A

Level 3 Certificate and Extended Certificate in Applied Science
June 2017

SCIENCE IN THE MODERN WORLD

ASC3/PM

Pre-release Material

- **This pre-released material should be opened and issued to learners on or after 31 March 2017.**

- **A clean copy of the pre-released material will be provided at the start of the examination.**

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INFORMATION

This pre-released material is to be issued to learners for use during preparation for this examination.

The pre-released material consists of four sources (A–D) on the subject of Heart Attack.

This material is being given to you in advance of this examination to enable you to study each source in preparation for questions based on the material in SECTION A of the examination.

A wider understanding of the topics and issues raised in the sources would be beneficial for the assessment.

You are not required to understand any detailed scientific explanations BEYOND those outlined in SOURCES A–D and those in the Applied Science specification.

You may write notes on this copy of the pre-released material, but you will not be allowed to bring this copy, or any other notes you may have made, into the examination room. You will be provided with a clean copy of this pre-released material at the start of the examination.

It is suggested that a minimum of three hours detailed study is spent on this pre-released material.

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SOURCE A – 'HEART ATTACK? – Know these signs and symptoms' poster

British Heart Foundation

HEART ATTACK?

Know these signs and symptoms

pain or discomfort in the chest that doesn't go away

the pain may spread to the left or right arm

or may spread to the neck and jaw

you may feel sick or short of breath

think quick… act fast call 999 immediately

FIGHT FOR EVERY HEARTBEAT

bhf.org.uk

SOURCE B – adapted from an article in the 'Daily Mail', 30 August 2016

Doctors failing to spot thousands of heart attacks in women – with fatal results

- **Women are 50% more likely than men to have heart attack misdiagnosed**
- **Doctors are more likely to diagnose their symptoms as indigestion**
- **The mistake has driven up death rates by 70%, new research shows**
- **It may explain why women more often die than men after heart attack**

Doctors are failing to spot thousands of heart attacks suffered by women every year, a major study warns today. According to an analysis of 600,000 British patients, women are 50 per cent more likely than men to have a heart attack misdiagnosed. Experts said this 'alarming' disparity in diagnosis may be because doctors wrongly think of heart disease as a problem that only affects middle-aged overweight men. As a result, they are more likely to incorrectly diagnose women heart attack sufferers as having a less serious problem – such as indigestion or muscle pain. That mistake can be fatal, delaying treatment and driving up death rates by as much as 70 per cent.

Some 69,000 women have a heart attack in Britain each year – nearly 20,000 more than are diagnosed with breast cancer.

Today's study, led by the University of Leeds, may explain why women are more likely than men to die after a heart attack.

Dr Chris Gale, a consultant cardiologist at the university, said: 'We need to work harder to shift the perception that heart attacks only affect a certain type of person. 'Typically, when we think of a person with a heart attack, we envisage a middle-aged man who is overweight, has diabetes and smokes. 'This is not always the case. Heart attacks affect the wider spectrum of the population – including women.'

'I THOUGHT IT WAS INDIGESTION': EX-NURSE REVEALS HOW SHE DISMISSED HER OWN SYMPTOMS BEFORE HEART ATTACK

When Alison Fillingham suffered a heart attack in June, she initially dismissed the symptoms as merely indigestion. 'I had this really bad pain near my collarbone and neck – and it spread to my jaw,' the 49-year-old from Bolton said. 'But it never occurred to me it was a heart attack. I keep fit, I do lots of walking with my dog and do yoga two or three times a week. 'You think of someone having a heart attack as a portly man – I never thought it would happen to me. 'I thought it was indigestion, maybe gallstones.' When the pain got so bad her sister Jennifer made her call an ambulance, the emergency medics were also dismissive.

Mrs. Fillingham, mother to a 24-year-old son, said: 'When the paramedics arrived they told me I was just having a panic attack, so I was taken to the hospital with no urgency.' Even when she arrived at the Royal Bolton, there was little concern. 'Because I look fit and well nobody thought it was a heart attack,' said

Mrs Fillingham. 'They did an ECG, but that didn't show anything, but then a few hours later, some blood tests came back and showed it was a heart attack.' Mrs Fillingham, who works as a home carer for elderly people after a 24-year career as a nurse, was taken to Wythenshawe Hospital in Manchester, where an angiogram showed she had a blocked artery.

