

An Indian-Australian research partnership

Project Title: **Enhancing the Management of Chronic Respiratory Conditions in Primary Care**
Project Number **IMURA1330**
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Research Clusters:
Research Themes:
Highlight which of the Academy's CLUSTERS this project will address?

 (Please nominate JUST one. For more information, see www.iitbmonash.org)

- | | |
|---|---|
| 1 | Material Science/Engineering (including Nano, Metallurgy) |
| 2 | Energy, Green Chem, Chemistry, Catalysis, Reaction Eng |
| 3 | Math, CFD, Modelling, Manufacturing |
| 4 | CSE, IT, Optimisation, Data, Sensors, Systems, Signal Processing, Control |
| 5 | Earth Sciences and Civil Engineering (Geo, Water, Climate) |
| 6 | Bio, Stem Cells, Bio Chem, Pharma, Food |
| 7 | Semi-Conductors, Optics, Photonics, Networks, Telecomm, Power Eng |
| 8 | HSS, Design, Management |

Highlight which of the Academy's Theme(s) this project will address?

 (Feel free to nominate more than one. For more information, see www.iitbmonash.org)

- | | |
|---|---|
| 1 | Artificial Intelligence and Advanced Computational Modelling |
| 2 | Circular Economy |
| 3 | Clean Energy |
| 4 | Health Sciences |
| 5 | Smart Materials |
| 6 | Sustainable Societies |
| 7 | Infrastructure |

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The research problem

Asthma and chronic obstructive pulmonary disease (COPD) are leading causes of death and disability globally. Three quarters of adults with COPD remain undiagnosed and are at increased risk of adverse outcomes. The overall rates of total, fatal and non-fatal burden for chronic respiratory conditions increase with increasing remoteness of residence and lower socio-economic status, warranting additional support and strategies for managing chronic respiratory conditions in those groups. The 2022 Lancet Commission on COPD has advocated for novel approaches to diagnosis that moves beyond spirometry criteria alone, especially in primary care and low resource settings.

Project aims

To implement and evaluate a multidisciplinary collaborative care model in primary care by integrating targeted case finding and augmented artificial intelligence to enable early detection and improved diagnostic accuracy of asthma and COPD.

Primary objective: To improve the diagnostic accuracy of asthma and COPD through Enhancing the Management of Chronic Respiratory Conditions in Primary Care (EMPIRIC) care model.

Secondary objectives:

1. To enhance early detection of asthma and COPD in primary care
2. To implement a general practitioner-pharmacist-nurse collaborative care model integrating targeted case finding and augmented artificial intelligence that enable early detection and improve diagnostic accuracy of asthma and COPD;
3. To evaluate the EMPIRIC care model against usual care; and
4. To assess the cost effectiveness of the EMPIRIC care model.

How skills/experience of the IITB and the Monash supervisor(s) support the proposed project

A/Prof George has a track record in respiratory research focusing on COPD and asthma, especially in the primary care setting. He has carried out large interdisciplinary trials in primary care and tertiary care funded through NHMRC, industry (GSK, Boehringer Ingelheim, Pfizer) and the MRFF schemes. A/Prof George is a member of the Lung Foundation's COPD guidelines committee. He is also the co-convenor of the Thoracic Society of Australia Newzealand's Primary Care Special Interest Group. Integrating technology and health services has been a key focus of A/Prof George's research. He has established collaborations with key organisations such as The Lung Foundation Australia, National Asthma Council, CSIRO, Primary Health Networks, Royal Australian College of General Practitioners, Australian Primary Care Nurses Association, Pharmaceutical Society of Australia etc.

Dr. Nirmal Punjabi is an A/Prof at the Koita Centre for Digital Health at IIT Bombay. His research focuses on optical sensing and digital diagnostics, with a strong emphasis on telemedicine and wearable healthcare devices. His work aims to develop innovative tools and technologies for improving healthcare monitoring and diagnostics. Dr. Punjabi's contributions include designing systems for real-time health monitoring and creating accessible solutions for remote healthcare delivery.

