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UK Research Spend in 2008 and 2012: comparing stroke, cancer, coronary heart disease and dementia

Project team: Ramón Luengo-Fernández, José Leal, Alastair Gray

Cancer, coronary heart disease (CHD), dementia and stroke are leading causes of death and disability. In the UK, these four diseases accounted for over half of all deaths in 2012, and for nearly 6 million disability adjusted life years. Their impact on care services is also considerable, with an annual combined cost of £20 billion in 2008. Given this, there is an argument for investing in research to improve the prevention, diagnosis, treatment and clinical management of these diseases so as to reduce this overall burden.

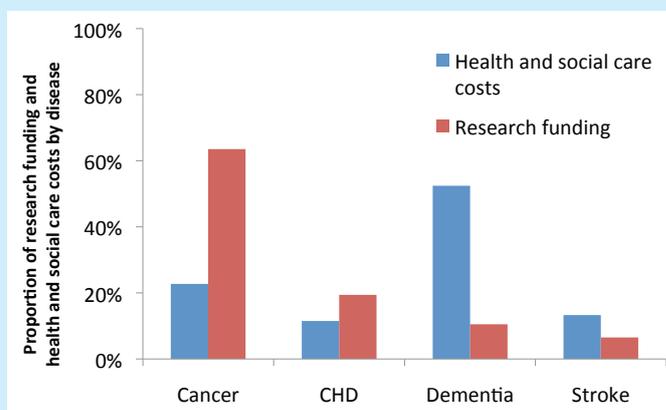
Previous research conducted by HERC has highlighted that most of the UK medical research funding on chronic disease is allocated to cancer, with other high burden conditions such as dementia or stroke receiving relatively low levels of funding. However, over recent years there have been significant policy changes affecting the way medical research funding is allocated, particularly by the UK central government. The aim of our study was therefore to estimate UK governmental and charity research funding in 2012 for cancer, CHD, dementia and stroke and

to compare these estimates against the relative burden of each disease. Another objective was to assess whether there have been significant changes in the relative levels of research funding for these four conditions between 2008 and 2012.

In 2012, combined research funding into cancer, CHD, dementia and stroke by governmental and charity organisations was £855 million. Of this total, £546 million (64%) was devoted to cancer, £165 million (19%) to CHD, £85 million (10%) to dementia and £58 million (7%) to stroke (see figure). We found that for every £10 of health and social care costs attributable to the disease, cancer received £1.09 in research funding, CHD £0.65, stroke £0.20 and dementia £0.07.

There was also wide variation between charities and governmental organisations in the distribution of research spending across disease areas. Of the £347 million that governmental organisations spent on the four conditions in 2012, 46% was devoted to cancer, 21% to CHD, 21% to dementia, and 12% to stroke. This is in stark contrast to the charity sector, where 76% of the total devoted to the four conditions was devoted to cancer, 18% to CHD, and 3% to each of dementia and stroke.

We also identified a considerable shift in the distribution of government research funding between 2008 and 2012. In 2008, 66% of governmental research funding into the four conditions was devoted to cancer, 21% to CHD, 9% to dementia and 4% to stroke. In 2012, the proportions devoted to dementia and stroke had increased to 21% and 12%, respectively, with cancer accounting for 46% of total research spend.



Our study shows that there has been much progress by governmental research organisations to increase the levels of funding for dementia and stroke. However, total research funding by charities and the government into stroke is small when compared to its burden, and disproportionately low when compared to cancer.

For more information: **HERC**

To listen to a BMJ podcast discussing this research, please visit:



“ ...for every £10 of health and social care costs attributable to the disease, cancer received £1.09 in research funding, CHD £0.65, stroke £0.20 and dementia £0.07 ”

HERC to carry out health economic analyses in 100,000 Genomes Project

Project team: Sarah Wordsworth, James Buchanan, Ingrid Slade, Jilles Fermont, José Leal

