



*National Institute for
Health Research*

Maudsley Biomedical Research Centre

**PhD Studentship
Project Catalogue**

Clinical and Population Informatics

Studentship to commence February 2018

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NIHR Maudsley Biomedical Research Centre (BRC)

NIHR Biomedical Research Centres are funded to support people- and/or patient-focused early translational (experimental medicine) research, the aim of which is to translate discoveries from basic/discovery science into clinical research, and through to benefits for patients, the health system and for broader economic gain.

On 16th September 2016 the Secretary of State for Health announced that the Department of Health has awarded £66 million funding over the next five years to the National Institute for Health Research (NIHR) Biomedical Research Centre (BRC) at South London and Maudsley NHS Foundation Trust and the Institute of Psychiatry, Psychology & Neuroscience at King's College London.

The award represents a substantial uplift in funding compared to the previous BRC funding round, and demonstrates the government's continued commitment to the current NIHR Maudsley BRC, allowing the research centre both to build on its current work and expand into new areas including substance use, obesity, pain and mobile health technology.

The expanded NIHR Maudsley BRC will bring together scientists, clinicians, mental health professionals, service users and carers, to improve clinical care and services across the field of mental health. The investment in the NIHR Maudsley BRC will allow research into ground-breaking treatments and care for mental health and dementia.

NIHR Maudsley BRC Strategy

There are four major elements to the NIHR Maudsley BRC strategy for the coming 5 years, reflected in aims of the 17 themes:

- **Precision psychiatry:** Bringing together insights from cognition, behaviour, genomics and brain imaging, we will develop biologically-informed strata of psychiatric syndromes, with the ambition to develop and provide more individually tailored treatment
- **Novel therapeutics:** Using the access to our large databases, electronic consent for contact procedures, and our dedicated experimental medicine Clinical Research Facility (CRF), we will undertake trials of new pharmacological, neuromodulation and psychological treatments
- **Translational informatics:** By using our bespoke natural language processing algorithms and 'smart agents', we will use informatics to influence treatment choice, increase adherence, improve health behaviours and increase patient empowerment, all of which will benefit patient outcomes and service delivery
- **Mental/physical interface:** We will decrease the 15 years of life lost to serious mental illness by using informatics to identify, prioritise and track the treatment of those with comorbid mental and physical disorders

Clinical disorder focused research themes

Seven clinical disorder focused research themes cover mental health and dementia from cradle to grave:

- Affective Disorders and Interface with Medicine
- Child and Neurodevelopmental Disorders
- Dementia and Related Disorders
- Lifestyle Substance Use & Harms (Substance Use)
- Obesity, Lifestyle and Learning from Extreme Populations (Obesity)
- Pain and headache
- Psychosis and Neuropsychiatry

Technology and methodology focused research themes

Seven technology and methodology focused research themes develop and deploy new approaches to clinical problems:

- Bioinformatics and Statistics
- Biomarkers and Genomics
- Clinical and Population Informatics
- Mobile Health
- Neuroimaging
- Patient and Carer Involvement and Engagement
- Translational Therapeutics

Cross cutting themes

Three cross cutting themes provide enabling infrastructure:

- BioResource
- Clinical Research Facility
- Training and Capacity Development

Projects

When applying for the NIHR Maudsley Biomedical Research Centre PhD studentship in **Clinical and Population Informatics** theme, please ensure you state your two preferred PhD projects from those listed in this catalogue only. These should be listed in order of preference and include the number that is assigned to the project and the project title.

For example:

1. CLPI-2.04 The relationship between mental health and smoking cessation
2. CLPI-2.01 Application of routine data to assess the effectiveness and cost-effectiveness of pharmacological therapy for people experiencing psychotic major depression

Important: With your application, in addition to the personal statement, please upload a separate single-side A4 document listing your first and second choice projects with a statement explaining why you have chosen your **first choice** project and why you would like to take this forward as a PhD (**maximum 300 words**).

If you wish to discuss a project before you apply, you will find supervisors' names and their contact details listed with each project in this catalogue.

Further information about project supervisors can be viewed in the [King's College London Research Portal](#). Under **Researchers**, type the name of the person you wish to view information about.

Please note: The final choice of funding, project and project details are agreed after successful interview.

