



**PhD studentship**

**Funded by the**

**NIHR Maudsley Biomedical Research Centre**

**Project Catalogue**

**Clinical and Population Informatics**

**Studentship to commence October 2018**

# Contents

<b>Introduction .....</b>	<b>3</b>
<b>NIHR Maudsley Biomedical Research Centre (BRC) .....</b>	<b>4</b>
NIHR Maudsley BRC Strategy.....	4
Clinical disorder focused research themes.....	5
Technology and methodology focused research themes.....	5
Cross cutting themes .....	5
Clinical and Population Informatics .....	6
<b>Institute of Psychiatry, Psychology and Neuroscience.....</b>	<b>7</b>
<b>Projects.....</b>	<b>8</b>
CLPI-2.01 .....	9
Disease and treatment timelines: unlocking temporal information from clinical narratives for clinical decision support .....	9
CLPI-2.02.....	11
The education of young people with mental health problems: a data linkage study to determine pathways to positive and adverse school outcomes.....	11

## Introduction

Welcome to the National Institute for Health Research (NIHR) Maudsley Biomedical Research Centre (BRC) project catalogue for potential candidates wishing to commence a PhD in October 2018 – we hope you will find a project which interests you.

The Maudsley BRC is a collaboration between the Institute of Psychiatry, Psychology and Neuroscience (IoPPN), King's College London – the largest collection of researchers in Europe investigating mental disorders, and the South London and Maudsley NHS Foundation Trust – a leading mental health trust with a long tradition in joining clinical and academic excellence. Most Maudsley BRC researchers, staff and students are based at the IoPPN at the King's College London Denmark Hill campus which is adjacent to the Maudsley Hospital. Within this setting we offer the opportunity to join a thriving group of interdisciplinary researchers with internationally recognised supervisors and we ensure our students benefit from an understanding of the context of their research, producing scientists with a strong translational ethos.

The Maudsley BRC is dedicated to developing better treatments for people with mental and neurological disorders, which collectively cause most of the disease burden in Western societies. Within the BRC we offer projects which are clinically relevant and attempt to bring new innovation to help treat people with mental disorders, dementia and other neurological conditions. This is the most exciting field in biomedical science, the least researched, the most important. And we offer an opportunity to gain research training in a vibrant and exciting centre where doctoral students are highly valued members of our team.

We hope we can look forward to receiving your application.



**Professor Matthew Hotopf**  
Director  
Maudsley Biomedical Research Centre



**Professor Richard Brown**  
Training Lead  
Maudsley Biomedical Research Centre

## 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 September 16 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

## 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

## Institute of Psychiatry, Psychology and Neuroscience

The Institute is organised into three academic divisions, each comprised of a number of cognate departments. Each Division includes academics and researchers from diverse scientific disciplines, working closely with colleagues across the faculty and our national and international partners:

- **Division of Academic Psychiatry** comprises 6 departments: Addictions Sciences; Forensic & Neurodevelopmental Science; Child & Adolescent Psychiatry; Old Age Psychiatry; Psychological Medicine and Psychosis Studies (<https://www.kcl.ac.uk/ioppn/divisions/academic-psychiatry/index.aspx>)
- **Division of Psychology & Systems Science** comprises 4 departments: Biostatistics & Health Informatics; Health Service & Populations Research; Social Genetic & Developmental Psychiatry; Psychology; (<https://www.kcl.ac.uk/ioppn/divisions/psychology/index.aspx>)
- **Division of Neuroscience** comprises 4 departments: Basic & Clinical Neuroscience; Neuroimaging; Developmental Neurobiology; Wolfson Centre for Age-related Diseases (<https://www.kcl.ac.uk/ioppn/divisions/neuroscience/index.aspx>)

Successful applicants for this studentship will be registered for their MPhil/PhD with King's College London and will be based in the same department as their first supervisor at the Institute of Psychiatry, Psychology and Neuroscience (IoPPN).

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

## Projects

When applying for the NIHR Maudsley Biomedical Research Centre PhD studentship in the **Clinical and Population Informatics** theme, please ensure you state your preferred PhD project/s 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-2.02      The education of young people with mental health problems: a data linkage study to determine pathways to positive and adverse school outcomes
2. CLPI-2.01      Disease and treatment timelines: unlocking temporal information from clinical narratives for clinical decision support

**\*\*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 apply for one or more of the other studentships we are currently advertising, please upload a *separate A4 sheet for each studentship* you are applying for, stating your preferred project choices from those advertised with the studentship, and a statement about your first choice project (see above). Please ensure each sheet clearly indicates which studentship you are applying for and lists only projects advertised for that particular studentship.**

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.

## CLPI-2.01 Disease and treatment timelines: unlocking temporal information from clinical narratives for clinical decision support

**Primary Supervisor:** Professor Robert Stewart

**Academic Department:** Psychological Medicine

**Email:** [Robert.stewart@kcl.ac.uk](mailto:Robert.stewart@kcl.ac.uk)

**Website:** <https://kclpure.kcl.ac.uk/portal/robert.stewart.html>

**Second Supervisor:** Dr Sumithra Velupillai

**Academic Department:** Psychological Medicine

**Email:** [sumithra.velupillai@kcl.ac.uk](mailto:sumithra.velupillai@kcl.ac.uk)

**Website:** <https://sumithravelupillai.wordpress.com/>

### Project Description

**Background:** Important progress has been made in extracting novel information in CRIS from text fields, including interventions (medication, psychotherapy), symptom profiles, and important exposures. While these provide substantial opportunities for novel research, an imminent challenge concerns our capacity to establish both temporal relationships and trajectories. Examples include dating the emergence of symptoms, occurrence of risk factors (e.g. violence/abuse), and timing of adverse drug events. Methods for extracting event and time information from clinical text have been developed in the NLP community over the past years, but they typically rely on a document-by-document approach. To develop a patient-level timeline, reasoning across documents is necessary. This project will leverage ongoing research on instance-based information extraction and use this to inform the development of summarized patient-level information from mental health records in CRIS.