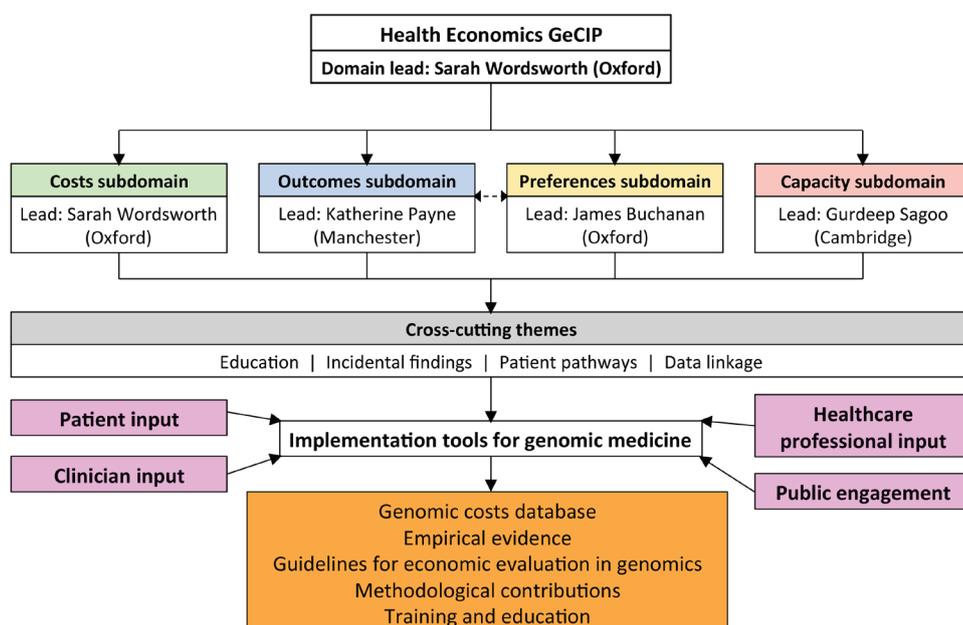
We are pleased to announce that HERC will be undertaking a variety of different health economic analyses for Genomics England as part of the 100,000 Genomes Project, in collaboration with health economists at the University of Manchester and the PHG Foundation in Cambridge.

The 100,000 Genomes Project is a ground-breaking project which plans to sequence 100,000 genomes from around 70,000 patients with cancer or rare diseases. The aim of this project is to create a new genomic medicine service for the NHS, offering patients a diagnosis where there wasn't one before, and creating the potential for new and more effective treatments.

As part of this work, Genomics England Clinical Interpretation Partnerships (GeCIPs) have been created, bringing together researchers, clinicians and trainees from both academia and the NHS to analyse data from the project. These GeCIP domains cover different topic areas, and some are 'cross-cutting' across the whole project; the Health Economics GeCIP domain falls into this latter category.

The aim of the Health Economics GeCIP is to apply, and further develop, health economic methods in order to better understand the economic impact of whole genome sequencing (WGS) in clinical practice. This project represents an ideal opportunity to systematically collect high-quality cost and health outcome data which, when used to conduct economic evaluations, will be able to provide information on where the use of WGS is most likely to represent value for money for the NHS. The project also provides a fantastic opportunity to address a range of methodological challenges facing health economists in this field. Planned outputs from this work include a database of genomic test costs, guidelines for economic evaluation in genomics and training courses for health economists, clinicians and scientists. Keep an eye on our website for further details of this work later in 2016!

For more information: **HERC**



Anxious children with anxious mothers: a way to stop the worry cycle?

Project lead: Mara Violato

Anxiety disorders are characterised by a level of fear and avoidance that interferes with day-to-day life. They are among the most common emotional difficulties experienced by children, present a risk for ongoing emotional difficulties in later life, and carry a substantial health and social cost. A talking therapy - cognitive-behavioural therapy (CBT) - is known to be effective for the treatment of childhood anxiety disorders, and CBT for child anxiety disorders (CCBT) has also been developed. However, if parents also have an anxiety disorder children often do not benefit as much as they should.

In this context, the MRC-funded MaCH trial conducted by the University of Reading (in collaboration with HERC and the University of Glasgow) aimed to establish whether or not supplementing CCBT would lead to better and more cost-effective child treatment outcomes than CCBT alone. Two supplementary treatments were considered: additional CBT for the mother for her own anxiety, or an intervention focused on maternal parenting responses (MCI).



