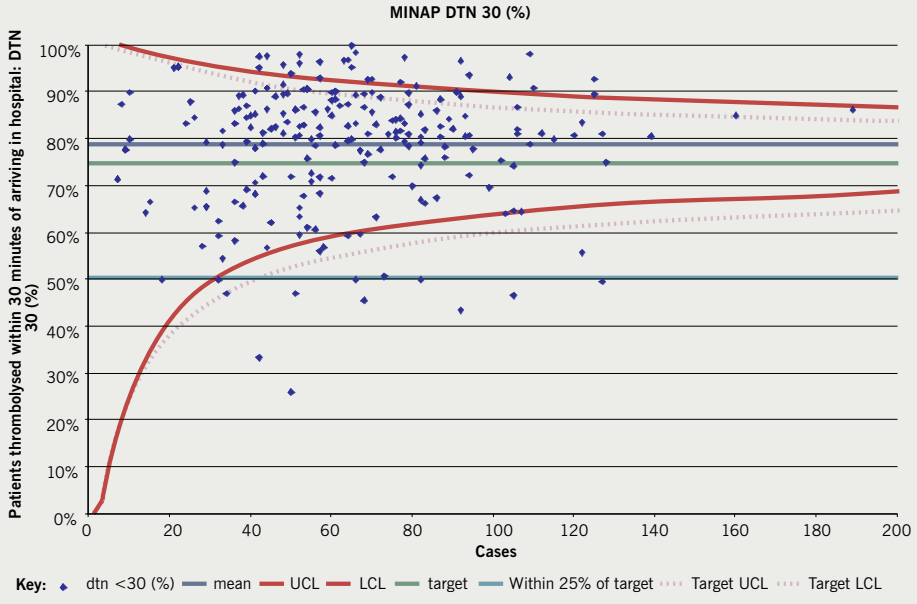
Feedback to hospitals

Complete and comprehensive data may also be enhanced through the provision of data and analyses to the hospitals who submit them. To date, available case-analysis has permitted the appraisal of evidence-based ACS care across England and Wales. Using statistical process control methods, we have demonstrated that funnel plots may be applied to the MINAP data set to allow visual comparison of performance data derived from hospitals (**figure 2**).[12] Through this methodology variation is readily identified, permitting units to appraise their practices so that effective quality improvement may take place. Anonymised real-time provision of analyses (such as funnel plots) to units submitting data may be one method by which hospitals get feedback. In addition to cross-sectional evaluation of care,[13] the shear quantity of data available from MINAP permits longitudinal analyses. For example, it is feasible to evaluate contemporary care practices consistent with national guidelines for ACS management, identify hospital characteristics predictive of adherence to guidelines, and assess whether adherence to guidelines is associated with mortality rates.

Indicators of performance

Adherence to ACS guidelines is associated with improvement in outcome.[14,15] The CRUSADE database and National Registry of Myocardial Infarction (NRMI) demonstrated a positive association between hospitals that perform well with respect to process measures and survival following acute myocardial infarction (AMI).[16,17] Whether these findings are upheld in the UK is yet to be determined, but possible through data from MINAP. Furthermore, with recommendations

Figure 2. Funnel plot for percentage of patients thrombolysed within 30 minutes of arriving in hospital (door-to-needle [DTN] 30). Data from MINAP Third Public Report



Key: DTN = door-to-needle, LCL = lower control limit, UCL = upper control limit, target = National Service Framework goal of 75%. Control limits given for target and mean

of primary percutaneous coronary intervention (PCI) for STEMI and early PCI for non-ST elevation myocardial infarction (NSTEMI), the UK ACS performance indicator (attainment of a 60 minute door-to-needle thrombolysis time threshold) seems soon to be no longer appropriate for the evaluation of acute cardiac services. The development and selection of novel and composite indicators[18] that strongly predict outcome is required.[19] Our group are presently developing and evaluating ACS performance indicators applicable to MINAP.

Performance (such as revascularisation times and attainment of evidence-based drugs on discharge) must be carefully analysed and represented because variation is attributable to many factors.[20] Analysis after case-mix adjustment reflects hospital process performance or 'quality of care', which is the basis of medical institution profiling[21,22] necessary for clinical governance, resource allocation and economic/workforce planning. Fair comparison of hospitals' performance, therefore, requires careful consideration of case-mix. This is possible through the development of ACS risk models (scores), of which many exist. Using MINAP data, our group recently developed a risk score that discriminated in-patient death for STEMI,[23] and externally validated the Global Registry of Acute Coronary Events (GRACE), Platelet Glycoprotein IIb/IIIa in Unstable Angina: Receptor Suppression Using Integrillin Therapy (PURSUIT), Global Utilization of Steptokinase and t-PA for Occluded Coronary Arteries (GUSTO-I), Simple Risk Index (SRI) and Evaluation of the Methods and Management of Acute Coronary Events (EMMACE) risk scores.[24] However, there are many challenges to the development and application of ACS risk models, and isolated case-mix adjustment can lead to the erroneous conclusion that an unbiased comparison between hospitals then follows (the case-mix fallacy).[25] Moreover, although MINAP has 118 data fields (not all have to be collected), it does not collect all the predictor variables used in common ACS risk scores. This is one of the weaknesses of MINAP data, and measures to overcome this constitute part of our Clinical Performance Group research programme.

Risk scores

Case-mix adjustment (far-point testing) is only one of the many uses for a validated

risk model. Risk models also represent a simple, convenient method of determining the risk characteristics of a patient (near-point testing). Consequently, they facilitate clinical decision making so that patients may receive timely evidence-based therapies. For ACS, early and accurate risk stratification is essential, as the benefits of more aggressive and costly treatments are seen mainly in those at higher risk of adverse clinical events.[26-29] In turn, this improves outcomes and optimises resource usage. Traditionally, logistic regression techniques have been used to generate risk scores for medical practice, but MINAP data are extensive and complex and require more sophisticated analyses to optimise model development. Indeed, building good models is not a simple process and a phrase attributed to George Box is often cited: "all models are wrong, but some are useful".[30] The wealth of data available from MINAP will permit the development of a range of near-point and far-point risk models that can be used by healthcare professionals, policy makers and epidemiologists alike.

Making the most…

MINAP has accumulated a vast quantity of contemporary ACS data that allow the investigation of cardiovascular services and outcome throughout England and Wales. This national resource is now in a position to be used for cardiovascular research, but would not have been possible without the assistance of all the hospitals in England and Wales who have contributed data to MINAP.

If *you* wish to make the most out of MINAP, applications for data may be accessed from: http://www.rcplondon.ac.uk/CLINICAL-STANDARDS/ORGANISATION/PARTNERSHIP/Pages/MINAP-.aspx

Alternatively, there are opportunities for MINAP research within the Clinical Performance Group, University of Leeds

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Conflict of interest

None declared.

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