MAKING DECISIONS ABOUT ANTIBIOTIC USE IN THE AUSTRALIAN PRIMARY HEALTHCARE SECTOR

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Abstract

The issue of antimicrobial resistance (AMR) is one that is escalating nationally and globally, with significant burden to human health and to the economy. It is estimated that if left unchecked, globally by 2050, AMR will cause 10 million deaths per year and cost up to a hundred trillion US dollars in lost Gross Domestic Product. Currently in Australia, the cost of AMR is estimated to be over $250 million per year. Our consumption of antibiotics is amongst the highest in the world.

Despite much published research in various disciplines such as medicine, public health, sociology, and behavioural psychology, it is not known which factors are dominant in influencing antibiotic use in the Australian primary healthcare sector. There is also a paucity of research in the area of antibiotic use which focusses on the multiple views of GPs, community pharmacists and consumers in the Australian context. This research sought to address these evidence gaps.

The research aim was to establish the dominant factors influencing decisions to use antibiotics by GPs, community pharmacists and consumers in the Australian primary healthcare sector. The purpose is to inform ongoing national programs working to reduce inappropriate antibiotic use. Two research questions (RQ) were posed and addressed: RQ1. What influences antibiotic use from the perspectives of GPs, community pharmacists and consumers?; RQ2. How do GPs and consumers trade-off on factors influencing antibiotic use?

An exploratory sequential mixed method design was used, with the qualitative and quantitative components being of equal importance. This was a fully integrated design comprising a substantial qualitative component — semi-structured interviews (QUAL) conducted first, in order to answer RQ1 and also to inform the development of the quantitative research instrument — discrete choice experiments (DCEs) (QUAN). The DCEs addressed RQ2. The underpinning research paradigm and research framework used were pragmatism and the Theoretical Domains Framework (TDF), respectively.

Fifty-four interviews were conducted comprising 10 GPs, 12 community pharmacists and 32 consumers. Convenience and snowball sampling were used to recruit these participants and interviews were conducted between late April and mid-October

2015. Transcriptions of interview recordings were coded using a blend of deductive and inductive coding. NVivo® software (Version 11.3.1.777; (2016)) was used to store and code the transcripts. First cycle coding was done with the raw data followed by three iterations of code mapping to arrive at three meta-categories to explain the phenomenon of what influences antibiotic use from the perspectives of GPs, community pharmacists and consumers: (a) clinical processes and challenges, (b) consumer attitudes, behaviours, skills and knowledge, and (c) engaging with antibiotic resistance. The Enabling Antibiotic Eupraxis (EABE) model was developed using these meta-categories. Briefly, the EABE model shows how the three meta-categories lie in tension and converge when aligned to allow antibiotic eupraxis — where eupraxis is good/right theoretically informed practice — and vice versa.

The problematic sequelae of delayed antibiotic prescriptions were surfaced from the qualitative component. This was used to focus the scenario created for the DCEs as well as to locate suitable attributes and levels from the interview data. Two DCE surveys were developed using essentially the same scenario, but with different decision-making questions for the two target cohorts — GPs and consumers. The DCE experimental designs were generated using NGENE® software (Version 1.1.2; (2014)). DCEs were launched online via the Key Survey® platform (Version 8.7.5; (2016)) in late July and closed on the 31st October 2016. Recruitment was by convenience sampling. A total of 23 GPs/GP Registrars and 205 consumers completed the respective DCE surveys. Data analysis was conducted using NLOGIT® (Version 6; (2016)) software to fit a model and estimate parameters associated with each attribute level. A mixed logit model was fitted to both sets of data. Eleven out of 14 parameters estimated were found to be statistically significant either at the $p < 0.01$ or $p < 0.05$ level, confirming the importance of all attributes (apart from "Familiarity with patient" in the GP DCE) in influencing decision-making.

In the GP DCE, all attributes were important in influencing GP preferences apart from the "Familiarity with patient" attribute. The attribute levels which exerted the strongest influence on GP decision-making when compared against the reference levels were: "Duration of symptoms – 1 week", "Patient expectations – Says they want antibiotics", "Life event – No" (the patient had no important events or deadlines coming up), and "Reassessment – No" (the patient is unable to return for reassessment). Overall, the dominant factors influencing GP prescribing behaviours were the patient's duration of symptoms followed by patient expectations for antibiotics.

In the consumer DCE, all attributes were important in influencing consumer preferences. The attribute levels which exerted the strongest influence on consumer decision-making when compared against the reference levels were: “Doctor’s advice – Says it’s probably a viral infection and antibiotics won’t help”, “Duration of symptoms – 1 week”, “Life event – No” (the consumer did not have an important event or deadline coming up), “Past experience – No” (the consumer had not taken antibiotics for similar symptoms in the past), and “Time off – No” (the consumer is unable to take time off from work/study to recover). Overall, the dominant factor influencing consumer antibiotic use behaviour was the GP's advice when prescribed an antibiotic.

Interestingly, the modifiable factors i.e. patient expectations for antibiotics (GP DCE) and GP's advice on the use of prescribed antibiotics (consumer DCE) are not only dominant factors, but are also mutually influencing factors for antibiotic decision-making on the part of GPs and consumers.

Results from both the qualitative and quantitative components were mutually confirming. The conclusions from both sets of findings gave rise to the hypothesis that: equipping GPs with clear strategies and communication skills to confidently convey their decision-making on the one hand; as well as equipping consumers with accurate information and communication skills to confidently convey their preference to avoid antibiotics where possible on the other hand; would lead to antibiotic eupraxis and the mitigation of antibiotic resistance.

These findings not only addressed the research aim and research questions posed, but also contributed to: (a) theoretical and methodological innovations — which demonstrate the significance and novelty of the research; (b) implications for policy and practice and (c) recommendations relevant to Australia’s National AMR Strategy 2015 – 2019 — which show the significance and importance of this study.

Two theoretical innovations were claimed — the novel use of the TDF and the creation of the EABE model which served to more fully explain the tensions between factors influencing antibiotic use not easily surfaced using the TDF alone. The methodological contribution was the adaptation of the DCE method for eliciting preferences to reveal dominant drivers in decision-making on antibiotic use, rather than preferences for jobs, goods or services as is usual. Implications for policy and practice, and recommendations were made to inform Australia's implementation of the National AMR Strategy 2015 – 2019. The thesis concluded with suggestions for future research, ranging from applied research to research on methods.

Key words

Antibiotics; antibiotic resistance; antimicrobial resistance; community pharmacist; consumer; decision-making; discrete choice experiment; general practitioner; interviews; mixed method; pharmacist; primary healthcare; qualitative; quantitative; semi-structured interviews.

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Abbreviations

AB	Antibiotics
ACRRM	Australian College of Rural and Remote Medicine
ACSQHC	Australian Commission on Safety and Quality in Health Care
AHPRA	Australian Health Practitioner Regulation Agency
AMR	Antimicrobial resistance
A*STAR	Agency for Science, Technology and Research, Singapore
AusHSI	The Australian Centre for Health Services Innovation
CC	Common cold
CRE-RHAI	Centre of Research Excellence in Reducing Healthcare Associated Infections
DCE	Discrete Choice Experiment
DM	Decision-making
DMP	Data Management Plan
EABE	The Enabling Antibiotic Eupraxis model
GP	General Practitioner
HREC	Human Research Ethics Committee
IHBI	Institute of Health and Biomedical Innovation, Australia
NHMRC	National Health and Medical Research Council
PBAC	Pharmaceutical Benefits Advisory Committee
PBS	Pharmaceutical Benefits Scheme
PSA	Pharmaceutical Society of Australia
QUT	Queensland University of Technology
RACGP	The Royal Australian College of General Practitioners
RQ	Research question
SEIFA	Socio Economic Indexes for Areas
TDF	Theoretical Domains Framework
WHO	World Health Organisation

Glossary

Antibiotic resistance	Antibiotic resistance occurs when bacteria change in ways that render ineffective the antibiotics used to cure the infections they cause.
Antimicrobial resistance	Antimicrobial resistance occurs when micro-organisms such as bacteria, viruses, fungi and parasites change in ways that render ineffective the medications e.g. antibiotics, antivirals, antifungals used to cure the infections they cause (World Health Organisation, 2016)
Antimicrobial stewardship	An organised antimicrobial management program implemented by healthcare institutions to ensure appropriate antimicrobial use, improve patient outcomes and reduce adverse consequences of antimicrobial use e.g. antimicrobial resistance, toxicity and unnecessary costs (MacDougall & Polk, 2005).
Consumers	People who make choices, and — usually though not always — pay for them. This term is used where information is being produced to inform a choice i.e. by patients, service users or their families and carers (Greenhalgh, in press).
Decision-making	The mental processing leading to the selection of one among several choices or actions (Newell & Shanks, 2014).
Delayed antibiotic prescription	This is an antibiotic prescription given to a patient with instructions to use it only if their symptoms persist or worsen. The delayed prescription is usually given to the patient during the initial consultation, although some GPs prefer to leave it with clinic reception for collection by the patient at a later date.
Discrete Choice Experiment	A quantitative method for eliciting preferences i.e. stated preferences, which can be used in the absence of revealed preference data.
Discounting the future	The tendency of people to discount rewards or benefits when the temporal horizon is in the future or in the past, so that the rewards or benefits cease to be valuable or to have additive effects.
Eupraxis	Good/right theoretically informed practice.
Inappropriate use of antibiotics	Antibiotics are prescribed when they are not needed. In cases where there is a clinical need, inappropriate use includes: for the prescriber — incorrect dose, incorrect treatment duration (too long or too short), incorrect route, selecting broad spectrum agents when targeted therapy is an option; for the consumer — incorrect use for example, not taking antibiotics as prescribed, sharing of antibiotics, or keeping leftover antibiotics for next time.
One Health	A concept that emphasises the inter-dependence and connectivity of human, animal and environmental health. According to the US Centres for Disease Control and Prevention, 6 out of every 10

	infectious diseases affecting humans are spread from animals (Centers for Disease Control and Prevention, 2016b)
Patients	People who are seeking or receiving healthcare. This term is used when looking for expertise in what it means to be ill and/or receive care (Greenhalgh, in press).
Prescribing	An iterative process involving the steps of information gathering, clinical decision-making, communication and evaluation that results in the initiation, continuation, or cessation of a medicine (NPS: Better Choices Better Health, 2012).
Repeat prescription	Repeat prescriptions enable a regular re-supply of the prescribed medicine without the patient having to see the GP each time. The number of repeats is authorised by the GP on the original prescription. The Pharmaceutical Benefits Scheme (PBS) Schedule lists medicines and the maximum number of repeats subsidised under the scheme. Time intervals between supplies must meet PBS criteria.
Theoretical Domains Framework	A theory for behaviour change in healthcare developed by Michie et al. (Cane, O'Connor, & Michie, 2012; Michie et al., 2005).

Statement of original authorship

The work contained in this thesis has not been previously submitted to meet requirements for an award at this or any other higher education institution. To the best of my knowledge and belief, the thesis contains no material previously published or written by another person except where due reference is made.

Signature: QUT Verified Signature

Date: 17th May 2017

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Soli Deo Gloria.