She had a heart bypass procedure and has been recovering for the past 11 weeks. 'Knowing how much this delayed diagnosis could have put my life at risk, I wish I'd recognised the symptoms and called the ambulance immediately,' she said. Doctors warn that not enough people know the symptoms of a heart attack – and often mistake the warning signs for indigestion or muscle pain.

Many people assume that a heart attack strikes suddenly, with someone clutching their chest and keeling over. Instead, it happens gradually, with people typically complaining of nausea and an aching chest, jaw or arms.

Rapid treatment is essential, with nearly half of the salvageable heart muscle being lost in the first hour of the attack starting. Yet only one in four attack victims get treated within this short window.

To accurately diagnose a heart attack doctors have to conduct a set of blood tests and scans – but too often the patient is misdiagnosed with another problem, and the tests are not done until their condition has deteriorated.

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Women themselves also often view heart issues as a typically 'male disease', scientists think. This means that when they start noticing symptoms they often do not seek help.

Dr Gale's research team examined records gathered over nine years at 243 NHS hospitals in England and Wales between April 2004 and March 2013. They found that overall, 198,534 men and women – a third of all heart attack patients – were initially misdiagnosed, before doctors later gave a correct diagnosis. But the data revealed that women were 59 per cent more likely than men to receive an initial misdiagnosis for the most severe type of heart attack – a STEMI attack in which there is a total blockage of the main artery.

For NSTEMI attacks, in which there is a partial blockage, women were 41 per cent more likely than men to be misdiagnosed at first. Looking across all types of heart attack, women were 50 per cent more likely than men to have their heart attack misdiagnosed, according to the study in the 'European Heart Journal: Acute Cardiovascular Care'. Speaking at the European Society of Cardiology congress in Rome, Dr Gale added: 'This research clearly shows that women are at a higher risk of being misdiagnosed following a heart attack than men.'

Some 69,000 women have a heart attack in the UK every year, compared to 119,000 men. But women are more likely to die as a result of the attack.

A separate study based on Swedish data, also presented by Dr Gale at the conference, suggested women are between 13 per cent and 53 per cent more likely than men to die following a heart attack, depending on the type of attack. He said that UK data might be slightly different,

but added: 'This would perhaps serve as an example of how big the problem is.'

Dr Gale said one problem is that women have different symptoms to men – they are more likely to complain of indigestion, palpitations or a 'funny turn', for example. Women are also more likely to be elderly and suffer from other complications such as diabetes, which makes spotting the problems harder.

But he said doctors and patients alike have to be taught that heart attacks can strike men as well as women – and can present in a variety of different symptoms.

'It's not necessarily 20 minutes of crushing chest pain, it may be some chest pain and a funny turn, or a feeling of palpitations and a bit of chest pain. 'It can be difficult but we have to work in an urgent environment and we have to work quickly,' he said.

'Heart attack care is all about speed. 'They come in from the ambulance clutching their chest and someone says, "I think you've got gallstones, or pancreatitis, or I think you're having a heart attack." His team found that women who were initially diagnosed with a heart attack had a 2.5 per cent risk of dying within 30 days. If they were initially misdiagnosed, their risk of death went up 70 per cent, to 4.2 per cent.

Men, in comparison, had an initial 1.8 per cent risk of death, which rose to 3.2 per cent if they were misdiagnosed.

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Dr Gale said: 'Healthcare professionals need to be aware that we need to give all eligible treatments to females and we need to all be aware that females who suffer a heart attack are at risk of death. 'It's about educating the public but it is also about ensuring we have continual professional development for healthcare professionals.

'In A&E it's not just doctors, it's emergency nurses, it's ambulance staff, paramedics. 'It's not just me as the cardiologist, it's the whole system.'

Previous research shows women are less likely to receive standard medications for heart disease and less likely to get on rehabilitation programmes.
Dr Mike Knapton, Associate Medical Director at the British Heart Foundation, which funded the research, said: 'Thanks to this study we now have a better understanding of the experiences of both men and women when they are diagnosed as having suffered a heart attack. 'The difference is alarmingly high.'
He said blood tests to rapidly diagnose heart attacks – which are currently being tested – could help solve the problem. 'This new study highlights the current scale of the issue and confirms more research is urgently needed into tests that will enable earlier and more accurate diagnosis of a heart attack, particularly in women.'