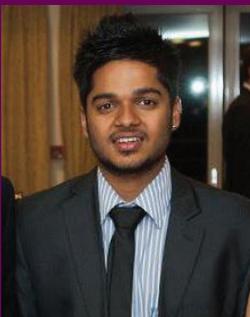
“Anxiety disorders...are among the most common emotional difficulties experienced by children”

The trial results suggested that these supplementary treatments did not significantly improve child anxiety outcomes. However, economic analyses led by HERC revealed that when the additional costs and benefits of treatment to the child were considered together, the CCBT treatment supplemented with the MCI intervention provided good value for money compared with CCBT alone. Although the increases in costs (£233) and QALYs (0.28) were small, the probability that CCBT and MCI in combination is cost-effective in comparison to CCBT alone was found to be around 75%. Exploratory analyses also considered the use of services beyond those directly associated with treatment (e.g. education welfare officers, family liaison officers), finding that participants in the CCBT group accessed approximately one-third more services than those in the other two groups. This may reinforce the result that combined child/mother interventions are more effective. Further health economic analyses are planned to capture the full impact of these combined interventions on child anxiety outcomes.

For more information:

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Spotlight on KUSAL LOKUGE



I joined HERC in October 2014 to undertake a DPhil in Population Health, funded by a Nuffield Department of Population Health studentship. My project is examining the peri-procedural (within 30 days of procedure) and long-term risks for patients undergoing different treatments for carotid artery stenosis, and in turn building a suitable framework to evaluate the cost-effectiveness of these treatment options.

I am currently reviewing randomised controlled trials comparing patients undergoing Carotid Endarterectomy (CEA) vs Best Medical Treatment (BMT) and CEA vs Carotid Artery Stenting (CAS), and using meta-analysis and network meta-analysis techniques to obtain pooled estimates of how peri-procedural and long-term risk vary between these treatment options. I am also carrying out a systematic review evaluating the same risk estimates in both single-arm and comparative observational cohorts, and considering how these estimates differ between patients of differing risk classifications.

I hope to use these results, in conjunction with individual patient data from the Asymptomatic Carotid Surgery Trial-1 (ACST-1) to develop an extrapolation framework to estimate the long-term effects of treatments.

This DPhil project has given me an opportunity to combine the skills I have gained in mathematics and economics during my previous academic experiences, and apply them to finding solutions to healthcare problems. During the past 9 months I have also had an opportunity to develop my epidemiological skills by attending a number of taught courses, and through the guidance of my supervisors. I have thoroughly enjoyed my time at HERC, my affiliated college (St Edmund Hall), and the University of Oxford as a whole; it has given me an opportunity to both work and network among a wide group of talented researchers and students, while engaging myself in various social and sporting activities.

Mapping from the PDQ-39 to the EuroQol EQ-5D: the value of mixture models

Project lead: Seamus Kent, Alastair Gray, Iryna Schlackow

Parkinson's disease is a progressive neurologic disorder associated with motor disabilities including tremor, rigidity, slowness and postural disturbance. In the UK, 8,000 new cases are diagnosed every year and more than 100,000 people are living with Parkinson's. Health-related quality of life in Parkinson's is often assessed using the 39-item Parkinson's Disease Questionnaire (PDQ-39). Although very valuable for understanding the health impacts of the condition, the PDQ-39 cannot be used in economic evaluations, which require generic preference-based measures of health, such as those obtained using the EQ-5D instrument. We therefore developed an algorithm to enable estimation of EQ-5D-3L responses and utilities from responses to the PDQ-39.

Based on responses to the PDQ-39 and EQ-5D-3L questionnaires among the 2,120 patients with newly diagnosed Parkinson's enrolled in the PD MED drug therapy trial, we estimated the probability of reporting none, some, or extreme problems for each of the five EQ-5D dimensions of health (mobility, pain, usual activities, self-care, and anxiety/depression) using multinomial logistic regression. The accuracy of predictions was examined in participants from the estimation data, PD MED, and in participants from a separate trial of deep brain stimulation, PD SURG. There is a large conceptual overlap between the EQ-5D and PDQ-39 questionnaires, and consequently we were able to predict EQ-5D utility with good precision, particularly at the aggregate level. Predictions were less accurate for those in the poorest health in PD MED and among participants in the PD SURG trial, who tended to have much more severe symptoms.

The work also assessed whether mixture models offer advantages over current approaches in the prediction of EQ-5D utilities. Mixture models may better account for the often complex distributions typically found in health-related quality of life data, and can help identify whether relationships differ among those in good and poor health, for example. However, in this study we found that mixture models performed similarly to, but not better than, standard models such as multinomial logistic regression.