What is expected of the student when at IITB and when at Monash?

The student will have the opportunity to work closely with an internationally reputed team of leading healthcare scientists and engineers to learn more about research methods, experience interdisciplinary research, get opportunities to work collaboratively with a range of stakeholders, get high ranking publications and also experience work/research in the Australian setting. The program will give numerous opportunities for networking and for building collaborations to lay a strong foundation for their research/academic/industry career.

Expected outcomes

The proposed PhD program builds on our extensive research in diagnosis/management of chronic respiratory conditions using consumer-centred interdisciplinary approaches, behaviour change and health technology interventions in primary care, and our ongoing influential partnerships in airway diseases research and practice involving consumers, clinicians, policy makers and other key stakeholders. EMPIRIC will enhance early/accurate diagnosis of asthma and COPD in primary care and offers a practical, scalable, cost-effective solution to the diagnostic challenges in primary care. The proposed program offers a solid platform for the PhD student to learn new research methods, being mentored by world class researchers in India and Australia and gain experience in Australia at a world leading university.

How will the project address the Goals of the above Themes?

The proposed project brings together the fields of healthcare, and artificial intelligence (AI). With the help of AI, the diagnosis of chronic respiratory conditions will be optimised. For this, simple devices for measuring expiratory flow to distinguish asthma and COPD will be undertaken. With the help of a diagnostic algorithm, this can bring about huge benefits to consumers and doctors alike. Examples from the UK (e.g. n-Tidal Diagnose) suggest that such approaches are practical and are likely to be cost-effective. By training the next generation of respiratory researchers with the help of AI, the goals of the theme can easily be achieved.

How well the IITB and the Monash supervisor(s) know each other

Sudarshan Rangarajan, Business Development Manager at the Academy organised a 1-hour meeting with Prof Punjabi and A/Prof George on 12/02/26. Several collaborative ideas and plans have been considered. Further meetings will occur as appropriate to progress the work.

Potential RPCs from IITB and Monash

Provide names of the potential research progress committee members (RPCs) and describe why they are most suited for the proposed project

Prof Simon Bell, Prof Ranjith Padinhateeri and Dr Rajiv Jayasena
Profs Bell and Padinhateeri are Directors of the respective centres and have plenty of experience working with both local and international students. Dr Rajiv Jayasena, Group Leader, Health System Analytics and Victorian Lead, AEHRC, CSIRO Health & Biosecurity Research Unit will play a pivotal role in coordinating the management and technical sides of the project. The multidisciplinary and multitalented group of supervisors and RPCs will ensure that the proposed project is completed on time, achieving high impact and best value for money.

Capabilities and Degrees Required

The ideal candidate will have:

1. A first degree in Science, Engineering or a Healthcare discipline
2. Masters in Science, Engineering, Health Sciences or Public Health
3. Some research experience as part of their Masters or as part of a job

4. Publication(s) in Q1 journals
5. Strong ability to communicate in English both verbally and in written format
6. Experience in publishing research papers, scientific reports
7. Familiarity in data management and experience in software such as RedCAP, and experience in statistical analyses (SPSS, SAS, R...) will be an advantage.

Necessary Courses

Name three tentative courses relevant to the project that the student should complete during his/her coursework at IITB (the student will require to secure 8 point in these courses)

Research Methods

Ethical conduct of research

Systematic review/Meta-analysis

Data management and analysis

Scientific writing

Potential Collaborators

Please visit the IITB website www.iitb.ac.in OR Monash Website www.monash.edu to highlight some potential collaborators that would be best suited for the area of research you are intending to float.

Public and private Hospitals

Primary Health Networks

Pharmaceutical Society of Australia

CSIRO

Lung Foundation Australia

Keywords relating to this project to make it easier for the students to apply.

Digital health, chronic respiratory conditions, artificial intelligence, clinical trials, interdisciplinary research