An NHS England spokesman said: 'Survival rates for heart attacks are the best they have ever been and swift diagnosis and treatment are key to this. 'We are working hard to continually improve tests for accurately diagnosing heart attacks in both men and women so that correct treatment can begin without delay, ensuring the best possible recovery for patients. 'We are also working to increase awareness of signs and symptoms of heart attack amongst both the public and healthcare professionals as this will help speed up diagnosis.'

SOURCE C – abridged version of an article from 'European Heart Journal: Acute Cardiovascular Care'

Impact of initial hospital diagnosis on mortality for acute myocardial infarction: A national cohort study

Jianhua Wu[1], Chris P Gale[2,3], Marlous Hall[2], Tatendashe B Dondo[2], Elizabeth Metcalfe[4], Ged Oliver[3], Phil D Batin[5], Harry Hemingway[6], Adam Timmis[7] and Robert M West[8]

ABSTRACT

AIMS: Early and accurate diagnosis of acute myocardial infarction is central to successful treatment and improved outcomes. We aimed to investigate the impact of the initial hospital diagnosis on mortality for patients with acute myocardial infarction.

METHODS AND RESULTS: Cohort study using data from the Myocardial Ischaemia National Audit Project of patients discharged with a final diagnosis of ST-elevation myocardial infarction (STEMI, *n* = 221,635) and non-STEMI (NSTEMI, *n* = 342,777) between 1 April 2004 and 31 March 2013 in all acute hospitals (*n* = 243) in England and Wales. Overall, 168,534 (29.9%) patients had an initial diagnosis which was not the same as their final diagnosis. After multivariable adjustment, for STEMI a change from an initial diagnosis of NSTEMI (time ratio 0.97, 95% confidence interval 0.92–1.01) and chest pain of uncertain cause (0.98, 0.89–1.07) was not associated with a significant reduction in time to death, whereas for other initial diagnoses the time to death was significantly reduced by 21% (0.78, 0.74–0.83).

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For NSTEMI, after multivariable adjustment, a change from an initial diagnosis of STEMI was associated with a reduction in time to death of 10% (time ratio 0.90, 95% confidence interval 0.83–0.97), but not for chest pain of uncertain cause (0.99, 0.96–1.02). Patients with NSTEMI who had other initial diagnoses had a significant 14% reduction in their time to death (time ratio 0.86, 95% confidence interval 0.84–0.88). STEMI and NSTEMI with other initial diagnoses had low rates of pre-hospital electrocardiograph (24.3% and 21.5%), aspirin on hospitalisation (61.6% and 48.5%), care by a cardiologist (60.0% and 51.5%), invasive coronary procedures (38.8% and 29.2%), cardiac rehabilitation (68.9% and 62.6%) and guideline-indicated medications at time of discharge from hospital. Had the 3.3% of patients with STEMI and 17.9% of NSTEMI who were admitted with other initial diagnoses received an initial diagnosis of STEMI and NSTEMI, then 33 and 218 deaths per year might have been prevented, respectively.

CONCLUSION: Nearly one in three patients with acute myocardial infarction had other diagnoses at first medical contact, who less frequently received guideline-indicated care and had significantly higher mortality rates. There is substantial potential, greater for NSTEMI than STEMI, to improve outcomes through earlier and more accurate diagnosis of acute myocardial infarction.

KEYWORDS
MINAP, mortality, NSTEMI, STEMI, acute myocardial infarction

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INTRODUCTION

Acute myocardial infarction is a common cause of hospital admission and a major burden on healthcare resources.[1,2] Its early and accurate diagnosis is central to successful treatment and improved outcomes.[3,4] Typically, on admission to hospital an initial diagnosis is made for each patient, which determines their treatment. In addition to pharmacological therapies, this includes primary percutaneous coronary intervention or fibrinolysis for ST-elevation myocardial infarction (STEMI) and invasive coronary imaging and revascularisation for non-STEMI (NSTEMI). Even though a prerequisite for the diagnosis of acute myocardial infarction is the detection of a rise and fall in troponin,[5] the preliminary hospital diagnosis is usually made in the absence of this information – being derived from pre-hospital data and that obtained from the history, clinical examination and 12-lead electrocardiograph (ECG) in an emergency environment.

