

Institution: University College London
Unit of Assessment: 2 - Public Health, Health Services and Primary Care
Title of case study: Improving the quality of care of people with and at risk of cardiovascular diseases
<p>1. Summary of the impact (indicative maximum 100 words)</p> <p>Research led by Professor Harry Hemingway at UCL on the quality and outcomes of care of people with, or at risk of, cardiovascular diseases has informed guidelines and clinical management in a number of areas. The work influenced NICE guidelines on <i>Chest pain of recent onset</i> (CG95) with regard to the use of exercise electrocardiography (ECG) in the diagnosis of stable angina and approaches to sex and ethnicity in diagnosis. Our research also underpinned recommendations on revascularisation in the NICE guidelines on <i>Management of stable angina</i> (CH126). Additionally, the research has led to recommendations about the need to assess psychosocial factors including depression in people with myocardial infarction.</p>
<p>2. Underpinning research (indicative maximum 500 words)</p> <p>Clinical practice in cardiovascular medicine does not necessarily keep pace with evidence-based recommendations. Beginning in 1994, Hemingway led a prospective study of consecutive patients undergoing coronary angiography at three London hospitals. Previous studies had suggested that ‘appropriateness’ might offer a missing link in optimising clinical practice with evidence-based care, for several inter-related reasons. However, it was unknown whether these ratings of appropriateness for coronary revascularisation or coronary angiography were valid in terms of clinical outcomes. Among consecutive ‘real world patients’ we hypothesised that people who were appropriate for a procedure but who did not receive it (underuse) would go on to experience worse outcomes. Ours was the first (and still among the few) studies to prospectively test, and confirm, this hypothesis [1].</p> <p>Our appropriateness studies allowed us to go beyond clinically naïve but widely published crude differences in rates of procedures e.g. between ethnic minorities, women and men (which are to be expected based on well known differences in the epidemiology of coronary disease) to assess whether procedure rates are clinically fair. What we demonstrated was that there was little evidence that South Asians had clinically important (in terms of death and heart attack risk) differences from the rest of the population in appropriateness for revascularisation [2].</p> <p>We used a novel method to address the clinically important decision arising when revascularisation with both coronary artery bypass grafting (CABG) and percutaneous coronary intervention (PCI) are considered clinically appropriate. Based on our formally-defined appropriateness criteria, and long-term follow up (five years) we demonstrated the cost-effectiveness of revascularisation with CABG, but showed that revascularisation with PCI was not cost effective [3]. These results were subsequently demonstrated (among selected patients) in randomised trials.</p> <p>We exploited linked electronic health records in primary care in Finland to provide the first large-scale evidence that stable angina has a considerably higher incidence than myocardial infarction and affects women and men with similar incidence risks. Furthermore, stable angina in women, among easily identifiable clinical subgroups, has similarly high absolute rates of prognostic outcomes compared with men [4].</p> <p>Between 1996 and 2002 we investigated the role of exercise electrocardiography in the initial evaluation of people with suspected stable angina and found that it contributed little new prognostic information beyond simpler clinical measures [5].</p> <p>Our systematic reviews and meta-analyses since the late 1990s have tested the long-held clinical impression that social and psychological factors might influence outcome in coronary disease.</p>

Impact case study (REF3b)

Most recently, in a systematic review looking at depression in particular, we found some evidence that depression may be important but also identified the need for methodological improvements in the research [6].

Our research has led to the establishment of the Farr Institute of Health Informatics Research, funded to a total of £9.3m from 10 UK funders (including MRC, Wellcome Trust, NIHR, British Heart Foundation.) We have also established the National Institute of Cardiovascular Outcomes Research, with £5.3m funding to curate and exploit quality registries for acute coronary syndromes and other cardiac conditions.

Key academic co-investigators involved in the research include: Professor Gene Feder (initially QMUL, Bristol since 2009), Professor Adam Timmis (QMUL), Professor Douglas Altman (Oxford).