Chapter 1: **Introduction**

1.1 BACKGROUND

Antimicrobial resistance (AMR) occurs when micro-organisms such as bacteria, viruses, fungi and parasites change in ways that render ineffective the medications (e.g. antibiotics, antivirals, antifungals) used to treat the infections they cause (World Health Organisation, 2016). Every dose of antibiotic prescribed and used, increases the likelihood of AMR (Phelps, 1989).

Australia is contributing to the global problem of AMR with one of the highest rates of antibiotic use, ranking ninth amongst 26 OECD countries in the 2011 and eleventh in the 2015 Health at a Glance reports, respectively. Nationally, antibiotic consumption for human health grew from 22 Defined Daily Doses (DDD) per 1000 population per day in 2000 to 23.6 DDD/1000 population/day in 2009 – well above the OECD average of 21.1 DDD/1000 population/day (OECD, 2011, 2015)

Antibiotics are not always used appropriately. The 2015 National Antimicrobial Prescribing Survey involving 281 hospitals across Australia found 21.9% of antibiotic prescriptions in hospitals were inappropriate when compared with best practice (Australian Commission on Safety and Quality in Health Care & National Centre for Antimicrobial Stewardship, 2016). However, 88% of antibiotic prescriptions were generated by GPs in the primary healthcare sector (Australian Commission on Safety and Quality in Health Care, 2016).

In the Australian primary healthcare sector, where over 27 million prescriptions for antibiotics are written annually (Department of Health, 2013), data from general practice suggests unnecessary antibiotics were prescribed for conditions that will resolve without it (Britt & Miller, 2009). These figures have since increased. Recent reports show that 30 million antibiotic prescriptions were dispensed in 2014 alone (Australian Commission on Safety and Quality in Health Care, 2016; Drug Utilisation Sub Committee, 2015), and that more than 50% of people with colds and other upper respiratory tract infections were prescribed an antibiotic unnecessarily (Australian Commission on Safety and Quality in Health Care, 2016).

Over or inappropriate use of antibiotics serve only to increase selection pressure resulting in more resistant micro-organisms (World Health Organization, 2012a), which are increasingly untreatable with existing antibiotics (World Health Organization, 2014a). In addition, AMR is no longer a problem confined within hospital walls. Surveillance reports by the Australian Group on Antimicrobial Resistance and the recent AURA 2016 report showed rising rates of multi-drug resistant organisms in the community (Australian Commission on Safety and Quality in Health Care, 2016; Turnidge, Gottlieb, Mitchell, Daley, & Bell, 2013).

AMR is complex, intractable and costly — in terms of the significant health burden and costs to individuals and to society. If left unchecked, by 2050 AMR could cause 10 million deaths[1] per year and a loss of Gross Domestic Product worth up to USD $100 trillion globally (Review on Antimicrobial Resistance, 2014). In Australia, it is estimated that AMR adds over $250 million per year to the healthcare budget, and costs the community another $500 million per year (Australian Commission on Safety and Quality in Health Care, 2013).

AMR cannot be eradicated, only managed. Management of this issue in hospitals is through antimicrobial stewardship programs to optimise the appropriate use of antibiotics, improve patient outcomes and reduce unwanted effects such as toxicity and unnecessary costs (MacDougall & Polk, 2005). In the absence of an established equivalent of antimicrobial stewardship for the primary healthcare sector, prudent use of antibiotics relies heavily on self-regulation and clinical practice of individual prescribers. AMR is fast becoming a societal issue that requires partnership and conscious participation of individuals — every prescriber, health professional and consumer, for its successful management.

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[1] This estimated figure is being disputed currently due to the uncertainties regarding the incidence of infections, prevalence of resistant infections and attributable mortality (de Kraker, Stewardson, & Harbath, 2016).

1.2 CONTEXT AND SCOPE

AMR is increasingly a public health concern internationally. The World Health Organisation was tasked in 2014 to devise a Global Action Plan with Member States, to be reported to the World Health Assembly in May 2015 (World Health Organization, 2014b). Globally, some momentum has been gained with the ratification of the WHO Global Action Plan at the 68th World Health Assembly in May 2015 (World Health Organization, 2015), which takes a One Health[2] approach (Centers for Disease Control and Prevention, 2016b). Member states are expected to establish their own action plan by 2017. This was reaffirmed through a landmark declaration at the UN General Assembly recently (General Assembly of the United Nations, 2016). For the first time, Australia now has a National AMR Strategy which encompasses both human and animal health (Australian Government, 2015) and an implementation plan launched in November 2016 (Australian Government, Department of Health, & Department of Agriculture and Water Resources, 2016).

A comprehensive synopsis of the current global situation of AMR, including key areas for urgent action is provided by Laxminarayan et al (2013). Figure 1 illustrates the three areas requiring urgent action to mitigate AMR: (a) appropriate use and access to antibiotics, (b) infection prevention and control, and (c) investment in research and development. Solutions to mitigate AMR involve many stakeholders spread across diverse industries and government agencies. These include stakeholders in the tertiary, secondary and primary healthcare sectors for human health; agriculture and aquaculture for food production; animal health; the pharmaceutical industry; universities and research institutes; professional and regulatory bodies; local, state, national and global agencies (Laxminarayan et al., 2013). Globally, solutions would need to balance excessive use with appropriate access to antibiotics.

Antibiotic usage both in human health and in agriculture contribute to selection pressure of micro-organisms which result in AMR (World Health Organization, 2014a). Adding to the complexity of the management of AMR, it is well documented

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[2] One Health: A concept that emphasises the inter-dependence and connectivity of human, animal and environmental health. According to the US Centres for Disease Control and Prevention, 6 out of every 10 infectious diseases affecting humans are spread from animals.

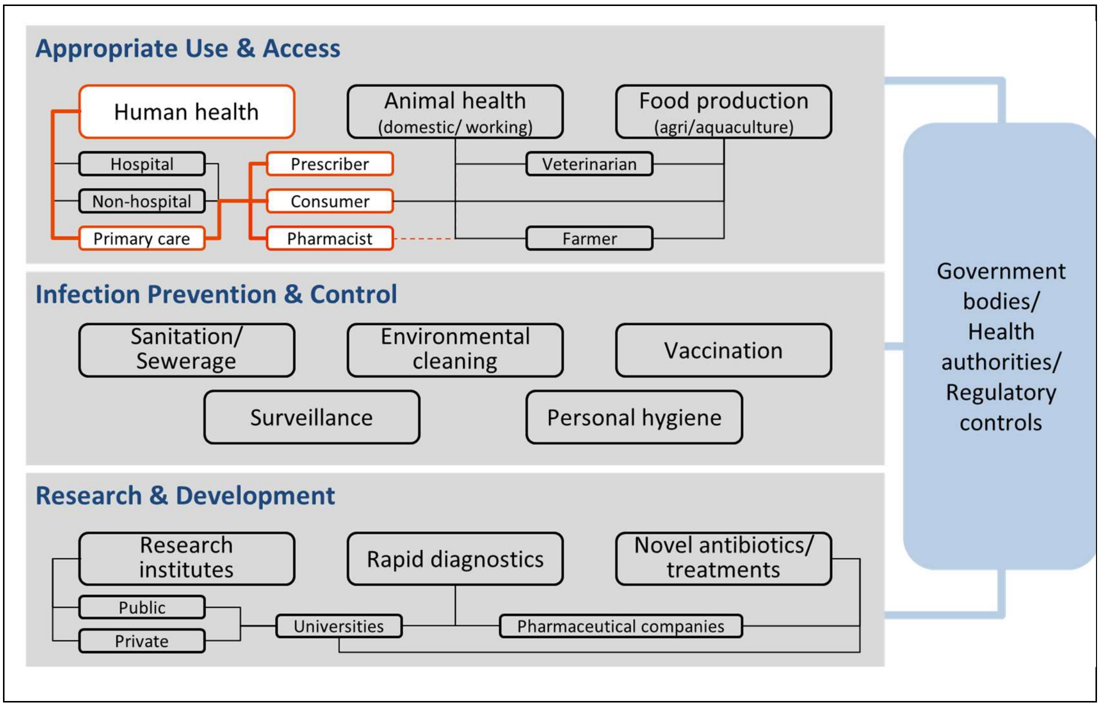
that resistant strains of bacteria such as Methicillin Resistant Staphylococcus Aureus (MRSA) can spread from animals to humans, and vice versa (Laxminarayan et al., 2013; US Department of Health and Human Services Centres for Disease Control and Prevention, 2013). Given the importance of viable antibiotics in modern medicine for the preservation of human health, current global estimates of antibiotic consumption found disproportionately heavy usage in food production e.g. for growth promotion in animals (Nathan & Cars, 2014).

In Australia, the Antimicrobial Resistance Summit 2011 – an interdisciplinary meeting of experts from medical, veterinary, agricultural, infection control and public health sectors, identified and agreed on urgent action in the following key areas (Gottlieb & Nimmo, 2011):

- National surveillance of AMR and antibiotic usage
- Strengthening regulatory processes
- Education and stewardship
- Infection prevention and control
- Research agenda with a focus on epidemiology and effective education and behavioural change interventions

With reference to Figure 1, my research study was situated in human health, within the area of education and stewardship, and specifically investigated the factors influencing decision-making of general practitioners (GPs), community pharmacists and consumers. The focus on GPs, community pharmacists and consumers is justified, as these are the key individuals involved in the use of antibiotics in the Australian primary healthcare sector. Research findings and recommendations which contribute to policy and practice, such as national programs targeted at GPs, community pharmacists and consumers run by NPS MedicineWise (2014a) and the Australian Commission on Safety and Quality in Health Care (2014) have been detailed in Chapter 6, Sections 6.3.3 and 6.3.4.

Figure 1. Three areas requiring urgent action to mitigate antimicrobial resistance.



1.3 RESEARCH AIM

This research aimed to establish the dominant factors influencing decisions to use antibiotics by GPs, community pharmacists and consumers in the Australian primary healthcare sector, in order to inform ongoing national programs to reduce antibiotic use.

1.3.1 Research questions

Two research questions (RQs) were posed and addressed:

RQ1. What influences antibiotic use from the perspectives of GPs, community pharmacists and consumers?

RQ2. How do GPs and consumers trade-off on factors influencing antibiotic use?

1.4 SIGNIFICANCE OF THE RESEARCH

This research is innovative in its cross-disciplinary approach — bringing together key principles used in healthcare behavioural change, clinical education, judgement and decision-making, and behavioural economics. The project is novel in the use of discrete choice experiments (DCEs) as a method to quantify the relative importance of factors influencing individual decision-making in the use of antibiotics for GPs and consumers.

The outcomes of this research confirmed the findings of previous research and contributed new knowledge in decision-making within the field of antibiotic use in the Australian primary healthcare sector. The factors influencing antibiotic use from the perspectives of GPs, community pharmacists and consumers were identified (a first, in the case of Australian community pharmacists and consumers), out of which a model was developed to both explain the phenomenon as well as to inform individual and collective action on enabling wise use of antibiotics. GP and consumer preferences in antibiotic prescribing and antibiotic consumption, respectively, were quantified (for the first time to the best of my knowledge), so as to enable the design of effective public health interventions for desired behaviour change for GPs, community pharmacists and consumers.