Our previous work found that patients with acute myocardial infarction who failed to receive evidence-based care at the pre-hospital phase were less likely to receive hospital treatments, and that this was associated with premature death.[6,7] Yet, we are not aware of any studies which have quantified the impact of an initial hospital diagnosis which is not acute myocardial infarction on clinical outcomes among patients who have had an acute myocardial infarction. Clarifying the extent to which patients with acute myocardial infarction received different initial diagnoses is important given data suggesting that high sensitivity troponins may increase the diagnosis of acute myocardial infarction and reduce rates of death.[8,9]

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In this study, we sought to determine the degree to which an initial non-specific/non-cardiac diagnosis impacted on mortality for patients hospitalised with acute myocardial infarction. Specifically, we aimed to describe the baseline characteristics, investigations performed, cardiovascular treatments received and mortality at one year for patients hospitalised with STEMI or NSTEMI who also had an initial diagnosis of 'chest pain of unknown cause' or 'other initial diagnosis'.

METHODS

Setting and design

We included all NHS hospitals (n = 243) in England and Wales which provided care for patients (n = 564,412) aged between 18 and 100 years at time of hospitalisation and discharged from hospital alive with acute myocardial infarction between 1 April 2004 and 31 March 2013. Patient-level data were extracted from the Myocardial Ischaemia National Audit Project (MINAP), a comprehensive registry of hospitalisations for acute coronary syndrome in England and Wales, which was started in 2000 and is now mandated by the Department of Health.[10] For multiple admissions, we used the earliest record to reduce potential bias from pre-existing treatments. Details of MINAP have been described previously.[6,10]

STUDY VARIABLES

We included demographic factors (age, sex, year of hospital admission), past medical history, markers of acute myocardial infarction severity at time of hospitalisation, investigations (pre-hospital ECG, any ECG, coronary angiography), acute treatments, medications prescribed at hospital discharge and care

(cardiac rehabilitation, care by a cardiologist). For each patient, we extracted information about their initial diagnosis (STEMI, NSTEMI, chest pain of unknown cause, and other initial diagnoses). For each hospital we calculated its average annual volume and deprivation level (mean Townsend score) across all patients recorded in MINAP as attending that hospital during 2004–2013.

MORTALITY

The primary clinical outcome was mortality from all causes at one year after discharge from hospital. National unique identifiers were used to link patients with the Office for National Statistics, and we accessed the registry to ascertain vital status or date of death at one year. The survival duration was derived from the date of death or censorship and date of discharge from hospital.

RESULTS

Of 564,412 patients with acute myocardial infarction (mean age 68.4 (SD 13.7) years, 66.8% male), the majority (86.4%) were White, one-fifth (19.1%) had diabetes and one-fifth (21.5%) previous myocardial infarction. Nearly two-thirds (64.1%) were prior or current smokers, 48.8% had hypertension, 33.3% hyperlipidaemia. For the cohort, 3.8% had a cardiac arrest, and 16.3% had ST depression on their ECG. The median (IQR) hospital stay was 5 (3–9) days. It shows that patients with a final diagnosis of NSTEMI were more frequently co-morbid, and had longer hospital stays. In total, 168,534 (29.9%) patients had an initial diagnosis which was not the same

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as their final diagnosis. For final diagnosis STEMI and NSTEMI, the proportions with other initial diagnoses (3.3% and 17.9%) were higher than the proportions with chest pain of uncertain cause (2.9% and 16.1%), but lower than the proportion with initial diagnosis NSTEMI (14.2%) and STEMI (19.7%).

MORTALITY

At one year following hospital discharge, the mortality rate among STEMI who had an initial diagnosis of STEMI was 5.6% compared with a higher rate for those with an initial diagnosis of NSTEMI (8.4%), chest pain of uncertain cause (8.3%) and other initial diagnoses (21.3%). For NSTEMI, the contrast in mortality at one year between patients with an initial diagnosis of NSTEMI (10.7%) and those with STEMI (11.4%) and chest pain of uncertain cause (11.5%) was less evident. Patients with NSTEMI who had other initial diagnoses, however, had mortality rates at one year more than double (25.5%) those of patients with an initial diagnosis of NSTEMI. With increasing age, but not by sex, these differences were accentuated.