For more information:

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Estimating the hospital costs of acute upper gastrointestinal bleeding

Project lead: Helen Campbell, Liz Stokes, Danielle Bargo

Acute upper gastrointestinal bleeding (AUGIB) can have several sources including peptic ulcers, dilated veins in the oesophagus, and inflammation of the lining of the stomach. It is a common medical emergency resulting in over 50,000 hospital admissions annually in the UK. When patients are admitted they frequently need intensive investigations such as laboratory tests and diagnostic endoscopy to identify the location and cause of the bleeding. They also often require treatments to control and reverse the effects of bleeding such as transfusion, radiological embolisation and sometimes surgery.

Previously, the healthcare costs associated with AUGIB had not been fully characterised, so as part of a randomised controlled trial funded by NHS Blood and Transplant and led by clinicians at their Clinical Trials Unit in Oxford we conducted a detailed patient-level costing exercise which included an assessment of care provided during the initial hospital admission. The results of this work were recently published in BMJ Open. The inpatient resource use data that were collected and costed included blood component transfusions; endoscopies performed; use of surgery or radiological intervention to control bleeding; adverse events; and time in the intensive treatment unit, the high dependency unit, and general medical/surgical wards. Using national incidence figures we then scaled up the trial-based initial patient-level cost estimates to obtain UK-wide estimates.

The mean total initial in-hospital cost per patient was £2,458, with almost 60% of this cost attributable to inpatient bed days (£1,439), 26% to diagnostic and therapeutic endoscopies (£642) and 8% to red blood cell (RBC) transfusions (£198). The total annual initial hospital treatment costs for an estimated 57,000 AUGIB hospital admissions in the UK were estimated at £155 million. Our work shows that AUGIB is clearly a large burden for UK hospitals with inpatient stay, endoscopy and RBC transfusion as the main cost drivers.

For more information:

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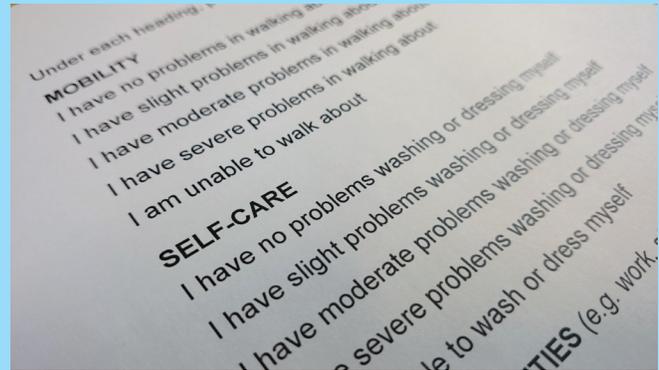
Use of PROMs and PREMs in European Kidney Disease Registries

Project lead: Rachael Morton

Treatment for end-stage kidney disease (including dialysis and transplantation) is routinely reported in regional, national and international registries for nearly all patients. Quality of care, as measured against national standards, is also often publicly reported and can be compared between centres and countries. However patient-reported outcome measures (PROMs) and patient-reported experience measures (PREMs) have not been widely incorporated into kidney disease registry datasets to date.

In a recent survey of European kidney disease registries, only two of twenty-three were collecting PROMs/PREMs, while three were actively exploring methods to collect such data. Barriers to collection included low response rates, legal constraints and the burden on patients and staff. A European Renal Association funded consensus meeting of key personnel from kidney disease registries, academics and patient representatives was held in Bristol in June 2014, with the purpose of developing recommendations for routine collection of PROMs and PREMs.

For PROMs, one generic instrument (the SF-12), one disease-specific instrument (the Kidney Disease Quality of life or KDQOLTM-36) and one preference-based instrument (the EQ-5D-5L) were recommended. More work was needed before specific recommendations for PREMs could be made. Further recommendations included: data collection for all patients regardless of age, comorbidity or treatment type on at least an annual basis; the importance of making patients aware of how the data were being used, and data for dialysis patients to be collected while 'off dialysis' to better represent usual health status.