Clinical and Population Informatics

Lead: Professor Robert Stewart

This theme is responsible for maintaining and developing applications of our Clinical Record Interactive Search (CRIS). This allows pseudoanonymised analysis of routine electronic medical records (EHR), using expertise in data security, record linkage and natural language processing, and linkages with internal and external datasets from a variety of sources, to maximise the research potential of these data.

Aims

1. Extend clinical and population mental health data resources through online recruitment platforms and enhanced clinical databases
2. Apply these data resources for improving physical health outcomes, supporting precision psychiatry and novel therapeutics, and delivering informatics-based interventions
3. Export data-generation / processing tools through a national e-network for mental health informatics

CLPI-2.01 Application of routine data to assess the effectiveness and cost -effectiveness of pharmacological therapy for people experiencing psychotic major depression

Primary Supervisor: Professor Paul McCrone

Academic Department: Health Science & Population Research

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Second Supervisor: Dr Margaret Heslin

Academic Department: Health Science & Population Research

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Project Description

Psychotic Major Depression (PMD) is a depressive disorder with the addition of delusions, hallucinations or depressive stupor. Although PMD is not uncommon, it is a largely under-researched disorder. Research has shown that people with PMD have a similar mortality risk as people with schizophrenia but might be more likely to attempt suicide and self-harm. Appropriate treatment for people with PMD is important to try to avoid or mitigate these outcomes. However, there is little high quality evidence on the best pharmacological treatment of PMD. This is reflected in the NICE guidelines: "For people who have depression with psychotic symptoms, consider augmenting the current treatment plan with antipsychotic medication (although the optimum dose and duration of treatment are unknown)".

Therefore, the aim of the project is to close this knowledge gap by determining which antidepressant -antipsychotic combination is most effective & cost effective in the treatment of PMD. This research has the potential to lead to clear recommendations on what the first line of pharmacotherapy should be in people with PMD & could contribute to updates of the NICE clinical guidelines for depression.

Using a naturalistic design with a cohort of people with PMD identified (divided into groups according to pharmacotherapy given over the follow-up) via the Mental Health Electronic Health Records (CRIS) held by the BRC, effectiveness and cost effectiveness studies will be conducted.

This PhD will provide training in bioinformatics, statistics, epidemiology and health economics.

Keywords: Clinical effectiveness; Medication; Health economics; Psychotic Major Depression; Bioinformatics;

Two representative publications from supervisors:

1: Heslin M, Lappin J, Donoghue K, Lomas B, Reininghaus U, Onyejiaka A, Croudace T, Jones PB, Murray RM, Fearon P, Doody GA, Dazzan P, Craig TJ. & Morgan C. (2016). Ten-Year Outcomes in First Episode Psychotic Major Depression Patients Compared with Schizophrenia and Bipolar Cases. *Schizophrenia Research*. doi:10.1016/j.schres.2016.04.049

2: McCrone P., Singh SP., Knapp M., Smith J., Clark M., Shiers D., & Tiffin PA. (2013) The economic impact of early intervention in psychosis services for children and adolescents. *Early Intervention in Psychiatry*, 7, 368-373.

CLPI-2.02 Employment on the pathway to recovery from mental disorders: Developing indicators of occupational functioning in CRIS (Clinical Record Interactive Search application)

Primary Supervisor: Dr Jayati Das-Munshi

Academic Department: Health Service & Population Research

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Second Supervisor: Professor Robert Stewart

Academic Department: Psychological Medicine

Email: robert.stewart@kcl.ac.uk

Project Description

The Clinical Records Interactive Search application ('CRIS') is a real-time research repository of electronic health records for patients under the care of South London & Maudsley NHS Trust. To date, CRIS has been instrumental in several landmark studies on mental disorders. More recent developments have included the incorporation of Natural Language Processing (NLP) to extract data from free text and structured fields. However, measures for employment have yet to be developed, despite employment being increasingly recognised as an important outcome in people living with mental disorders. Employment may provide a useful measure of 'recovery' for people living with severe mental illnesses and potentially has wide-ranging applicability to other mental health conditions.

The successful candidate will develop a measure for employment within CRIS using NLP and use the derived indicator as an outcome for studies on mental disorders. The PhD may for example assess employment as an outcome in people with severe mental illnesses, however there is flexibility to apply the derived measure as an outcome in other mental disorders, of the student's choosing.