After adjustment for case mix, investigations and treatments, for STEMI a change from an initial diagnosis of NSTEMI (time ratio 0.97, 95% CI 0.92–1.01) and chest pain of uncertain cause (0.98, 0.89–1.07) was not associated with a significant reduction in time to death, whereas for other initial diagnoses the time to death was significantly reduced by 21% (0.78, 0.74–0.83). For NSTEMI, after multivariable adjustment, a change from an initial diagnosis of STEMI was associated with a reduction in time to death of 10% (time ratio 0.90, 95% CI 0.83–0.97), but not for chest pain of uncertain cause (0.99, 0.96–1.02). Patients with NSTEMI who had other

initial diagnoses had a significant 14% reduction in their time to death (time ratio 0.86, 95% CI 0.84–0.88).

Further, if the 7411 patients with STEMI who were admitted with other initial diagnoses had received an initial diagnosis of STEMI then 332 deaths (33 deaths per year) at one year might have been prevented. Equally, if the 61,204 patients with NSTEMI who were admitted with other initial diagnoses had received an initial diagnosis of NSTEMI then 2185 deaths (218 deaths per year) at one year might have been prevented.

DISCUSSION

Acute myocardial infarction is a common reason for hospitalisation and a medical emergency that requires early access to specialist treatment.[11,12] Evidence from clinical and basic science studies reveals that delays to guideline-indicated care (such as timely reperfusion for STEMI and risk-stratified revascularisation for NSTEMI) are associated with increased mortality.[3,4,13] The diagnosis of acute myocardial infarction, however, is not always apparent at first medical contact. Our study of over 500,000 patients with a diagnosis of STEMI or NSTEMI shows that a preliminary diagnosis made at initial medical contact which was not of acute myocardial infarction was not infrequent. Among the one in three cases where there was inconsistency between the initial and final diagnosis, the chance of receiving guideline-indicated treatments for the management of acute myocardial infarction was significantly reduced and associated with high rates of premature death.

We estimated that, over the decade of study, had patients with acute myocardial infarction who were admitted with other initial diagnoses received an initial diagnosis of acute myocardial infarction, then over 250 deaths per year might have been prevented, respectively.

Whilst a preliminary diagnosis of STEMI is readily made among patients with chest pain who have ST-segment elevation or new left bundle branch block on their presenting ECG, its timely diagnosis relies on the early use of the ECG. In the UK, as with other modern healthcare systems, the emergency management of STEMI has become institutionally operationalised – patients bypass local hospitals to receive primary PCI at Heart Attack Centres – and this has been associated with the decline in the rates of death following STEMI.[14-16] Even so, our study shows that a proportion of patients (who, typically, were more co-morbid) did not receive an early diagnosis of STEMI. In turn, this was associated with premature death because they were much less likely to receive evidence-based care. Our earlier work revealed sub-optimal use of the pre-hospital ECG, which is a critical step in the 'perfect patient pathway' for the management of STEMI.7 Moreover, early missed care opportunities such as the provision of a pre-hospital ECG are associated with the failure to provide guideline-indicated care later on, which in turn is associated with significantly higher rates of death compared with patients who receive interventions early in the STEMI pathway.[6]

Survival was reduced by up to one-fifth among patients with acute myocardial infarction who had other initial diagnoses at first medical contact. These findings were upheld after adjusting for case mix, cardiovascular risk and treatments received, suggesting that either other

factors were responsible for the reduced survival or our adjustment was not comprehensive. Other factors may include delays to rather than the receipt of treatments or the availability of specialist hospital facilities and staffing.[16] By comparison we found, after adjustment, no survival disadvantage for NSTEMI who initially were diagnosed as STEMI, and STEMI who were initially diagnosed with NSTEMI. This may have been because, although the risk of receiving guideline-indicated care was lower for patients who changed between STEMI and NSTEMI diagnoses, treatment use among these groups was comparably high and our models captured the multimorbidity of patients with NSTEMI. Similarly, we did not find a survival disadvantage following adjustment for case mix, risk and treatments received for patients who had an initial diagnosis of chest pain of uncertain cause. Again, whilst these patients were less likely to receive care interventions, overall they had high rates of use of guideline-indicated treatments for acute myocardial infarction. Moreover, it was among patients who had initial other diagnoses that treatments were less frequent compared with patients with chest pain of uncertain cause and those who did not have a change of diagnosis.