1.5 THESIS OUTLINE

This chapter (Chapter 1) introduces the thesis and provides an overview of the rationale for the research. Chapter 2 comprises a review of the literature on: (a) what is currently known about barriers and enablers of antibiotic use for GPs, community pharmacists and consumers in the primary healthcare sector, (b) behaviour change strategies, and (c) decision-making. It concludes with a summary of research gaps and highlights the research questions addressed in this thesis.

Chapter 3 outlines and justifies the research paradigm (pragmatism), research design, the selection of methods used and the respective strengths and limitations of each method. Implementation of the method including development of research instruments, and sampling and recruitment are also discussed.

Chapter 4 extensively details the coding and data analysis of the qualitative component — semi-structured interviews conducted with GPs, community pharmacists and consumers. The results for each participant cohort in answer to Research Question 1 are reported in this chapter. A new model (EABE model, Section 4.5) to explain the phenomenon of what influences antibiotic use from the perspectives of GPs, community pharmacists and consumers and to inform individual and collective action on how to enable wise use of antibiotics, emerged from the qualitative data. The chapter concludes with a bridging section which explains the transformation of selected qualitative data in the development of the quantitative research instrument — the discrete choice experiments (DCEs). Justification for not conducting a DCE for community pharmacists is provided in Section 4.6.2.

Chapter 5 comprises the data analysis and results of the quantitative component — DCEs — conducted with GPs and consumers to answer Research Question 2. Dominant factors which influenced antibiotic prescribing behaviours and consumer antibiotic consumption behaviours were found.

Chapter 6 presents the discussion and synthesis of findings from both the qualitative and quantitative phases, in line with a mixed methods approach. Where appropriate, intentional application of the research paradigm was discussed. Strengths and limitations of the research overall, including the application of the chosen methods and reflections on how the research has shaped the researcher, are presented. The significance, novelty and importance of research contributions are claimed and discussed — theoretical and methodological innovations, implications for policy and practice, and recommendations.

Chapter 7 concludes the thesis with a succinct grand summary of the research and offers several suggestions for future research. The thesis ends with a concluding statement.

Chapter 2: **Literature Review**

Chapter 2 comprises a review of the literature on: (a) what is currently known about barriers and enablers of antibiotic use for GPs, community pharmacists and consumers in the primary healthcare sector, (b) behaviour change strategies, and (c) decision-making. The literature review is used to problematise the research gaps. The chapter concludes with a summary of research gaps and highlights the research questions addressed in this thesis.

The literature review focuses on three areas in the context of primary healthcare: barriers and enablers of antibiotic use affecting GPs, community pharmacists and consumers; behaviour change strategies; and decision-making. The primary aim of the literature search was to identify contextually relevant barriers and enablers of antibiotic use for GPs, community pharmacists and consumers, respectively. Secondary aims were to identify behaviour change strategies reported to be useful for GPs and consumers; and to explore medical decision-making contextualised for prescribing.

A literature search[3] was carried out using the following key words: antibiotic, antimicrobial, antibiotic resistance, antimicrobial resistance, antibiotic use, decision-making, judgment, behaviour, interventions, strategies, prescribing, prescriber, doctor, general practitioner, pharmacist, community pharmacist, consumer, patient, public, ambulatory, primary care and primary health care.

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[3] While the literature search was conducted systematically, a systematic review was not justifiable due to the availability of a newly published review at the time (Teixeira Rodrigues, Roque, Falcão, Figueiras, & Herdeiro, 2013).

An example of a key word search using Medline is shown below:

S1: antibiotic* OR antimicrobial OR antibiotic resistance OR antimicrobial resistance
S2: prescrib* OR decision?making OR judg?ment
S3: doctor OR prescri* OR general practitioner OR gp
S4: ambulatory OR primary care OR primary health?care
S5: S1 AND S2 AND S3
S6: S4 AND S5

The search was limited to peer-reviewed journal articles in the English language, published between January 2000 and March 2014, abstracts being available, and subjects being adults. Databases searched included Medline, CINAHL, PsycINFO and Scopus. These searches resulted in a final number of articles found as follows: for the primary aim — to identify barriers and enablers of antibiotic use for GPs (253 articles), community pharmacists (37 articles) and consumers (43 articles); for the secondary aims — to identify behaviour change strategies for GPs (118 articles) and consumers (70 articles); and to explore medical decision-making contextualised for prescribing (17 articles) (see Appendix C for details).

Reference lists of key articles were examined for publications not captured in the original search, and included if relevant. Relevant literature published after March 2014 were added via an alert service tagged to landmark papers or articles of importance from the original literature search.

Grey literature was identified by searching websites of national and international entities engaged in the area of AMR, such as the World Health Organization, US Centers for Disease Control and Prevention, European Centre for Disease Prevention and Control, the Australian Department of Health, the Australian Commission on Safety and Quality in Health Care, and NPS MedicineWise.

2.1 RESEARCH FRAMEWORK

The conceptual framework for this research – the Theoretical Domains Framework (TDF), was chosen based on the following considerations: (a) ability to encompass the fields of behaviour change, clinical education, judgement and decision-making, and behavioural economics, (b) commonly used in healthcare or health services interventions, and (c) utility for translation of research outcomes into practice.

2.1.1 Theoretical Domains Framework

The TDF was developed specifically as a theory for behaviour change in healthcare (French et al., 2012). It is based on 33 psychological and organisational theories for cross-disciplinary use in the area of clinician behaviour change (Michie et al., 2005). The domains within the TDF encompass potential barriers to change at an individual level, which when analysed in the context of a clinical area, can be used to select or design an appropriate clinical or educational intervention to overcome modifiable barriers (French et al., 2012). French et al (2012) argue that the use of theory to inform the design of complex healthcare interventions can narrow the gap between evidence and clinical practice. Apart from its original purpose, the TDF has also been used in the selection of theories of behaviour change to inform interventions (Francis, Tinmouth, et al., 2009), as well as to identify and verify key domains influencing clinical practice (Francis, Stockton, et al., 2009). As such, it is reasonable to adopt the TDF based on the barriers and enabling strategies identified in the literature affecting behaviour change and decision-making in the area of antibiotic use in primary healthcare.

The TDF has recently been validated, refined and expanded from 12 to 14 domains (Cane et al., 2012), summarised in Table 4.

Table 1. Theoretical Domains Framework[4]

Domain	Definition
D1. Knowledge	An awareness of the existence of something
D2. Skills	An ability or proficiency acquired through practice
D3. Social/ Professional Role and Identity	A coherent set of behaviours and displayed personal qualities of an individual in a social or work setting
D4. Beliefs about Capabilities	Acceptance of the truth, reality or validity about an ability, talent or facility that a person can put to constructive use
D5. Optimism	The confidence that things will happen for the best or that desired goals will be attained
D6. Beliefs about Consequences	Acceptance of the truth, reality or validity about outcomes of a behaviour in a given situation
D7. Reinforcement	Increasing the probability of a response by arranging a dependent relationship, or contingency, between the response and a given stimulus
D8. Intentions	A conscious decision to perform a behaviour or a resolve to act in a certain way
D9. Goals	Mental representations of outcomes or end states that an individual wants to achieve
D10. Memory, Attention and Decision Processes	The ability to retain information, focus selectively on aspects of the environment and choose between two or more alternatives
D11. Environmental Context and Resources	Any circumstance of a person's situation or environment that discourages or encourages the development of skills and abilities, independence, social competence, and adaptive behaviour
D12. Social Influences	Those interpersonal processes that can cause individuals to change their thoughts, feelings or behaviours
D13. Emotion	A complex reaction pattern, involving experiential, behavioural and physiological elements, by which the individual attempts to deal with a personally significant matter or event
D14. Behavioural Regulation	Anything aimed at managing or changing objectively observed or measured actions

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[4] Adapted from "Validation of the theoretical domains framework for use in behaviour change and implementation research," by J. Cane, D. O'Connor, S. Michie, 2012, Implement Sci, 7(37).

Proponents of the TDF encourage further testing of the framework in different contexts and to examine the links between theoretical assessment and behaviour change strategies (Francis, O'Connor, & Curran, 2012; French et al., 2012). This research takes up the challenge by using the TDF in four novel ways: (a) as the theoretical basis for establishing the dominant factors in decision-making in both an area (antibiotic use in Australian primary healthcare) and in individuals (community pharmacists and consumers), naïve to the TDF, (b) as a coding framework for qualitative data gained from semi-structured interviews, (c) as a conceptual framework for selection of attributes of interest for the DCEs, and (d) as a translation framework for recommendations to national programs targeting desired behaviour change in antibiotic use. In addition, the mapping of evidence to the TDF on antibiotic prescribing and antibiotic use in primary care has not been done before in peer-reviewed journals[5]. This work therefore builds upon existing knowledge, adds to implementation science/behaviour change research, and extends the application of the TDF.

2.2 BARRIERS AND ENABLERS FOR INFLUENCING ANTIBIOTIC PRESCRIBING IN PRIMARY CARE

GPs, community pharmacists and consumers experience different types of barriers and enablers in relation to antibiotic use. The magnitude or relative importance of these barriers for the individual is not known – whether GP, community pharmacist or consumer.

This section outlines what influences antibiotic use in the primary healthcare sector and highlights contrasting findings or controversies. Detailed mapping of influencing factors found in the literature to the Theoretical Domains Framework (TDF) is provided for GPs, consumers and community pharmacists in Tables 1, 2 and 3, respectively. An explanation of the TDF was provided in Section 2.1.1.

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[5] The mapping of evidence for this thesis was completed in 2014. Since then, grey literature has been found, produced by Public Health England in 2015, which used the TDF to organise evidence in this area (Public Health England, 2015).

2.2.1 What influences general practitioners?

It is important to understand what factors influences antibiotic prescribing behaviour, as national programs aimed at reducing inappropriate use are predicated on determinants of behaviour (Weissman & Besser, 2004). Barriers to appropriate prescribing of antibiotics reported in the literature include (a) patients demanding antibiotics, (b) the perception that patients expect antibiotics, (c) prescribing antibiotics to save time due to the perception that it takes longer to explain why antibiotics are not needed, (d) concerns that the patient may not return for follow up, (e) uncertainty in the diagnosis where antibiotics may be warranted, (f) concern about possible complications, (g) preservation of the doctor-patient relationship, and (h) knowledge and attitudes to antibiotic resistance (Butler, Rollnick, Kinnersley, Jones, & Stott, 1998; Butler, Rollnick, Pill, Maggs-Rapport, & Stott, 1998; Coenen, Michiels, Renard, Denekens, & Van Royen, 2006; Hardy-Holbrook, Aristidi, Chandnani, DeWindt, & Dinh, 2013; Kumar, Little, & Britten, 2003; McDonnell Norms Group, 2008; Teixeira Rodrigues et al., 2013). However, it is not known which of these barriers are more important, and therefore more critical to address in national programs promoting prudent use of antibiotics.