Objectives: Year 1: Literature reviews. Liaise with computational scientists. Attend training
Year 2: Develop employment indicator
Year 3: Analyses of employment indicator as an outcome in epidemiological studies on course of mental disorder
Year 4: Complete write-up; Submit PhD

Training: The primary supervisor leads and teaches on modules in epidemiological and statistical methods and the candidate will be able to attend these if appropriate. The candidate will also be able to attend in-house training on Clinical Informatics.

Keywords: employment; recovery; severe mental illness; clinical informatics;

Two representative publications from supervisors:

1: Cohort profile of the South London and Maudsley NHS Foundation Trust Biomedical Research Centre (SLaM BRC) Case Register: current status and recent enhancement of an Electronic Mental Health Record-derived data resource Gayan Perera, Matthew Broadbent, Felicity Callard, Chin-Kuo Chang, Johnny Downs, Rina Dutta, Andrea Fernandes, Richard D Hayes, Max Henderson, Richard Jackson, Amelia Jewell, Giouliana Kadra, Ryan Little, Megan Pritchard, Hitesh Shetty, Alex Tulloch, Robert Stewart *BMJ Open* 2016;6:3 e008721 doi:10.1136/bmjopen-2015-008721

2: Das-Munshi J, Ashworth M, Gaughran F, Hull S, Morgan C, Nazroo J, et al. Ethnicity and cardiovascular health inequalities in people with severe mental illnesses: protocol for the E-CHASM study. *Social Psychiatry and Psychiatric Epidemiology*. 2016;51(4):627-38

CLPI-2.03 Physical activity, bones, pain and healing hearts: using bioinformatics to develop a lifestyle intervention for people with psychosis

Primary Supervisor: Professor Robert Stewart

Academic Department: Psychological Medicine

Email: robert.stewart@kcl.ac.uk

Second Supervisor: Dr Fiona Gaughran

Academic Department: Psychosis Studies

Email: fiona.p.gaughran@kcl.ac.uk

Third co supervisor: Dr Brendan Stubbs. South London and Maudsley NHS Foundation Trust

Project Description

This PhD proposal will sit at the heart of the mental health and physical interface and adopt a multifaceted approach to tackle the poor physical health in people with severe mental illness. This project would suit an independent budding clinical-academic with an interest in informatics and mhealth.

This PhD is designed to gather data to inform, develop and pilot a multi-modal stratified protocol for the targeted optimization of lifestyle and physical activity in people with psychosis and in a pilot study measure its effect on cardiometabolic risk, pain and bone health indicators.

Year 1: Collaborating with the statistics and bioinformatics departments, the student will analyze existing research datasets to identify clinical, lifestyle, biological, pharmacological, mental capacity and service level indicators of emergent cardiac, metabolic and bone health risk.

Year 2: This information will be combined with practice guidelines to develop an algorithm for personalised multi- modal monitoring and lifestyle protocols to improve cardiac, metabolic and bone health and reduce pain. This will be supported by digital tools, such as electronic Personal Health Plans, and mhealth technology such as movement sensors in mobile phones, pedometers and accelerometers.

Year 3: An early stage pilot to determine feasibility and acceptability and to power a separately funded trial. Measures will include: estimated VO2 exercise and sedentary behavior; nutrition intake, BMI; HbA1c; lipids; inflammation; pain; prolactin levels; vitamin D levels; smoking rates; unplanned admission rates.

Keywords: Psychosis; Physical activity; mhealth; Clinical informatics; Lifestyle modification;

Two representative publications from supervisors:

1: 45. Perera G, Broadbent M, Callard F, Chang C-K, Downs J, Dutta R, Fernandes A, Hayes RD, Henderson M, Jackson R, Jewell A, Kadra G, Little R, Pritchard M, Shetty H, Tulloch A, Stewart R. Cohort profile of the South London and Maudsley NHS Foundation Trust Biomedical Research Centre (SLaM BRC) Case Register: current status and recent enhancement of an Electronic Mental Health Record derived data resource. *BMJ Open* 2016; 6: e008721.

CLPI-2.04 The relationship between mental health and smoking cessation

Primary Supervisor: Dr Leonie Brose

Academic Department: Addictions

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Second Supervisor: Professor Ann McNeill

Academic Department: Addictions

Email: ann.mcneill@kcl.ac.uk

Project Description

Smoking prevalence is much higher among those with mental health problems and smoking plays a major contributory role to the 'stolen years', the large life expectancy gap between those with and without mental health problems. Little is known about the quitting smoking process in people with mental health problems compared to those without, and how the transition can be facilitated and accelerated to reduce physical health problems.