3. References to the research (indicative maximum of six references)

- [1] Hemingway H, Crook AM, Feder G, Banerjee S, Dawson JR, Magee P, Philpott S, Sanders J, Wood A, Timmis AD. Underuse of coronary revascularization procedures in patients considered appropriate candidates for revascularization. *N Engl J Med*. 2001 Mar 1;344(9):645-54. <http://dx.doi.org/10.1056/NEJM200103013440906>
- [2] Feder G, Crook AM, Magee P, Banerjee S, Timmis AD, Banerjee S, Hemingway H. Ethnic differences in the invasive management of coronary disease: prospective cohort study of patients undergoing angiography. *BMJ* 2002;324: 511-516. <http://dx.doi.org/10.1136/bmj.324.7336.511>
- [3] Griffin SC, Barber JA, Manca A, Sculpher MJ, Thompson SG, Buxton M, Hemingway H. Cost effectiveness of clinically appropriate decisions on alternative treatments for angina pectoris: prospective observational study. *BMJ* 2007;334(7594):624. <http://dx.doi.org/10.1136/bmj.39129.442164.55>
- [4] Hemingway H, McCallum A, Shipley M, Manderbacka K, Martikainen P, Keskimäki I. Incidence and Prognostic Implications of Stable Angina Pectoris Among Women and Men in a Large Ambulatory Population; *JAMA* 2006; 295:1404-1411. <http://dx.doi.org/10.1001/jama.295.12.1404>
- [5] Zaman MJ, Junghans C, Sekhri N, Chen R, Feder GS, Timmis AD, Hemingway H. Presentation of stable angina pectoris among women and South Asian people. *CMAJ* 2008 Sep 23; 179(7): 659–67. <http://dx.doi.org/10.1503/cmaj.071763>
- [6] Nicholson A, Kuper H, Hemingway H. Depression as an etiologic and prognostic factor in coronary heart disease: a meta-analysis of 6496 events among 147416 participants in 61 observational studies. *Eur Heart J* 2006; 27(23): 2763–74. <http://dx.doi.org/10.1093/eurheartj/ehl338>

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4. Details of the impact (indicative maximum 750 words)

The research of Hemingway's group has directly informed national and international public health policy, clinical guidelines and the development of underpinning methods which have subsequently been implemented and have had an important impact on the healthcare and health of the UK and international populations, and our capacity for carrying out research for patient benefit.

Clinical investigation of patients with suspected or confirmed coronary disease

Impact case study (REF3b)

Since the early post-war period the exercise electrocardiogram (ECG) has been the most widely performed diagnostic test for stable angina. In March 2010, however, NICE guidelines on *Chest pain of recent onset* (CG95) recommended the following: “Do not use exercise ECG to diagnose or exclude stable angina for people without known CAD”. Hemingway was a member of the Guideline Development Group and his research is cited 16 times in the guideline [a]. This has led to one of the most significant changes in the diagnostic pathway of patients with suspected stable angina for decades. In the light of recent evidence showing the modest incremental value for exercise ECG – the strongest contemporary UK evidence coming from our research – NICE made this bold recommendation, which has subsequently been implemented.

This recommendation has since gone on to change clinical practice. For example, an analysis of diagnostic testing at the Newcastle Rapid Access Chest Pain Clinic in 2011 reported that: “The proportion of the study population before and after the guidelines undergoing exercise testing was 50.1% vs 0.0%; for calcium score/CT coronary angiography 0.0% vs 14.7%; for functional imaging 25.6% vs 13.4%; and for invasive coronary angiography 15.3% vs 25.8%. The proportion not requiring further testing was unchanged (30.0% vs 31.0%)” [b]. An analysis from the Royal Derby Hospital in 2013 reported that “implementation of the 2010 NICE guidance...resulted in a greater proportion of initial discharge to primary care with less frequent outpatient review and similar rates of referral for coronary angiography” [c].

CG95 also made recommendations based on our research on sex and ethnicity in angina pain. The guideline recommended: “Do not define typical and atypical features of anginal chest pain and non-anginal chest pain differently in men and women” (recommendation 1.3.3.2) and “Do not define typical and atypical features of anginal chest pain and non-anginal chest pain differently in ethnic groups” (recommendation 1.3.3.3). These two recommendations (arising from ref. 5 above) for the first time make an unequivocal statement to clinicians that typical anginal pain does not differ by sex and ethnicity. This is important because it has previously been used as a post-hoc justification of why rates of procedure use might differ between these groups.