The doctor-patient relationship

It is undisputed that the doctor-patient relationship is core to the clinical consultation. The nature of the doctor-patient encounter and its impact on antibiotic prescribing has been studied by Strandberg and colleagues (Strandberg, Brorsson, Hagstam, Troein, & Hedin, 2013). The interaction could be harmonious when both GP and patient expectations are aligned, or more akin to a fight involving either collaboration or negotiation, resulting in agreement, a compromise or disagreement. Important factors related to the encounter which enabled prudent prescribing of antibiotics include: professional autonomy of the GP and continuity of the clinical relationship (patient is well known to the GP). The latter encouraged the GP to invest time in educating the patient and explaining why antibiotics were not required in that instance, if indeed that was the case (Strandberg et al., 2013).

Several studies infer the centrality of prescribers wanting to preserve the doctor-patient relationship over all other factors. This is evidenced by GPs acquiescing to perceived or actual patient expectation for antibiotics (Coenen et al., 2013; Lopez-

Vazquez, Vazquez-Lago, & Figueiras, 2012; Mangione-Smith, Stivers, Elliott, McDonald, & Heritage, 2003; McDonnell Norms Group, 2008; Tonkin-Crine, Yardley, & Little, 2011). Motivations for preserving the doctor-patient relationship varied from being able to draw upon a good relationship in the future to negotiate a more serious medical matter to concerns about loss of revenue to the clinic as many believed that the patient would seek antibiotics from another GP elsewhere (Butler, Rollnick, Pill, et al., 1998). In a recent survey of 730 GPs in Australia, about 40% of respondents reported they would prescribe antibiotics to meet patient expectation (Hardy-Holbrook et al., 2013). While in another study more than half of the GPs surveyed self-reported that they would prescribe antibiotics for an upper respiratory tract infection to meet patient expectations (Fletcher-Lartey, Yee, Gaarslev, & Khan, 2016). However, GPs' perception of which patients expected antibiotics were not strongly correlated with the patients' actual view, although it resulted in antibiotics being more likely to be prescribed (Coenen et al., 2013). In contrast, GPs who withheld antibiotics where appropriate to do so, seemed confident that it would not jeopardise the doctor-patient relationship (Kumar et al., 2003). While preservation of the doctor-patient relationship is understandably desired, it is not unequivocal that it is the foremost factor impacting on prescribers' decision.

General Practitioners' views on AMR and prescribing behaviours

GPs' views on AMR influenced how readily they prescribed antibiotics. AMR is only one of many considerations GPs take into account when making prescribing decisions and is often not the most prominent factor (Simpson, Wood, & Butler, 2007). Generally, GPs are aware of the increasing problem of AMR, and therefore of the need to conserve potent broad spectrum antibiotics, as well as reduce the volume of antibiotic used (Dallas, van Driel, van de Mortel, & Magin, 2014; Simpson et al., 2007; Wood et al., 2013; Wood, Simpson, & Butler, 2007). However, how GPs conceived of AMR as an issue spatially (in the foreground, background or "elsewhere") or temporally (immediate or future time), coloured prescribing decisions.

GPs who held their concerns about AMR in the forefront when making decisions about antibiotic prescribing, were more mindful of selecting the narrowest spectrum antibiotic that would work. In contrast, GPs who de-emphasised the issue of AMR tend to more readily prescribe potent broad spectrum antibiotics. These findings have been consistent throughout the UK and in Europe (Wood et al., 2013; Wood et al., 2007).

GPs who saw AMR as an issue "in the future" were high volume prescribers of potent broad spectrum antibiotics, and justified their prescribing decisions as duty of care to the individual patient. These GPs "wanted to be sure of a good result" i.e. to prevent serious decline especially of very ill or elderly patients (Wood et al., 2007).

A dichotomy is seen in GPs' prescribing responses to AMR. GPs who believed that most infections no longer respond to narrower spectrum or older antibiotics as a result of AMR, resorted to prescribing broad spectrum antibiotics for their patients' benefit – a view found to be prevalent amongst GPs in Southern and Eastern European countries (Wood et al., 2013). In contrast, GPs who displayed more careful prescribing of these antibiotics were acting to conserve the utility of these antibiotics into future – a view held by GPs in Northern European countries (Wood et al., 2013). Interestingly, in choosing either of these courses of actions, GPs perceived themselves as acting in a socially responsible way (Wood et al., 2007).

The conundrum in primary healthcare here and elsewhere, lies in the uncertainty of not only which patients would benefit from an antibiotic, but also which antibiotic to select. Often GPs need to make a decision without means of being sure of the infecting micro-organism and its sensitivities to antibiotics. It is not surprising therefore, that broad spectrum antibiotics comprise the largest volume of antibiotic usage in Australia (Department of Health, 2013). Research that brings about accurate, cost-effective and rapid point-of-care testing as incentivised by the Longitude Prize (Longitude Prize, 2016), would be impactful in providing GPs with a microbiological basis for prescribing.

Global investment to facilitate both the development and widespread uptake of rapid diagnostics is a promising circuit breaker for the overuse of antibiotics. O'Neill makes a convincing case that rapid diagnostics could reduce unnecessary prescribing of antibiotics, reduce the use of broad spectrum antibiotics, improve selection of antibiotics, and reduce costs for hospitals, patients and healthcare systems (Review on Antimicrobial Resistance, 2015). The underlying assumption is that the rapid diagnostic test would be able to quickly and reliably show whether the organism is bacterial or viral, the type of bacteria including whether it is a resistant strain, and the bacteria's susceptibility to available antibiotics (Review on Antimicrobial Resistance, 2015). However, he is careful to point out that behaviour change is still needed "to alter long-established ways of using antibiotics" and recommends increasing public awareness of antimicrobial resistance globally (Review on Antimicrobial Resistance, 2015).

General Practitioners' views of themselves and prescribing behaviours

Social science research found that prescribing behaviour was related to GPs' self-perception (Henriksen & Hansen, 2004). GPs felt pressured by both extrinsic and intrinsic factors, and prescribed in a way that protected their personal and professional self (Henriksen & Hansen, 2004). To illustrate, when patients demanded or clearly expected an antibiotic, GPs were exposed to extrinsic pressure, and felt that their autonomy had been compromised or that the patient lacked respect for them. Some GPs reported feeling used or abused (Butler, Rollnick, Pill, et al., 1998; Henriksen & Hansen, 2004). Intrinsically, if GPs gave in to the pressure and prescribed antibiotics against evidence based medicine, they became disappointed with themselves. This negative self-perception triggers the application of both preventative strategies (such as communication skills) and coping strategies (such as adhering more strictly to clinical guidelines) as a form of self-protection (Henriksen & Hansen, 2004).

How real is AMR?

GPs' views about the reality of AMR ranged from acknowledging that it is a significant issue to claiming they had not encountered this in their practice. Some believe that AMR is an important problem in particular clinical areas only e.g. urinary tract infections but not in upper respiratory tract infections (Vazquez-Lago, Lopez-Vazquez, Lopez-Duran, Taracido-Trunk, & Figueiras, 2012). GPs who think the problem of AMR is exaggerated require less evidence to prescribe antibiotics, than those who believe that AMR poses a real threat (Björnsdóttir, Kristinsson, & Hansen, 2010).

European GPs often attributed treatment failure to reasons other than AMR, i.e. patient's non-adherence to antibiotics or to the viral aetiology of the infection (Wood et al., 2013). GPs in Northern Europe believe that the issue of AMR is more serious in

Southern Europe where antibiotics are available without a prescription in some jurisdictions (Wood et al., 2013).

In Australia, Britt, Harrison, and Miller (2012) caution against making a causal link between primary healthcare sector prescribing of antibiotics with the emergence of AMR due to limited evidence. However, recent surveillance reports by the Australian Group on Antimicrobial Resistance, showed rising rates of multi-drug resistant organisms in the community (Australian Commission on Safety and Quality in Health Care, 2016; Turnidge et al., 2013). In corroboration, a new meta-analysis of studies conducted in the US and Europe provided strong evidence of a positive relationship between antibiotic consumption and AMR in the community (Bell, Schellevis, Stobberingh, Goossens, & Pringle, 2014).

AMR at an individual level for up to 12 months, has been shown to be associated with the prescribing of antibiotics in primary care, particularly for urinary tract, respiratory tract and skin infections (Costelloe, Metcalfe, Lovering, Mant, & Hay, 2010). Costelloe et al appropriately concluded that residual resistance to antimicrobials detectable up to 12 months is an important driver for endemic levels of antimicrobial resistance in the community (Costelloe et al., 2010). In other words, individual prescribers' decisions to prescribe an antibiotic can contribute to an increase in AMR at the population level.

Too little, too late?

Some GPs remain optimistic about being able to collectively contain the problem of AMR with more careful prescribing, preventative action such as vaccinations and patient education, and development of new agents. Others are pessimistic and believe it is too late for changes in prescribing practice to have a real impact on reducing AMR (Wood et al., 2013). This is perhaps not surprising given that some GPs interviewed felt that if antibiotics are inappropriately prescribed "once or twice a year for an upper respiratory tract infection or a little bronchitis", no harm is done (Butler, Rollnick, Pill, et al., 1998). Other GPs have reported "throwing in the towel" as far as preventing inappropriate prescribing of antibiotics for upper respiratory tract infections were concerned (Butler, Rollnick, Pill, et al., 1998).

2.2.2 Why we need to get it right: Emerging prescribers

The need to more fully understand the drivers influencing prescribing of antibiotics in the primary healthcare sector is critical as non-medical prescribers, apart from dentists, emerge. In Australia, non-medical prescribers currently include nurse practitioners, midwives, optometrists, paramedics and podiatrists (Health Workforce Australia, 2013). It is imminent that physiotherapists and pharmacists will soon hold authorisations to prescribe (Pharmacy Board of Australia, 2014; Physiotherapy Board of Australia, 2014).

Already a recent study of nurse practitioners in the UK point to similar challenges in antibiotic prescribing for the management of patients presenting with respiratory tract infections (Rowbotham et al., 2012). As such, findings from this research will also be useful to inform healthcare interventions targeted at non-medical prescribers.