We found that the proportion of patients with NSTEMI who did not have an initial diagnosis of NSTEMI was at least five-fold higher than for patients with STEMI. Such patients, whilst being more co-morbid, were less likely to receive guideline-indicated care and more likely to die sooner than patients who had an initial diagnosis of NSTEMI. Even though it is not unusual for patients with NSTEMI to have a normal ECG, we found that one-quarter of those with other initial diagnoses had

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electrocardiographic ST-segment depression, which was of similar frequency to that for patients who had an initial diagnosis of NSTEMI. In contrast to STEMI, the diagnosis of NSTEMI is more dependent upon the results of the troponin assay, which is rarely available at first medical contact. Therefore, approaches to reduce potential harm through omission of care would include the early use of high-sensitivity troponin, which is associated with higher and earlier rates of diagnosis of NSTEMI, more frequent use of guideline-indicated care and better clinical outcomes.[9] By increasing diagnostic certainty, emergency department congestion would be reduced and there would be fewer unnecessary non-cardiac hospitalisations.[17,18]

Our investigation has a number of other important clinical implications. In the absence of early troponin results, physicians are reliant on the clinical history and results of the ECG. Yet, over half of patients will have a non-diagnostic ECG and atypical symptoms of acute myocardial infarction are not uncommon in the elderly, women and in patients with diabetes, chronic renal failure or dementia.[19-21]

Furthermore, a history of chest pain has been shown to be of limited value in cases of suspected acute coronary syndrome.[22,23] For NSTEMI, where the diagnostic yield from the ECG is, by definition, lower than for STEMI, physicians are even more reliant on the typicality of the history of chest pain. Our observational evidence of potentially avoidable deaths associated with delayed STEMI and NSTEMI diagnoses serves to remind clinicians of the importance of being aware of the range of characteristics with which patients with acute myocardial infarction present to hospital. Specifically for NSTEMI, our results in light of other recent cohort

data call for the earlier use and wider adoption of high sensitivity troponins as well as a focus on the systematic application of accelerated diagnostic protocols using risk scores rather than subjective clinical assessment.[9,24-26]

There are some limitations to this study. We did not have data regarding the type and timing of the troponin assay and therefore, we could not determine their effect on the change in diagnosis. Nonetheless, there is good evidence for the impact of troponins on diagnostic yield.[8,9,24] We were reliant on the accurate recording of the diagnoses and we did not have data for the specific clinical diagnosis under the category other initial diagnoses. Even though MINAP performs annual data validation,[10] this could have led to misclassification bias and precluded higher resolution interrogation of specific preliminary diagnoses (such as the frequency of pancreatitis as an initial diagnosis). Nonetheless, we were careful in our selection of patients with a final diagnosis of acute myocardial infarction, and one of the strengths of the cohort was the ability to determine STEMI and NSTEMI among a very large cohort of patients. Also, we excluded patients who died in hospital because we were unsure as to what treatments they had received. In doing so, we may have underestimated the effects of a change in diagnosis because the risk of dying from acute myocardial infarction is higher early after the event.[27] Finally, MINAP does not record data for all patients with acute myocardial infarction.[1] Given this, our calculation of the numbers of preventable deaths is underestimated and the potential for improvement is likely to be much greater.

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Author contributions: JW had full access to all the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis. Study concept and design: CPG, RMW. Acquisition, analysis, or interpretation of data: all authors. Drafting of the manuscript: CPG, JW. Critical revision of the manuscript for important intellectual content: all authors. Statistical analysis: JW, RMW. Administrative, technical, or material support: MH. Study supervision: CPG, RMW. Ethical approval: The National Institute for Cardiovascular Outcomes Research, which includes the MINAP database (Ref: NIGB: ECC 1–06 (d)/2011), has support under section 251 of the National Health Service (NHS) Act 2006 to use patient information for medical research without consent. Ethical approval was not required under NHS research governance arrangements. Registration: Clinical Trials. gov NCT02600962. MINAP is commissioned by the Health Quality Improvement Partnership as part of the National Clinical Audit and Patient Outcomes Programme. The funding agencies had no role in the design and conduct of the study; collection, management, analysis, and interpretation of the data; preparation, review, or approval of the manuscript; and decision to submit the manuscript for publication.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

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SOURCE D

Heart, News & Analysis by Spectator Health Reporter (2nd September 2016) cannot be reproduced here due to third-party copyright constraints.

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END OF SOURCES A, B, C AND D