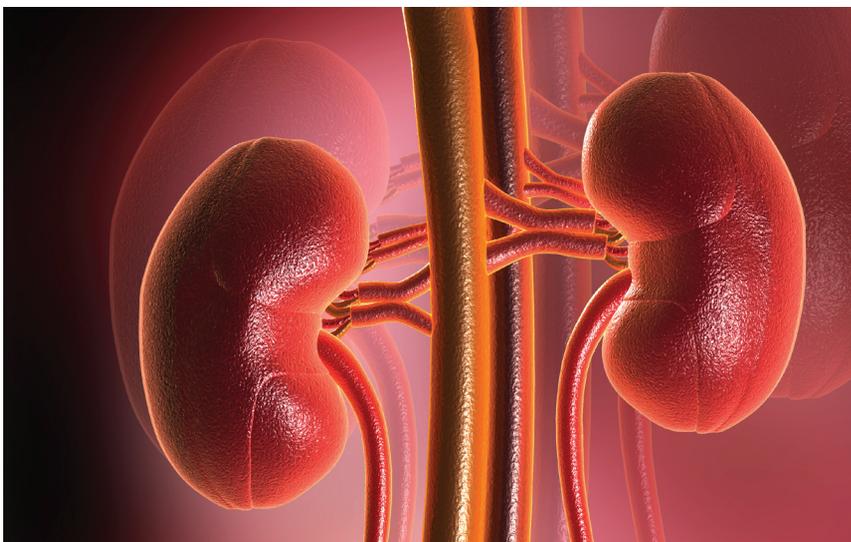
In summary, the routine collection of PROMs and PREMs data in kidney disease registries was thought to be extremely important in order to better understand what matters to patients, however it is likely to be challenging and close international collaboration is needed. HERC has conducted substantial work on utility-based quality of life for people with kidney disease and will continue to provide guidance to the European Renal Association for measures that enable health economic evaluation.

For more information:

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The impact of kidney disease severity and cardiovascular disease on hospital costs

Project lead: Seamus Kent, Iryna Schlackow, Alastair Gray and Boby Mihaylova on behalf of the SHARP Collaborators



Reliable estimates of the hospital costs incurred by patients at different stages of chronic kidney disease (CKD) and their cardiovascular complications are needed to inform health policy. Data on more than 7,000 individuals with moderate-to-severe CKD followed for an average of 5 years in the Study of Heart and Renal Protection (SHARP) were used to relate their annual hospital costs to stage of CKD, the occurrence of non-fatal major vascular events, and vascular and non-vascular deaths. We found renal replacement therapy and major vascular events to be the main contributors to the high hospital care costs in moderate-to-severe CKD. In the year of initiation, kidney transplantation costs were £24,600 and dialysis £19,000. However, in subsequent years, kidney transplantation was associated with substantially lower hospital costs compared to maintenance dialysis: £1,150 versus £23,330.

Non-fatal major vascular events increased annual costs in the year of the event by £6,130 for patients on dialysis and £4,350 for patients not on dialysis, and were associated with increased costs, though to a lesser extent, in subsequent years. In the absence of major vascular events or death (which are more common with increasing severity of CKD), we found little difference in annual hospital costs incurred by patients in CKD stages 3-5 who were not receiving renal replacement therapy.

The annual hospital cost model allows reliable evaluation of the cost implications of interventions and policies to modify vascular risks, progression of CKD, kidney transplantation rates and kidney transplant survival in moderate-to-severe CKD. A downloadable cost calculator is available at <http://www.herc.ox.ac.uk/downloads/supportingmaterial>. This work is currently being used to support the estimation of lifetime costs and quality of life of cholesterol lowering therapy in kidney patients.

For more information:

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Staff News – Welcome to:



Dmitrij Achelrod

Dmitrij, a PhD student from the Hamburg Center of Health Economics (Germany), is visiting HERC from July - October 2015. He is evaluating the use of cardiovascular disease preventive drugs in the elderly European population using the longitudinal Survey of Health, Ageing and Retirement in Europe (SHARE) dataset working with Bobby Mihaylova.



Emily Dobell

Emily, a Public Health Registrar, joined HERC in August 2015 for a two month rotation. Emily is working on the Oxford Vascular Study (OXVASC) alongside Dr Ramón Luengo-Fernández. In October, Emily will begin her MSc in Global Health Science with the Nuffield Department of Population Health.