Table 2. Factors influencing GPs from the literature

Theoretical Domains Framework	General Practitioners: Barriers and enablers from literature	Papers
D1. Knowledge	GPs were aware of AMR as a significant problem generally.	(Dallas et al., 2014; Hardy-Holbrook et al., 2013; McCullough, Rathbone, Parekh, Hoffman, & Del Mar, 2015; Simpson et al., 2007; Wood et al., 2013; Wood et al., 2007)
	Some GPs question the evidence linking their prescribing patterns to AMR and poorer patient outcomes.	(Dallas et al., 2014; Fletcher-Lartey et al., 2016; Simpson et al., 2007)
	In antibiotic selection, GPs feel hampered by not having sensitivities available at the point of prescribing. Results take too long to influence treatment decisions.	(Wood et al., 2013; Wood et al., 2007)
	Prescribing narrow spectrum antibiotics as confident that most commonly encountered micro-organisms would respond.	(Wood et al., 2007)
	A small number of GPs felt that having access to local resistance data would help in selecting narrower spectrum antibiotics.	(Wood et al., 2013)
	Evidence that unnecessary antibiotics can harm individuals may change prescribing behaviour.	(Butler, Rollnick, Pill, et al., 1998)
D2. Skills	Use of running commentary as a communication technique during consultation can reduce patient expectations for antibiotics.	(Mangione-Smith et al., 2003)
D3. Social/ Professional role and identity	Prescribing potent broad spectrum antibiotics due to a sense of duty to do their best for the patient in front of them.	(Butler, Rollnick, Pill, et al., 1998; Wood et al., 2007)
	Not prescribing potent broad spectrum antibiotics due to a sense of social responsibility to conserve potent broad spectrum antibiotics for the future, unless clearly indicated by microbiology.	(Tonkin-Crine et al., 2011; Wood et al., 2007)
D5. Optimism	Antibiotics perceived to have a low incidence of side effects and an easy dosing regimen.	(McDonnell Norms Group, 2008; Wood et al., 2007)
	AMR can be contained with prudent use of antibiotics being one of the key strategies.	(Wood et al., 2013)
	AMR is seen as a problem in the future.	(McCullough, Rathbone, et al., 2015; Wood et al., 2007)

Table 2 (*continued*)

Theoretical Domains Framework	General Practitioners: Barriers and enablers from literature	Papers
D6. Beliefs about consequences	Prescribing broad spectrum antibiotics seen as "effective early treatment" to prevent serious decline in very ill, elderly, or patients with co-morbidities.	(Kumar et al., 2003; Teixeira Rodrigues et al., 2013; Vazquez-Lago et al., 2012; Wood et al., 2007)
D6. Beliefs about consequences (*continued*)	Belief that most infections are resistant to narrow spectrum antibiotics and therefore prescribe newer broad spectrum agents.	(Wood et al., 2013)
	Have not encountered AMR in daily practice. Attributed treatment failure to patient's non-adherence to antibiotics or to infection being of viral origin, rather than to AMR.	(Simpson et al., 2007; Wood et al., 2013)
	Belief that patients will seek antibiotics from another prescriber anyway (if not prescribed an antibiotic).	(Butler, Rollnick, Pill, et al., 1998; Vazquez-Lago et al., 2012)
	Prescribing antibiotic as a way to shorten consultation. Trying to change patient's beliefs and expectations perceived to be time consuming and unrewarding.	(Butler, Rollnick, Pill, et al., 1998; Dallas et al., 2014; Tonkin-Crine et al., 2011)
	Too late to contain AMR with prudent use of antibiotics.	(Wood et al., 2013)
D7. Reinforcement	Experience of frequent treatment failures with narrower spectrum antibiotics.	(Wood et al., 2007)
D9. Goals	Prescribing a potent broad spectrum antibiotic to prevent a possible hospital admission.	(Wood et al., 2007)
D10. Memory, attention and decision processes	Require a very good reason to prescribe a fluoroquinolone e.g. microbiology.	(Wood et al., 2007)
	GPs justified non-adherence to clinical guidelines by arguing that this was in the best interest of the patient e.g. evidence base for clinical guidelines are flawed as clinical trial populations are unlike their patients.	(Wood et al., 2007)
	Patient's social situation e.g. perceived importance of patient's job, perceived ability to afford a sick day, ability to return for reassessment.	(Björnsdóttir et al., 2010; Teixeira Rodrigues et al., 2013; Tonkin-Crine et al., 2011)
	GPs used nationally recognised antibiotic guidelines when making prescribing decisions, as it provides a safety net should the treatment fail.	(Dallas et al., 2014)

Table 2 (*continued*)

Theoretical Domains Framework	General Practitioners: Barriers and enablers from literature	Papers
D11. Environmental context and resources	Prescribing potent broad spectrum antibiotics to reduce number of re-presentations, and hence workload.	(Wood et al., 2007)
	Belief that AMR is less of/not a problem in primary healthcare, more a concern for hospital sector.	(Fletcher-Lartey et al., 2016; McCullough, Rathbone, et al., 2015; Teixeira Rodrigues et al., 2013; Vazquez-Lago et al., 2012; Wood et al., 2013)
	Concerns regarding loss of patients, hence loss of revenue.	(Butler, Rollnick, Pill, et al., 1998; Teixeira Rodrigues et al., 2013)
D12. Social influences	Prescribing antibiotics due to perceived patient expectations and to preserve good doctor-patient relationship.	(Butler, Rollnick, Pill, et al., 1998; Coenen et al., 2006; Coenen, Van Royen, Vermeire, Hermann, & Denekens, 2000; Fletcher-Lartey et al., 2016; McDonnell Norms Group, 2008; Teixeira Rodrigues et al., 2013; Tonkin-Crine et al., 2011; Vazquez-Lago et al., 2012; Wood et al., 2007)
	Prescribing choices influenced by peers through meetings, training events and discussions, or shaped by senior medical colleagues/supervisors.	(Dallas et al., 2014; Wood et al., 2007)
D13. Emotion	Feeling under pressure to prescribe antibiotic.	(Kumar et al., 2003; Wood et al., 2007)
	Aware that antibiotics are not indicated for most upper respiratory tract infections and acute bronchitis, yet still prescribe them due to the desire to take the path of least (emotional) resistance.	(Dallas et al., 2014)
	Uncertainty of diagnosis (viral or bacterial) contributing to fear or anxiety of missing a serious infection requiring antibiotic treatment (and consequences of not starting antibiotics).	(Coenen et al., 2000; Kumar et al., 2003; McDonnell Norms Group, 2008; Teixeira Rodrigues et al., 2013; Tonkin-Crine et al., 2011; Vazquez-Lago et al., 2012)

Table 2 (*continued*)

Theoretical Domains Framework	General Practitioners: Barriers and enablers from literature	Papers
D13. Emotion (continued)	Distancing/ Externalisation: Attributing the rise of AMR to over-prescribing of antibiotics for self-limiting infections, inappropriate use by patients e.g. self-prescribing of antibiotics or non-adherence, use in livestock, prescribing behaviour of dentists and hospital doctors; pharmacies giving out antibiotics without a prescription.	(Hardy-Holbrook et al., 2013; Vazquez-Lago et al., 2012; Wood et al., 2013)
	Indifference/ apathy regarding the problem of inappropriate antibiotic prescribing.	(Teixeira Rodrigues et al., 2013)
	Feel unable to influence the problem of AMR.	(Simpson et al., 2007)
D14. Behavioural regulation	Prescribing antibiotics to avoid an expensive hospital admission when funding arrangements for primary and tertiary healthcare are managed by the same body e.g. local health board, primary care trust.	(Wood et al., 2007)
	Prescribing choices influenced by formulary.	(Wood et al., 2007)

2.2.3 What influences consumers?

Barriers related to consumers which prevent appropriate use of antibiotics include (a) confusion as to whether viruses or bacteria caused the infection, (b) belief that antibiotics will shorten illness duration, (c) seeking antibiotics despite being aware of the self-limiting nature of the illness, (d) not being aware of risks associated with antibiotic use, (e) needing a legitimate reason to be away from work, and (f) the perception that antibiotic resistance is a problem for hospitals only and caused by doctors who overprescribe antibiotics (Belongia, Naimi, Gale, & Besser, 2002; Braun & Fowles, 2000; Brooks, Shaw, Sharp, & Hay, 2008; Cals et al., 2007; Emslie & Bond, 2003; Eng et al., 2003; Gonzales, Wilson, Crane, & Barrett, 2000; McCullough, Parekh, Rathbone, Del Mar, & Hoffman, 2015; NPS MedicineWise, 2014b).

Patient satisfaction

Patient satisfaction levels with clinic visits were not necessarily related to getting antibiotics (Butler, Rollnick, Pill, et al., 1998; Coenen et al., 2013). Many simply wanted reassurance, were seeking information or pain relief (Butler, Rollnick, Pill, et al., 1998). Conversely, a Cochrane review by Spurling et al (2013) found patient satisfaction to be higher for immediate antibiotic prescriptions despite no difference in clinical outcomes for cough and the common cold.

While research on the experiences and satisfaction levels of patients are informative, it would be more useful to investigate what consumers as patients really want from the visit to the GP for largely self-limiting conditions such as acute respiratory tract infections e.g. reassurance, medical certificate, before assuming consumers are seeking a prescription for antibiotics.

Consumer views of AMR and antibiotic use

Consumers were found to be generally aware of the link between antibiotic use and AMR in a European study (Brookes-Howell et al., 2012). However, the majority of patients interviewed misunderstood AMR to mean that the body becomes resistant rather than the micro-organism acquiring mechanisms of resistance to antibiotics (Brookes-Howell et al., 2012; McCullough, Parekh, et al., 2015; Wellcome Trust, 2015). Patients' interpretations of AMR being a property of the body included, the body being incompatible with the antibiotic, the body "getting used" to the antibiotic, the immune system being damaged through taking unnecessary antibiotics, or AMR being hereditary (Brookes-Howell et al., 2012; McCullough, Parekh, et al., 2015; Wellcome Trust, 2015).

A significant proportion of consumers is still confused and incorrectly thinks that antibiotics are effective against viral infections (Cals et al., 2007; NPS MedicineWise, 2013b), despite public health campaigns aimed at raising awareness of AMR (Huttner, Goossens, Verheij, & Harbarth, 2010). For example, 53% of respondents in Europe thought that antibiotics kill viruses, while 47% believed antibiotics to be effective for the common cold (European Commission, 2010). In Australia, more than half of the respondents surveyed thought that antibiotics are effective against viruses (NPS MedicineWise, 2013b). In addition, 65% of Australian workers believed that taking antibiotics for the common cold would hasten recovery and enable an earlier return to work (NPS MedicineWise, 2014b). Consistent confusion in consumers' understanding of AMR and knowledge about antibiotics indicate that communication from GPs, community pharmacists and public health campaigns need to be clearer and more precise.

Consumer behaviour and AMR

Apart from seeking antibiotics for minor self-limiting illnesses such as an acute respiratory tract infection, two types of consumer behaviour contribute to AMR – self-medication with antibiotics and non-adherence to prescribed antibiotics (Céspedes & Larson, 2006; World Health Organization, 2014a).

Consumers reported having antibiotics on hand "just in case" and demand antibiotics from pharmacists without a prescription, believing these medicines to be a panacea (Anghel & Craciun, 2013; Roque et al., 2013). Self-medication with antibiotics is highly prevalent in Southern and Eastern Europe especially in countries where antibiotics are available without a prescription (Grigoryan et al., 2008), and has been targeted in the 2014 European Antibiotic Awareness Day (Earnshaw et al., 2014). In Australia, where antibiotics are only available with a prescription, self-medication can occur when patients use antibiotics leftover from a previous illness, share another's antibiotics or obtain them while overseas. Little research has been done to understand the issue of self-medication with antibiotics in Australian consumers.

Non-adherence with antibiotics is common, with only about 60% of patients taking as prescribed (Kardas, Devine, Golembesky, & Roberts, 2005). Patients display a range of intentional and unintentional non-adherent behaviours (Hawkings, Butler, & Wood, 2008). Intentional non-adherent behaviours include stopping antibiotics early to save them for future use or stopping as soon as they feel better because antibiotics are "unnatural" (Hawkings et al., 2008). Unintentional non-adherence occurs due to missing doses because of work and social constraints or forgetfulness (Hawkings et al., 2008). While strategies for integrating medicine-taking into daily routines and a clear plan for managing missed doses can mitigate unintentional non-adherence, factors motivating intentional non-adherence will need to be addressed to bring about behaviour change.

