Applying Statistical Models to Health Outcomes For Australian Patients with Bronchiectasis

Pitchaya Kingkam

FACULTY OF SCIENCE
UNIVERSITY OF TECHNOLOGY SYDNEY

A thesis submitted in fulfilment of the requirements for the degree of Doctor of Philosophy

April 2021

CERTIFICATE OF ORIGINAL AUTHORSHIP

I, [Pitchaya Kingkam] declare that this thesis, is submitted in fulfilment of the requirements for the award of doctoral degree, in the School of Mathematical and Physical Sciences at the University of Technology Sydney.

This thesis is wholly my own work unless otherwise reference or acknowledged. In addition, I certify that all information sources and literature used are indicated in the thesis.

This document has not been submitted for qualifications at any other academic institution.

This research is supported by the Australian Government Research Training Program.

Signature of Student: Production Note: Signature removed prior to publication.

Date: 30 April 2021

ACKNOWLEDGEMENT

First of all, I would like to express my gratitude and appreciation to my supervisors, Professor James Brown, Associate Professor Stephen Woodcock and Associate Professor Lucy Morgan. My priceless journey started when Professor James Brown and Dr. Stephen Woodcock accepted me to work on this project. I am extremely thankful for all supports, guidance and insightful comments throughout the development of this thesis. Without their help and kindness, I would not have survived from unexpected situations. Indeed, I do appreciate their excellent supervision, motivation and valuable support. For years, I have learned a lot for being a good researcher. This is a precious time and wonderful experience in my life.

I would like to express my very great appreciation to Professor Tony Moon. He is such a guardian angel for me and Thai students. I am grateful to meet him in Sydney. I will never forget his encourage and kindness for the rest of my life.

I would like to express my special thanks to Doctor Lucy Morgan, Concord Hospital, and Lung Foundation Australia for helping me to understand chronic lung disease (especially bronchiectasis) and how statistics can help us all understand the patient journey.

I would also like to express my deep gratitude to my family, friends and all Thai government staffs for their caring and great supports when I faced difficult situations.

Finally, I would like to dedicate this thesis to my deceased father, who passed away during my study. His love gave me forces to make this project.

ABSTRACT

Bronchiectasis is a common disease caused by chronic infection in the small airways of the lungs. Patients often carry a heavy burden of symptoms. Unfortunately, little is known about the impact of bronchiectasis on Australians or on our healthcare system. For many years, bronchiectasis was considered as another Chronic Obstructive Pulmonary Disease and was bundled (for costing purposes) with COPD or other pulmonary infections, without recognition that the condition was associated with significant, particular clinical features that required longer and more complex admissions to hospital than COPD. Prior to July 2018, there was no disease specific code within the system that allocates hospital funding and consequently, episodes of care for patients with bronchiectasis were assigned into other respiratory illness in the AR-DRG system. This misallocation is likely to have affected hospital funding which is calculated based on ALOS associated with the AR-DRG group of diseases. The main purpose of this thesis was to explore the factors contributing to the length of stay and hospital readmission for patients with bronchiectasis in Australia in three parts;

i) An evaluation of the effect of a specific AR-DRG on funding of length of hospital stay for bronchiectasis patients and a comparison of the actual length of stay in hospital (LOS) with the average length of stay (ALOS) based on the assigned AR-DRG. We found that the AR-DRG system consistently underestimated the LOS and costs for acute hospital admissions due to bronchiectasis.

ii) An investigation of the effect of seasonality of presentation and patient characteristics (sex, age, smoking status, ABR registry status) on hospital LOS and ALOS. The cohort in this study included 299 patients who were diagnosed as bronchiectasis with 505 admissions of >24 hours to Concord Hospital, NSW between July 2011-June 2018. The results were showing significance (p <0.05) between the non ABR-registry and the response lnALOS. This implied that bronchiectasis patients who participated with ABR- registry tend to have length of stay in hospital shorter than patients who did not register in the ABR.

iii) An analysis of the time between episodes of care of bronchiectasis patients using longitudinal data analysis and multilevel models. Bronchiectasis patients who were smokers and hospital LOS, were statistically significant risk factors for readmission. Hospital LOS was negatively correlated with time to readmission suggesting that longer stays in hospital can reduce readmission risk. In addition, patients who were smokers had a significantly higher readmission rate than patients who were not smokers.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF PUBLICATION

KINGKAM, P., VISSER, S., BROWN, J., WOODCOCK, S., BAIRD, T., JACKSON, D. & MORGAN, L. 2017. The argument for a bronchiectasis specific AR-DRG: analysis of hospital discharge data (2012-2016) for patients registered to the Australian Bronchiectasis Registry. *Respirology,* 22**,** 206-207.