**Novelty and Importance:** The BRC already has a substantial national and international lead in NLP innovation applied to healthcare. As well as innovations in its application across potentially a wide range of research questions, temporal analysis of clinical text is currently one of the hardest NLP challenges and has attracted a lot of international attention in its field. This project will provide an important basis for further development particularly in the mental health domain, which is still understudied in the NLP community.

#### Primary aim(s):

- 1) To review published material on methods for timeline generation from clinical narratives
- 2) To develop methods for patient-level information aggregation on a timeline in historic cohorts using CRIS
- 3) To perform intrinsic and extrinsic evaluation of the prototype system involving both clinicians and carers

The clinical case studies supporting this research will be determined according to BRC priorities at the time. However, these are likely to include work to define early treatment response and outcomes in first episode psychosis, and might well include the more refined definition of treatment resistance in depressive and other disorders.

## CLPI-2.01 Disease and treatment timelines: unlocking temporal information from clinical narratives for clinical decision support

### Planned research methods and training provided:

Quantitative methodology  
Natural language processing  
Data Science

### Objectives / project plan:

**Year 1:** Review literature and analyze existing approaches to temporal information extraction from clinical text in collaboration with NLP researchers and data scientists, as well as clinicians, patients and carers to gain a deeper understanding of stakeholder needs.

**Year 2:** Initiate development of a timeline generation prototype, define appropriate cohorts from CRIS

**Year 3:** Finalize prototype development and carry out extensive intrinsic and extrinsic evaluation with stakeholders. Complete and submit thesis.

### Two representative publications from supervisors:

**1:** 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.

**2:** Velupillai, S., Mowery, D., South, B. R., Kvist, M., & Dalianis, H. (2015a). Recent Advances in Clinical Natural Language Processing in Support of Semantic Analysis. *IMIA Yearbook of Medical Informatics*, 10, 183–193.

**Keywords:** Clinical informatics; Data science; Natural language processing; NLP; Text analytics; Machine learning;

**BRC Theme/s:** [Clinical and Population Informatics](#)  
[Patient and Carer Involvement and Engagement](#)  
This project also links into most of the [Clinical disorders research themes](#) (see [page 5](#))

## **CLPI-2.02 The education of young people with mental health problems: a data linkage study to determine pathways to positive and adverse school outcomes**

**Primary Supervisor:** Professor Robert Stewart

**Academic Department:** Psychological Medicine

**Email:** [robert.stewart@kcl.ac.uk](mailto:robert.stewart@kcl.ac.uk)

**Website:** <https://kclpure.kcl.ac.uk/portal/robert.stewart.html>

**Second Supervisor:** Dr Johnny Downs

**Academic Department:** Child and Adolescent Psychiatry

**Email:** [johnny.downs@kcl.ac.uk](mailto:johnny.downs@kcl.ac.uk)

**Website:** <https://kclpure.kcl.ac.uk/portal/johnny.downs.html>

**Third Co-supervisor:** Professor Tamsin Ford

**Academic Department:** University of Exeter Medical School

**Email:** [T.J.Ford@exeter.ac.uk](mailto:T.J.Ford@exeter.ac.uk)

### **Project Description**

**Background:** Children and adolescents with mental health problems are more likely to have low educational grades than others in their age group. They are also reported to have worse school attendance records, more school exclusions, and poor scores on tests of literacy and numeracy. Lower than average educational performance is both an antecedent and outcome of mental health disorders. However, there are very limited number of clinical studies which track the educational trajectories of patient groups. As a result, little is known about which individual, school and clinical service characteristics for young people receiving CAMHS care are associated with both good and adverse school outcomes.

The successful candidate will understand how to extract and analyse NHS CAMHS data linked to the National Pupil Database using Clinical Record Interactive Search (CRIS). They will establish an approach to discern different longitudinal educational attainment patterns by mental disorder, and examine their clinical and school outcomes. For example, the PhD may examine educational trajectories over primary and secondary school, and their associated characteristics, for children and adolescents with severe depression.

### **Objectives**

**Year 1:** Literature review. Training in clinical epidemiology, health informatics, education data base analysis, longitudinal modelling approaches.

**Year 2:** Develop approaches to model educational trajectories based according to CAMH disorders of interest.

**Year 3:** Analyses of health and school outcomes by educational trajectory.

**Training:** The candidate will access in-house training on Big Data and Clinical Informatics. Epidemiological and statistical methods will be available through IoPPN courses, supplemented by advanced courses at the London School of Hygiene and Tropical Medicine. Educational data training will be provided externally by courses run by the Institute of Education.

## **CLPI-2.02 The education of young people with mental health problems: a data linkage study to determine pathways to positive and adverse school outcomes**

### **Two representative publications from supervisors:**

**1:** Downs J, Gilbert R, Hayes RD, Hotopf M, Ford T. (2017) Linking up data to plan and improve mental health services for children in England. *Archives of Diseases in Childhood*, **102** : 599-602

**2:** Perera G, Broadbent M, Chang CK, Downs J...Stewart R. (2016) 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* **6**: 1-22 e008721

**Keywords:** Education; Child and adolescent mental health; Clinical informatics; Longitudinal analysis; Data linkage;

**BRC Theme/s:** [Child and Neurodevelopmental Disorders](#)  
[Clinical & Population Informatics](#)