Table 3. Factors influencing consumers from the literature

Theoretical Domains Framework	Consumers: Barriers and enablers from literature	Papers
D1. Knowledge	Past experience of antibiotics working for similar symptoms e.g. coloured sputum.	(Butler, Rollnick, Pill, et al., 1998)
	Most patients are aware of the link between antibiotic use and AMR.	(Brookes-Howell et al., 2012)
	Misconception of what AMR means e.g. the body becomes resistant.	(Brookes-Howell et al., 2012; McCullough, Parekh, et al., 2015; Wellcome Trust, 2015)
	Think that antibiotics are effective against viruses.	(Cals et al., 2007; European Commission, 2010; NPS MedicineWise, 2013b)
	Think that antibiotics are effective against coughs and the common cold.	(European Commission, 2010)
	Unaware that most coughs and the common cold are caused by viruses.	(NPS MedicineWise, 2013b)
	Big figures (financial cost, lives lost) are too abstract to have an impact on consumers. Analogies to climate change or the term "superbugs" are not persuasive. Practical implications e.g. impact on surgery, side effects, are more persuasive.	(Wellcome Trust, 2015)
D4. Beliefs about capabilities	Belief that they knew whether antibiotics were needed before consulting doctor.	(Belongia et al., 2002; Wellcome Trust, 2015)
	Feel that solutions to AMR are outside their control.	(Brooks et al., 2008; McCullough, Parekh, et al., 2015)
	Confident about self-medication with antibiotics.	(Anghel & Craciun, 2013; Grigoryan et al., 2008; Roque et al., 2013)
D5. Optimism	Belief that new drugs/solutions would be developed to solve AMR.	(Brooks et al., 2008; Wellcome Trust, 2015)
D6. Beliefs about consequences	Faith in the efficacy of antibiotics.	(Anghel & Craciun, 2013; Vazquez-Lago et al., 2012)
	Past experience or belief of quicker recovery with antibiotics.	(Braun & Fowles, 2000; Eng et al., 2003; Gonzales et al., 2000; NPS MedicineWise, 2014b)
	Risk of taking antibiotics perceived to be small. Benefits of taking antibiotics outweigh the risks.	(Eng et al., 2003; McDonnell Norms Group, 2008)

Table 3 (*continued*)

Theoretical Domains Framework	Consumers: Barriers and enablers from literature	Papers
D6. Beliefs about consequences (continued)	Most patients thought AMR would not affect them personally. More a problem for society.	(Brooks et al., 2008; McCullough, Parekh, et al., 2015)
	Taking antibiotics for a cold prevented more severe illness.	(Eng et al., 2003)
D9. Goals	Going to the doctor to get antibiotics due to symptoms e.g. coloured sputum, very sore throats.	(Belongia et al., 2002; Braun & Fowles, 2000; Butler, Rollnick, Pill, et al., 1998; Emslie & Bond, 2003; Eng et al., 2003)
D10. Memory, attention and decision processes	Concerns about AMR not a reason for modifying own behaviour.	(Brooks et al., 2008)
	Stopping antibiotics early or as soon as feeling better – to save some for next illness or belief that antibiotics are "unnatural".	(Hawkings et al., 2008)
D11. Environmental context and resources	Cost of the antibiotic is less than the cost of follow up clinic visit (time and money).	(McDonnell Norms Group, 2008)
D13. Emotion	Going to the doctor for reassurance when concerned it may be something serious.	(Butler, Rollnick, Kinnersley, et al., 1998)
	Attributes AMR to other people's behaviours – i.e. other patients, doctors who over prescribe antibiotics.	(Brooks et al., 2008; McCullough, Parekh, et al., 2015)

2.2.4 What influences community pharmacists?

Community pharmacists are accessible to consumers for advice and self-management of minor illnesses such as acute respiratory tract infections. As such, community pharmacists are well placed to promote prudent use of antibiotics to consumers in three major ways (World Health Organization, 2014c). First, advice on appropriate non-antibiotic self-care strategies, including preventative measures such as vaccination. Second, not providing antibiotics without both clinical justification (in the case of repeat prescriptions, or where over-the-counter antibiotics are legal) and legal requirements being met (where a prescription is required to access antibiotics). Third, when antibiotics are prescribed, advice on appropriate use, management of side effects and return of leftover antibiotics for disposal (World Health Organization, 2014c). A recent policy analysis on AMR by the World Health Organization concluded that community pharmacists have been underutilised and should be engaged by health authorities to be stewards of antibiotic use in collaboration with GPs (World Health Organization, 2014c).

Globally, out of fourteen national campaigns to promote prudent use of antibiotics, only one (Canada) explicitly targeted community pharmacists (Huttner et al., 2010). Community pharmacists justified their modest participation in public health campaigns to raise awareness of AMR by citing time constraints, a lack of support from managers, professional organisations and GPs, or a lack of suitable educational resources for themselves and for consumers (Coleman, 2003). Further, community pharmacists were reluctant to question GPs about the appropriateness of antibiotic prescriptions (Kotwani, Wattal, Joshi, & Holloway, 2012). Given the unwritten medical hierarchy, community pharmacists may be better utilised in the consumer-facing arm of national campaigns.

What are the current attitudes and behaviours of community pharmacists with regard to the consumer interface and AMR? Disconcertingly, some community pharmacists were observed to be willing to provide antibiotics without a prescription with little persuasion (Stoyanova, Dimova, & Raycheva, 2012), others reported being pressured by consumers to do so (Roque et al., 2013). Community pharmacists identified the following reasons for consumers requesting or demanding antibiotics without a prescription: past experience with and/or belief in the effectiveness of antibiotics, difficulty in accessing a GP, unable to afford a medical consultation, or unable to miss work without financial penalty being imposed (Roque et al., 2013). Other reasons cited for providing antibiotics without a prescription include: economic gain (Kotwani et al., 2012; Stoyanova et al., 2012), to clear near-expiry stock, to save poorer patients the cost of consulting a GP, or out of fear of losing customers (Kotwani et al., 2012). An attitude of complacency prevailed around provision of antibiotics, as many community pharmacists did not think that this practice contributed to AMR as they were "only giving antibiotics for a few days" (Kotwani et al., 2012; Roque et al., 2013). Some of these factors coupled with knowledge of the consumer's clinical history and/or confidence in obtaining a prescription retrospectively from the GP, may be powerful enough for community pharmacists to yield to consumer demand (Roque et al., 2013).

Like GPs and consumers, community pharmacists externalised the issue of inappropriate use of antibiotics – attributing responsibility to GPs and health authorities to lead on combating AMR, and also to consumers (Kotwani et al., 2012; Roque et al., 2013). Taken together, from the perspectives of GPs, consumers and community pharmacists, the responsibility for mitigating AMR is attributed to "everyone else" and therefore, to no one.

There is clearly a role for community pharmacists in the fight against AMR by virtue of their training and their placement as one of the key healthcare interfaces with consumers, apart from GPs. However, little qualitative research has been done to understand how community pharmacists in Australia view the issue of AMR, their professional role in mitigating the rise of AMR and their perceptions of what influences use of antibiotics. Understanding what motivates or de-motivates community pharmacists as active partners will be critical in empowering and engaging them as stewards of antibiotic use. Knowing what enablers and barriers community pharmacists face in promoting prudent use of antibiotics will be critical in designing suitable healthcare interventions targeted at consumers.

Table 4. Factors influencing community pharmacists from the literature

Theoretical Domains Framework	Community pharmacists: Barriers and enablers from literature	Papers
D1. Knowledge	Mixed level of awareness regarding inappropriate use of antibiotics and links to AMR – ranging from unaware to generally aware.	(Coleman, 2003; Kotwani et al., 2012)
D3. Social/ Professional role and identity	Providing antibiotics without a prescription out of a sense of compassion for patient's social situation and duty of care.	(Kotwani et al., 2012; Roque et al., 2013)
D6. Beliefs about consequences	Providing antibiotics without a prescription for fear of losing customers.	(Kotwani et al., 2012)
	Complacency around provision of antibiotics - did not think that this practice contributed to AMR.	(Kotwani et al., 2012)
D8. Intentions	Providing antibiotics without a prescription for economic gain.	(Stoyanova et al., 2012)
	Providing antibiotics without a prescription to clear near-expiry stock.	(Kotwani et al., 2012)
D12. Social influences	Providing antibiotics without a prescription due to demand or pressure from patients, especially if patients have difficulty accessing a GP, unable to afford a medical consultation, or unable to miss work without financial penalty.	(Roque et al., 2013)
D13. Emotion	Providing antibiotics without a prescription out of a sense of compassion for patient's social situation and duty of care.	(Roque et al., 2013)
	Distancing/ Externalisation: Attributed responsibility of reducing mitigating AMR to GPs, health authorities and consumers.	(Kotwani et al., 2012; Roque et al., 2013)

2.3 BEHAVIOUR CHANGE FOR POLICY AND PRACTICE

Behaviour change can occur at three different levels – individual, interpersonal and community. The underlying behaviour change theory for public policy is the rational choice model where individuals seek to maximise benefits to self (Australian Public Service Commission, 2007; Simon, 1955). This model takes into account individual and group choice, but arguably falls short when other important factors influencing behaviour such as social and environmental factors, come into play. One of the constraints of the rational choice model is when what is perceived to be a personal benefit by an individual i.e. receiving antibiotics for a cough or cold, runs counter to societal benefit, as this behaviour increases antibiotic resistance in the community.

Interventions aimed at influencing desired behaviour change in the use of antibiotics in the primary healthcare sector have largely been aimed at individuals – largely, GPs and consumers. Taking a societal perspective, the desired behaviour change for prescribers is a reduction in unnecessary prescribing of antibiotics. In the case of consumers, the desired behaviour change is greater health literacy, for example, coughs and colds are caused by viruses, and that antibiotics are not useful in treating viral infections – which lead consumers to not expect or demand antibiotics.

The European Centre for Disease Control (ECDC) has led an annual Antibiotic Awareness Day (EAAD) targeted at both GPs and consumers across Europe to promote prudent use of antibiotics since 2008 (Earnshaw et al., 2014). The effects of public campaigns on antibiotic consumption are mixed. There appears to be no association between the number of years of participation in the EAAD with national antibiotic consumption (Earnshaw et al., 2014; OECD, 2011). Campaigns that were formally evaluated reported a range of effects from a significant reduction in antibiotic consumption over a number of years to no measurable effect over time (Huttner et al., 2010). Strategies with the strongest evidence for success in reducing inappropriate antibiotic use include (a) delayed antibiotics – defined as a prescription provided with advice to delay using the prescription for more than 48 hours after initial consultation, (b) appropriate education for parents ideally prior to illness episode, (c) prescriber audit and feedback, and (d) educational meetings particularly using a social marketing approach (Andrews et al., 2012; Arnold & Straus, 2005; Spurling et al., 2013). Campaigns which include multifaceted strategies are more likely to have a positive effect (Arnold & Straus, 2005), especially if educational material for prescribers are combined with educational meetings (van der Velden et al., 2012). The impact of such campaigns on curbing AMR is proving challenging to quantify, as is the potential adverse consequences of reduced antibiotic prescribing e.g. complications (Huttner et al., 2010). It remains unclear which messages, interventions or combination of interventions are most effective in reducing antibiotic consumption and AMR (Huttner et al., 2010).