Farewell to: One of our Editorial Team... Rachael Morton

At the end of June we said a fond farewell to Dr Rachael Morton who had completed a two-year academic visit to HERC as part of a Sidney Sax - Public Health Overseas Fellowship through the Australian National Health and Medical Research Council (NH&MRC) to investigate "The impact of socio-economic status on the management and progression of chronic kidney disease (CKD)". As part of her fellowship, Rachael worked closely with Dr Bobby Mihaylova, Prof Colin Baigent and Prof Alastair Gray on reviewing the evidence on effects of social disadvantage in CKD as well as investigating the relevance of educational attainment to health outcomes and the impact of disease on household income in the Study of Heart and Renal Protection (SHARP) in which 9,270 individuals with moderate-to-advance CKD were followed over about 5 years. The outputs from this work are already emerging and demonstrate Rachael's ongoing important contribution to the field of health economics. Her wider input to a range of HERC activities such as teaching, seminars and this newsletter has also been immensely valuable. Rachael will be missed by everyone and we wish her every happiness and success in the future.

Presentations by members of HERC

Annual Conference of the Scottish Economic Society

Perth, April 2015

Peter Eibich

Understanding the effect of retirement on health: Mechanisms and Heterogeneity

British Society for Rheumatology (BSR) Conference

Manchester, April 2015

José Leal

(Poster Presentation) Hip Fracture Costs

Oxford Saïd Business School and Medical Sciences Division

Oxford, May 2015

Alastair Gray

MBA Healthcare elective: Healthcare Systems and Markets

20th Congress of the European Hematology Association

Vienna, June 2015

Richéal Burns

Economic burden of disorders of the blood in Europe

Oxford Dementia Research Day (OxDARE)

Oxford, July 2015

Alastair Gray

Economic aspects of dementia and ageing

12th Annual Medical Sciences DPhil Day

Oxford, July 2015

Seamus Kent

Hospital costs in relation to body mass index in 1.1 million women in England: a prospective cohort study

Filipa Landeiro (Poster presentation)

The impact of social isolation on delayed hospital discharges of older hip fracture patients and associated costs

HEA 11th World Congress

Milan, July 2015

HERC Presenters

James Buchanan

Presenting risk information in discrete choice experiments: do graphical techniques influence willingness-to-pay?

Peter Eibich

Effects of sports and exercise in different stages of appendicular lean mass and strength in the old - Data from the Berlin Aging Study II

Seamus Kent

Hospital costs in relation to body mass index in 1.1 million women in England: a prospective cohort study

José Leal

Estimating long-term disease impact using administrative health datasets: hip fracture as a big data case study

Ramón Luengo-Fernández

Is the current UK national screening programme for diabetic retinopathy cost-effective?

Apostolos Tsiachristas

Cost-effectiveness of disease management programs for cardiovascular risk and COPD in the Netherlands

Sarah Wordsworth

What behavioural traits are associated with the 'overuse' of antibiotics? A survey of population beliefs

Personalised 'Genomic' Medicine: How is health economics determining its value?

This was an Organised session which brought together four presentations with the overarching theme of using genomic technologies in creating more personalised (stratified) medicine including:

Whole Genome Sequencing: Where is it likely to provide the greatest value?

HERC Seminars Convenor: Jilles Fermont

HERC runs a series of seminars with invited speakers from the health economics community who talk on a wide range of applied and methodological topics.

During Trinity Term 2015, **Rachel Knott**, a Research Fellow at the Centre for Health Economics, Monash University visited HERC to give a presentation on *Modelling the cost of cancer: a system of equations approach to understanding inter-relationships* and **Dr Ellen Van de Poel**, from the Institute of Health Policy and Management, Erasmus University Rotterdam, gave a talk on the *Impact of performance-based financing in a low resource setting: a decade of experience in Cambodia*.

Details of forthcoming talks can be found on the HERC website: **HERC**

To be added to our mailing list for future seminars, email us at herc@dph.ox.ac.uk

Recent Publications

Beard D, Rees J, Rombach I, Cooper C, Cook J, Merritt N, **Gray A**, Gwilym S, Judge A, Savulescu J, Moser J, Donovan J, Jepson M, Wilson C, Tracey I, Wartolowska K, Dean B, Carr A, CSAW Study Group None. *The CSAW Study (Can Shoulder Arthroscopy Work?) - a placebo-controlled surgical intervention trial assessing the clinical and cost effectiveness of arthroscopic subacromial decompression for shoulder pain: study protocol for a randomised controlled trial. Trials. 2015 May 9; 16:210*