We have collaborated on a nationally representative household survey in England, which began in 2006 to assess smoking prevalence, quit attempts and successful quitting, in samples of approximately 1,800 adults each month. In 2016, we added questions to this survey to assess lifetime and current mental health problems and treatment. Since these questions were included, six and 12 month follow-ups have been added enabling comparison of unique cohorts of people with and without mental health problems.

This provides a unique opportunity to explore the influence of mental health status on the outcomes of quit attempts in a prospective cohort, the mechanisms of quit attempts and the effects of failed attempts on future behaviour, and to assess whether pharmacological and/or behavioural treatments (including e-cigarette use) for quitting or alongside smoking, influence future quit attempts, successful quitting and relapse or lead to a change in tobacco cigarette consumption. Using literature reviews and other data, the project will also explore how unsuccessful and successful quit attempts affect mental health.

Skills training: Literature review, critical appraisal, complex data analysis, publishing research, inter-university collaboration

Keywords: smoking cessation; smoking; mental health; longitudinal survey;

Two representative publications from supervisors:

- 1: THURGOOD, S. L., MCNEILL, A., CLARK- CARTER, D. & BROSE, L. S. (2016) A Systematic Review of Smoking Cessation Interventions for Adults in Substance Abuse Treatment or Recovery, *Nicotine Tob Res*, 18, 993-1001.
- 2: TAYLOR, G., MCNEILL, A., GIRLING, A. et al. (2014) Change in mental health after smoking cessation: systematic review and meta-analysis, *BMJ*, 348, g1151.

CLPI-2.05 Use of large-scale administrative data sources for risk prediction in addiction services clients

Primary Supervisor: Dr Katherine Morley

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Second Supervisor: Professor Michael Lynskey

Academic Department: Addictions

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Project Description

People with substance use disorders are more likely to have multiple risk factors for poor long-term health outcomes than the general population, making them important targets for interventions for liver disease and other treatable chronic conditions. However, opportunities for intervention are often missed when people enter treatment for their alcohol and/or drug dependence. The aim of this project is to use administrative data resources, such as electronic health records (EHR), to develop statistical models that can help clinical staff identify addiction services clients at high risk of developing adverse long-term health conditions.

Objectives:

Year 1 - Client cohort definition: Development of phenotype algorithms for extraction of variables from EHR data sources, including the use natural language processing techniques.

Year 2 - Identification of novel risk factors: Apply network analysis techniques (Roque et al. 2011, PLoS Comp Biol) to data set developed in Year 1 to identify novel risk factors associated with adverse health outcomes for incorporation into prediction models.

Year 3 & 4 - Development of risk prediction model: Statistical models for prediction that make full use of longitudinal data is an active research area; the student will have the opportunity to explore and compare different analytical strategies in the process of developing their model. The model will be evaluated using an independent data set and a variety of statistical techniques (Riley et al. 2016, BMJ).

Training: This project will provide the student with training in epidemiological research and an opportunity to learn advanced data manipulation and statistical analysis skills.

Keywords: drug dependence; physical health; electronic medical records; statistical learning; risk prediction;

Two representative publications from supervisors:

1: Morley KI, Wallace J, Denaxas SC, Hunter RJ, Patel RS, Perel P, Shah AD, Timmis AD, Schilling RJ, Hemingway H. Defining disease phenotypes using national linked electronic health records: a case study of atrial fibrillation. PLoS One. 2014 Nov 4;9(11):e110900. doi: 10.1371/journal.pone.0110900. eCollection 2014. PubMed PMID: 25369203

2: Agrawal A, Nelson EC, Littlefield AK, Bucholz KK, Degenhardt L, Henders AK, Madden PA, Martin NG, Montgomery GW, Pergadia ML, Sher KJ, Heath AC, Lynskey MT. Cannabinoid receptor genotype moderation of the effects of childhood physical abuse on anhedonia and depression. Arch Gen Psychiatry. 2012 Jul;69(7):732-40. doi: 10.1001/archgenpsychiatry.2011.2273. PubMed PMID: 22393204