A note about delayed prescribing

Delayed prescribing has been recommended as a strategy for reducing inappropriate antibiotic prescribing by the National Institute for Health and Care Excellence (National Institute for Health and Care Excellence, 2008) and has been used by some GPs (Butler, Rollnick, Pill, et al., 1998). GPs felt delayed prescribing to be useful in managing diagnostic uncertainty, preventing a return visit to the clinic, providing a measure of reassurance to the patient, and reducing consultation time (Kumar et al., 2003). However, recent studies including a Cochrane Review found no difference in clinical outcomes for cough and the common cold when patients were refused antibiotics (Coenen et al., 2013; Spurling et al., 2013), suggesting that delayed antibiotics should no longer be recommended practice.

2.4 APPLICATIONS TO MEDICAL DECISION-MAKING

Decision-making implies an individual's conscious application of cognitive processes such as gathering relevant information and reasoning or thinking, to select a course of action from a set of alternatives.

Drawing from dual-processing theories in cognitive and social psychology (Evans, 2008), Kahneman categorises thinking into fast thinking and slow thinking (Kahneman, 2011). Characteristics of fast thinking include it being automatic, instantaneous, intuitive, associated with emotion and perhaps a memory. Experientially, fast thinking "happens to you". In contrast, slow thinking is effortful and involves some control of attention. Because slow thinking is closer to subjective experience, for example making a conscious decision, individuals are more conscious of this way of thinking.

These modes of thinking are fluid. Slow thinking can move to become fast thinking when the task at hand has been mastered, for example driving a car in normal traffic conditions. In addition, mental effort comes at a cost. Kahneman establishes that slow thinking is guided by fast thinking, and that often, slow thinking is used to simply confirm decisions made from fast thinking alone (Kahneman, 2011).

Bate et al (2012) applies Kahneman's findings to medical decision-making, where gaps are often seen between evidence base and actual practice. Here, it seems that the doctor develops a pattern of knowledge which they then rely on for decision-making (fast thinking), rather than activating slow thinking – systematically working through available evidence to inform prescribing decisions (Bate et al., 2012). Conceivably, specialists or experts in the field may access fast and slow thinking in a different way – a decision has been made using fast thinking (accurate pattern of clinical features and presentation from years of experience), and slow thinking is applied to simply provide confirmation of their original decision.

More usually in medical decision-making, apart from clinical considerations, GPs balanced clinical risks against patients' social situation (Björnsdóttir et al., 2010). For example, in considering whether to prescribe an antibiotic for an infection, GPs may weigh up clinical risks such as the possible harm from an untreated infection against the development of AMR in the community. Some GPs considered both types of risks, while others considered neither (Björnsdóttir et al., 2010). Clinical risks were balanced against patients' social situation such as being able to return for a follow up visit (availability of time and money), their role in society (perceived importance of the patient's job) and financial resources (patient's need for earnings, ability to afford a sick day) (Björnsdóttir et al., 2010). The relative importance of clinical risks against other factors such as patients' social situation, patients' expectations, or societal risks of AMR to name a few, is not known.

Physical and emotional state

GPs' emotional and physical state at the time of prescribing can potentially impact on their decision-making (Tonkin-Crine et al., 2011). The cognitive demand of multiple clinical decisions per day can result in decision fatigue – resulting in GPs being more vulnerable to making inappropriate prescribing choices (Linder et al., 2014). Linder et al (2014) showed that GPs were more likely to prescribe antibiotics for acute respiratory infections in the latter half of both morning and afternoon 4-hour clinic sessions. It remains to be seen if and how awareness of this tendency assists GPs in modulating their decision-making.

Competing interests: Individual vs Societal benefits

The confluence of moral choice and medical decision-making occurs at the doctor-patient interface, where patient well-being is likely to take precedent over all other entities. The withholding of antibiotics for what could be self-limiting minor illnesses may therefore place GPs in an uncomfortable position — pitting patient well-being against public good.

In moral decision-making, psychological distance either temporally or spatially from an event decreases deontological judgements and increases consequentialist choices (Gong, Iliev, & Sachdeva, 2012). That is, if the event (e.g. prescribing antibiotics) is far into the future or happens in a distant location, individuals are more likely to choose the course of action that will have the best anticipated outcome for most people (consequentialist). In the case of antibiotic prescribing, this translates to choosing not to prescribe antibiotics for an acute respiratory tract infection to a patient (next year or in the UK) if this will lead to more people being protected from AMR. The converse is true for deontological judgements, where duty of care to the patient is paramount. The associations between consequentialist responses with deliberate, rational thinking, and deontological responses with emotion and intuition (Gong et al., 2012), is reminiscent of Kahneman's (2011) slow and fast thinking, respectively.

This way of viewing moral decision-making may explain why GPs who prescribed potent broad spectrum antibiotics for their patients and those who chose to conserve these antibiotics for the future, both perceived their actions to be socially responsible.

2.5 SUMMARY AND IMPLICATIONS

Every dose of antibiotic prescribed and used, increases the likelihood of AMR (Phelps, 1989). The greatest proportion of antibiotics is prescribed in the primary healthcare sector (Australian Commission on Safety and Quality in Health Care, 2016), where its use is strongly correlated to antimicrobial resistance rates (Bell et al., 2014; National

Institute for Health and Care Excellence, 2008). Hence, the primary healthcare sector is an important area for action.

The literature highlights several research gaps, some of which will be addressed in this study. Efforts to reduce inappropriate antibiotic use in the Australian primary healthcare sector have largely comprised clinical and educational interventions targeted at individual GPs and/or consumers. Designing effective healthcare interventions to reduce the inappropriate use of antibiotics, be they clinical, educational or pertaining to policy, means identifying and addressing the barriers to appropriate antibiotic use that is pertinent to each individual involved. Although some barriers and enablers to appropriate use of antibiotics affecting GPs and consumers are known, it is not clear which factors are most important or dominant that would impact on the decision. In addition, research on GP prescribing behaviours and attitudes found in published literature were predominantly completed on those practising in the UK, Europe or the USA. To date, limited research has been done with Australian GPs in this area. The same can be said of consumers. In the case of community pharmacists, little qualitative research has been done to understand how those practising in Australia view the issue of AMR, their professional role in mitigating the rise of AMR and their perceptions of what influences use of antibiotics.

Another research gap identified which would add useful insight to efforts in mitigating AMR, is to investigate factors that are known to colour decision-making, such as discounting the future. In addition, the analysis of barriers and enablers to behaviour change against a theoretical framework suited for knowledge translation is critical for informing existing national programs to bring about a reduction in inappropriate use of antibiotics. Research findings can then (a) influence how key messages and public health campaigns are crafted to prompt desired behaviour change, and (b) inform clinical education and empowerment of GPs and community pharmacists to play a more responsive role as stewards of antibiotic use in the community. Absence of such research compromises our collective ability to synergise multi-level intervention strategies to reduce antibiotic consumption in Australia.

Chapter 3: **Research Design and Methods**

In this chapter I establish the argument for using a mixed methods research design, justify and describe the methods used, detail the development of research instruments, and describe the conduct of research. The chapter is divided into three portions. The first portion, Sections 3.1 to 3.3, deals with the research design — description of the research paradigm used (pragmatism), and justification for the methodology (mixed methods) including the points of interface between each method i.e. how and where "mixing" will occur in the research. The second, Section 3.4, deals with the qualitative method selected — semi-structured interview. Justification for the selection of semi-structured interview is provided, along with the development of the interview guide, and a description of how research interviews were conducted. A brief statement about me — the researcher — is provided in Appendix B, as per best practice reporting for qualitative research (Tong, Sainsbury, & Craig, 2007). The third portion, Section 3.5, details the quantitative method selected — discrete choice experiment (DCE). The rationale for DCE, the development, and the implementation of the DCE survey are detailed. Strengths and limitations of both methods are discussed in their respective sections. Research ethics and management of research data are stated in Sections 3.6 and 3.7, respectively.

Descriptions of methods (this chapter) and reporting of results (Chapters 4 and 5) follow recognised best practice guidelines — the consolidated criteria for reporting qualitative research (COREQ) for the semi-structured interviews (Tong et al., 2007), and the recommendations of the Good Research Practices for Conjoint Analysis Task Force of The International Society for Pharmacoeconomics and Outcomes Research (ISPOR) for the DCEs (Bridges et al., 2011).

3.1 RESEARCH PARADIGM: PRAGMATISM

The substantive theory stance in mixed methods research states that the key driver for guiding inquiry decisions should be the substantive issues and conceptual theories relevant to the study being conducted, rather than philosophical paradigms in and of themselves (Greene, 2007, p. 69). However, there is value in adopting a paradigm if this lends further robustness to situate and frame the research and its findings.

This research has been conducted using pragmatism as the underpinning philosophy, relying on Dewey's pragmatism in particular, approaching inquiry as beginning with the problem and through inquiry transforming the "indeterminate situation" into one "that is so determinate in its constituent distinctions and relations as to convert the elements of the original situation into a unified whole" (Biesta, 2010). That is, pragmatism understood as a problem-driven approach, the overriding concern being the research question. It is important to emphasise here that pragmatism as a philosophy does not equate to an "anything goes" approach. Rather, I understand pragmatism to be a composite of the following core ideas: that knowledge is based on practical outcomes and judged on its usefulness when applied to a "real world" problem, that there is no single or best method that can be used to elicit indisputable knowledge, that knowledge is provisional and contextual (what is true now for a particular cultural context, may not be so in the future) due to the way it is produced, and finally, that pragmatism as a philosophy is anti-dualistic (for example, that water-tight distinctions between theory and practice is at best unhelpful).

Given that the research aim was to establish the dominant factors influencing decisions to use antibiotics by GPs, community pharmacists and consumers in the Australian primary healthcare sector — currently an "indeterminate situation", and that it points to a problem-driven approach, it seemed appropriate to underpin this work with pragmatism as a philosophy.

3.2 METHODOLOGY: MIXED METHODS

Research that involves the investigation of applied issues often requires both quantitative and qualitative methods. The use of mixed methods research, while not new, is one that is still evolving (Tashakkori & Teddlie, 2010). As such, there are currently several definitions of what constitutes mixed methods research (Teddlie & Tashakkori, 2010). The definition adopted for this research is the use of two or more methods in a single research project which yields both qualitative and quantitative data (Creswell & Plano Clark, 2011; Teddlie & Tashakkori, 2009).

While definitions of mixed methods may vary, several common characteristics hold true, which aligns with the investigative aim of this research. These common characteristics of contemporary mixed methods research, which are at the same time useful and compelling, are outlined below. Following a short introduction of each characteristic, a brief explanation of how it is relevant to this research is provided.

The first characteristic — methodological eclecticism, allows the selection and synergistic integration of the most appropriate methods from quantitative, qualitative and mixed strategies to thoroughly investigate a phenomenon of interest (Teddlie & Tashakkori, 2010, p. 5). For this research, which aimed to establish the dominant factors influencing decision-making on the part of general practitioners, community pharmacists and consumers whether to use an antibiotic, a qualitative component was required to explore what these factors may be in the Australian primary healthcare context. The qualitative component alone, while yielding useful insights in answer to the first research question (RQ1. What influences antibiotic use from the perspectives of GPs, community pharmacists and consumers?), would not have fully addressed the research aim. A quantitative component was also required so that factors identified from both the literature and the qualitative component could be measured or weighted relative to one another (RQ2. How do GPs and consumers trade-off on factors influencing antibiotic use?).