Treatment of patients with angina

From the perspective of the patient, or the health system payer, one of the most significant decisions taken among patients with angina relates to the mode of revascularisation (coronary artery bypass graft [CABG] or percutaneous coronary intervention [PCI]). Our work was cited ten times in the NICE guidelines on *Management of stable angina* (CH126) issued in July 2011 and directly influenced recommendations, all of which were ‘Key priorities for implementation’ [d].

First, ‘When either procedure would be appropriate, explain to the person the risks and benefits of PCI and CABG for people with anatomically less complex disease whose symptoms are not satisfactorily controlled with optimal medical treatment. If the person does not express a preference, take account of the evidence that suggests that PCI may be the more cost-effective procedure in selecting the course of treatment.’

Second, ‘When either procedure would be appropriate, take into account the potential survival advantage of CABG over PCI for people with multivessel disease whose symptoms are not satisfactorily controlled with optimal medical treatment and who have diabetes or are over 65 years or have anatomically complex three-vessel disease, with or without involvement of the left main stem.’

Our published unique ‘real world’ cost and outcome data highlighted the prevalence of patients who are judged appropriate for both forms of revascularisation (refs [1] and [3] above) and underpinned to specification of these recommendations. Our UK evidence base added to that internationally has led to a slowing in the rate of increase of PCI for stable coronary disease.

Co-existing depression among people with myocardial infarction

Our systematic reviews and meta-analyses of the role of depression in the prognosis of coronary

Impact case study (REF3b)

disease have contributed in part to recommendations in European guidance on the need to assess psychosocial factors in these patients. Hemingway contributed to the 2007 guidelines on cardiovascular disease prevention in clinical practice from European Society of Cardiology, and the most recent (2012) guidelines directly cite our work in support of the identification of depression as a specific risk factor in CVD [e]. These are the strongest recommendations to date that clinicians might consider psychosocial factors in addition to the better recognised behavioural and biological factors.

5. Sources to corroborate the impact (indicative maximum of 10 references)

- [a] *Chest pain of recent onset: Assessment and diagnosis of recent onset chest pain or discomfort of suspected cardiac origin*. NICE Clinical Guidelines, CG95 - Issued: March 2010
<http://guidance.nice.org.uk/CG95/Guidance>. Cites ref 5 (above) and two other publications from our group not listed above.
- [b] Haq IU, Skinner JS, Adams PC. Implications of a likelihood based approach to diagnostic testing in coronary artery disease: impact of the new nice guidelines. *Heart* 2011;97:Suppl 1 A39. <http://dx.doi.org/10.1136/heartjnl-2011-300198.63>
- [c] Sheppard C, Edmund J, Frawley K, Dubey G, Baron J, Burn S, Azeem T, Bhandari M, Chitkara K, Tukan A, McCance A, Kelly D. More discharges, less follow-up and similar rates of coronary angiography: initial 'real-world' experience of NICE guidance on assessment of chest pain of recent onset in the Rapid access chest pain clinic. *Heart* 2013 99: A76.
<http://dx.doi.org/10.1136/heartjnl-2013-304019.128>
- [d] *The management of stable angina*. NICE Clinical guidelines, CG126 - Issued: July 2011.
<http://guidance.nice.org.uk/CG126/Guidance/pdf/English>. Cites ref. 3 (above) and another publication from our group not listed above.
- [e] Perk J, De Backer G, Gohlke H, Graham I, Reiner Z, Verschuren M, Albus C, Benlian P, Boysen G, Cifkova R, Deaton C, Ebrahim S, Fisher M, Germano G, Hobbs R, Hoes A, Karadeniz S, Mezzani A, Prescott E, Ryden L, Scherer M, Syväanne M, Scholte op Reimer WJ, Vrints C, Wood D, Zamorano JL, Zannad F; European Association for Cardiovascular Prevention & Rehabilitation (EACPR); ESC Committee for Practice Guidelines (CPG). **European Guidelines on cardiovascular disease prevention in clinical practice** (version 2012). The Fifth Joint Task Force of the European Society of Cardiology and Other Societies on Cardiovascular Disease Prevention in Clinical Practice (constituted by representatives of nine societies and by invited experts). *Eur Heart J*. 2012 Jul;33(13):1635-701.
<http://dx.doi.org/10.1093/eurheartj/ehs092>. Cites ref 6 (above) in support of its identification of depression as a risk factor in CVD.