Breckenridge K, Abbott D, Bekker H, Briançon S, Cullen R, Carneata L, Gibbons E, Jager KJ, Lønning K, Metcalfe W, **Morton RL**, Murtagh FM, Prutz K, Robertson S, Rychlik I, Sharp L, Schon S, Speyer E, Tentori F, van der Veer SN, Caskey FJ. *How to routinely collect data on patient-reported outcome and experience measures in renal registries in Europe: an expert consensus meeting. Nephrol Dial Transplant, Epub 2015*

Buchanan J, Wordsworth S, O'Connor L, Pike G, Walker AS, Wilcox MH, Crook DW. *Management of patients with suspected infectious diarrhoea in hospitals in England. J Hosp Infect. 2015 Jul; 90(3):199-207*

Campbell HE, Stokes EA, Bargo D, Logan RF, Mora A, Hodge R, Gray A, James MW, Stanley AJ, Everett SM, Bailey AA, Dallal H, Greenaway J, Dyer C, Llewelyn C, Walsh TS, Travis SP, Murphy MF, Jairath V, TRIGGER investigators. *Costs and quality of life associated with acute upper gastrointestinal bleeding in the UK: cohort analysis of patients in a cluster randomised trial. BMJ Open, 2015; 5*

Campbell HE, Stokes EA, Bargo DN, Curry N, Lecky FE, Edwards A, Woodford M, Seeney F, Eaglestone S, Brohi K, Gray AM, Stanworth SJ. *Quantifying the healthcare costs of treating severely bleeding major trauma patients: a national study for England. Crit Care, Jul 2015; 19*

Creswell C, Cruddace S, Gerry S, Gitau R, McIntosh E, Mollison J, Murray L, Shafran R, Stein A, **Violato M**, Voysey M, Willetts L, Williams N, Yu LM, Cooper PJ. *Treatment of childhood anxiety disorder in the context of maternal anxiety disorder: a randomised*

controlled trial and economic analysis. Health Technol Assess. 2015 May; 19(38):1-184

Eibich P. *Understanding the effect of retirement on health: Mechanisms and Heterogeneity: Journal of Health Economics, 2015; 43, 1-12.*

Kent S, Schlackow I, Lozano-Kühne J, Reith C, Emberson J, Haynes R, **Gray A**, Cass A, Baigent C, Landray MJ, Herrington W, **Mihaylova B**, SHARP Collaborative Group None. *What is the impact of chronic kidney disease stage and cardiovascular disease on the annual cost of hospital care in moderate-to-severe kidney disease? BMC Nephrol, 2015 Apr; 16:65*

Kent S, Gray A, Schlackow I, Jenkinson C, McIntosh E. *Mapping from the Parkinson's Disease Questionnaire PDQ-39 to the Generic EuroQol EQ-5D-3L: The Value of Mixture Models. Med Decis Making, 2015 Apr 29; Epub, pii: 0272989X15584921*

Lacroix J, Hébert PC, Fergusson DA, Tinmouth A, Cook DJ, Marshall JC, Clayton L, McIntyre L, Callum J, Turgeon AF, Blajchman MA, Walsh TS, Stanworth SJ, **Campbell H**, Capellier G, Tiberghien P, Bardiaux L, van de Watering L, van der Meer NJ, Sabri E, Vo D, ABLE Investigators, Canadian Critical Care Trials Group. *Age of transfused blood in critically ill adults. N Engl J Med. 2015 Apr 9; 372(15):1410-8*

Luengo-Fernández R, Leal J, Gray A. *UK research spend in 2008 and 2012: comparing stroke, cancer, coronary heart disease and dementia. 2015, BMJ Open, 5*

Simon J, **Gray A**, Mayer S, Laszewska A, Rugkasa J, Yeeles K, Burns T. *Cost-effectiveness of Community Treatment Orders (CTOs): Economic Evaluation of the OCTET Study Journal of Mental Health Policy and Economics, 2015 Mar; 18, S36 - S36*

Taggart DP, Altman DG, **Gray AM**, Lees B, Nugara F, Yu LM, Flather M, ART Investigators. *Effects of on-pump and off-pump surgery in the Arterial Revascularization Trial. Eur J Cardiothorac Surg, 2015 Jun; 47(6):1059-65*