From this we can know which factors have more weight in influencing decision-making on antibiotic use. This in turn would inform the development and points of emphases of key messages in Australia's public health campaigns, in order to produce a measurable reduction in antibiotic use nationally.

The second characteristic — paradigm pluralism, asserts that more than one paradigm can serve as the underlying philosophy for mixed methods research, albeit only one paradigm can be used in a single study (Teddlie & Tashakkori, 2010). While pragmatism has often been touted as the only acceptable paradigm for mixed methods research, other plausible paradigms include dialectics (Greene & Hall, 2010), critical theory (Hesse-Biber, 2010) and critical realism (Maxwell & Mittapalli, 2010). Here, I have chosen to use pragmatism as the underlying philosophy given that (a) the research aim describes an "indeterminate situation", (b) the research contributes provisional knowledge and potential solutions to a "real world" problem, and (c) the required combination of qualitative and quantitative methods to address the research aim, makes essential the anti-dualistic stance of pragmatism i.e. not preferring positivism (quantitative methods) over interpretivism (qualitative methods) or vice versa.

The third characteristic is an emphasis on diversity at all levels of the research, apart from methodological eclecticism and paradigm pluralism outlined above. This emphasis on diversity means that a carefully designed mixed methods study can address both confirmatory and exploratory questions simultaneously (Teddlie & Tashakkori, 2010). Properly conducted mixed methods research also provides intellectual space to process divergent conclusions and inferences from research findings (i.e. data and subsequent analyses). This third characteristic has served my research well, where the qualitative component has not only been exploratory (identifying factors), but also confirmatory (supporting the results from the quantitative component). In mixing the findings from both the qualitative and qualitative components, synergy has been found in that the qualitative component lent useful explanations to the results from the quantitative component. In short, applying this third characteristic of mixed method research has proven to be fruitful for this research in providing greater insight into the complex phenomenon of decision-making in a healthcare context, and exposed further gaps in what is currently understood about the issue.

The fourth characteristic — an emphasis on continua rather than dichotomies, moves away from setting up binaries and replaces the either-or paradigm debates. Continua allows for a range of options from across the methodological spectrum (Teddlie & Tashakkori, 2010). Hence, in my research, the inclusion of methods associated with interpretivist paradigms (qualitative), as well as methods associated with positivist paradigms (quantitative), was made possible.

The fifth characteristic stipulates an iterative, cyclical approach to research, which includes both inductive and deductive logic in the same study (Teddlie & Tashakkori, 2010). Tashakkori & Teddlie (Teddlie & Tashakkori, 2010) explains that the cycle of research may be seen as moving from results (facts/ observations) through inductive logic to general inference (or theory), then from those general inferences through deductive logic to tentative hypotheses or predictions of particular outcomes. Although research may start from any point in the cycle, all mixed methods research goes through a full cycle at least once.

In my research the literature review provided the starting point, in which deductive logic was applied using the selected theoretical lens — Theoretical Domains Framework (Section 2.1.1), to inform the development of interview guides for the qualitative component. Data from the semi-structured interviews were coded using a blend of deductive and inductive coding (Section 4.1). Inductive logic was then applied to identify realistic decision points, attribute and levels for the quantitative component — discrete choice experiments (DCEs). Finally, deductive logic was applied to the findings of the DCEs, together with those from the semi-structured interviews, to arrive at tentative hypotheses in answer to the research aim and research questions. This research cycle and design is represented in a schematic diagram in Section 3.3.1 (Figure 2).

The sixth characteristic, a focus on the research question in determining the methods used in a study, is perhaps the characteristic that comes to mind most when thinking about mixed methods research (Teddlie & Tashakkori, 2010, p. 10). This problem-driven approach serves to de-couple the methods employed from philosophical issues such as epistemology and ontology. Indeed, good research on any important evidence-based problem would very likely need to use a mix of methods (Gorard, 2010). In Sections 3.4 and 3.5 justification is provided for the methods selected in order to investigate the research questions posed.

The seventh characteristic is a set of fundamental research designs and analytical processes, commonly associated with and used in mixed methods research (Teddlie & Tashakkori, 2010, p. 10). There is as yet no universal terminology to describe these research designs and no consensus regarding the specific number and types of research designs admissible in the field of mixed methods research. Section 3.3 contains a discussion on mixed methods research design generally, as well as the design used for this research.

The eight characteristic — a tendency toward balance, drawing from appropriate methodologies where required rather than sitting at either end of the methodological spectrum (positivism vs. interpretivism), serves my research aim which cannot be adequately addressed by adopting either a positivist or interpretivist approach alone.

Finally, the ninth characteristic — a reliance on visual representations (for example diagrams) and a common notation system for research design by Morse (Tashakkori & Teddlie, 2010, p. 12), allows mixed method researchers to easily communicate their research designs in shorthand — see Section 3.3.1 for the Morse notation used in this study.

In summary, the rationale for using mixed methods in this research is that firstly, a qualitative component was needed in order to elicit attitudes, behaviours and perspectives of Australian general practitioners, community pharmacists and consumers, on antibiotic use. This was to better understand the Australian context, as much of the published research and grey literature in this area had been produced elsewhere — in countries with different levels of access to healthcare systems and models of funding. Secondly, building on the literature, the findings from the qualitative component were not only used to develop the quantitative research instrument, but also to gain a more comprehensive understanding of the first research question (RQ1). Thirdly, while previous research has reported on factors that seem to influence prescribing patterns of doctors, both those working in primary care or in hospital settings, to the best of my knowledge there is as yet no better appreciation of which factors are dominant in doctors' decision-making processes. Hence, a quantitative component which would allow these factors to be measured or weighted relative to one another, would narrow this research gap. The application of mixed methods, as described above, maximises the strengths of each approach and allows synergistic analyses of the findings to bear upon the research aim.

3.3 RESEARCH DESIGN

There is as yet no consensus regarding the specific number and types of mixed methods designs. Robust scholarly debates are still ongoing, which serve to further develop this field (Tashakkori & Teddlie, 2010) while allowing newer researchers to contribute to the conversation. Certainly the fact that mixed methods research is not yet "set in stone", seems to have attracted its application in diverse disciplines, from sociology to psychology, and increasingly in health services research (Russo et al., 2016; Wong, Norman, Dunning, Ashley, & Lorgelly, 2014).

Amidst the current lack of consensus in the field of mixed methods research, there are at least three different frameworks in use for planning and implementing such research, represented by the work of Janice Morse, Jennifer Greene, and Tashakkori and Teddlie, respectively.

In Morse's framework, one method is dominant over another. The dominant or core method is that part which can stand alone as its own completed study (and can be reported as such), while the non-dominant method cannot. Morse determines that the dominant method sets the overall theoretical drive, either inductive or deductive, for that study. She argues for the necessity of keeping the quantitative and qualitative components of a study as separate as possible, in order to realise the strengths of each component. Hence, there is no mixing of theoretical drives (Tashakkori & Teddlie, 2010). Although a recognised pioneer of mixed methods research, Morse's position on research design is different from what is now generally endorsed in the field, where a more thorough mixing of methods is expected.

In line with contemporary mixed methods practice, Greene encourages the mixing of theoretical drives, as methods cannot be divorced from assumptive frameworks (Tashakkori & Teddlie, 2010). This advantageous stance serves five important purposes of research designs: allowing triangulation, complementarity, development, initiation and expansion.

Finally, Tashakkori and Teddlie lay out their typology based on research implementation processes of the qualitative and quantitative components. They identified four families of designs: parallel, sequential, conversion, and fully integrated (Teddlie & Tashakkori, 2010, p. 24). Each of the first three designs can be further sub-divided according to the data sources: multiple samples (qualitative and quantitative data are from different individuals or are not linked), same or subsample (both types of data are available for some individuals and are linked), and multilevel samples (data are collected from different social 'hierarchies' of individuals i.e. qualitative data from parents and quantitative data from children, and linked during analysis) (Teddlie & Tashakkori, 2010, p. 24). The fully integrated design can include combinations of these options — the three families of designs with the sub-divisions of data sources, in an iterative manner (Teddlie & Tashakkori, 2010, p. 24)

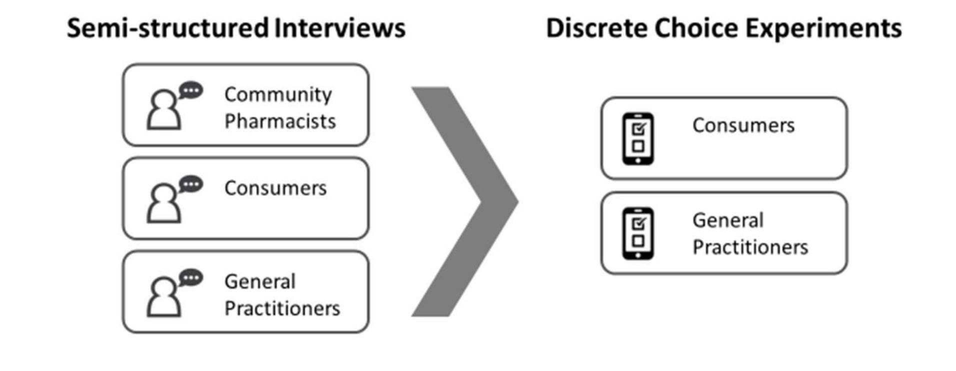
3.3.1 Research design for this study

The research design for this study was an exploratory sequential mixed methods design (Creswell, 2014), and compatible with Greene's mixing of theoretical drives, although it is perhaps most closely aligned to Tashakkori and Teddlie's typology — a fully integrated design comprising sequential implementation of qualitative followed by quantitative components, using multiple samples. In Morse's notation, the research design is represented as QUAL → QUAN. A substantial qualitative component (QUAL) designed to be conducted first, in order to answer the first research question (RQ1), also informed the development of the quantitative research instrument — discrete choice experiments (QUAN). The DCEs addressed the second research question (RQ2). Each component was of equal importance.

The literature review provided the starting point, in which deductive logic was applied using the selected theoretical lens — Theoretical Domains Framework (Section 2.1.1), which informed the development of interview guides for the semi-structured interviews (QUAL). Findings from the semi-structured interviews were coded using a blend of deductive and inductive coding (Section 4.1). Inductive logic was then applied to identify realistic decision points, attributes and levels for the quantitative component — DCEs (QUAN). This step is the first (Mixing 1) of two points of interface where the mixing of methods occurred. Finally, deductive logic was applied to the findings of the DCEs, together with those from the semi-structured interviews (Mixing 2) to arrive at tentative hypotheses in answer to the research aim and research questions. This research cycle and design is represented in a schematic diagram (Figure 2).

The two methods selected for this research were (a) semi-structured interviews for the qualitative component, and (b) discrete choice experiments for the quantitative component. Justification for the selection of each of these methods, development of research instruments, implementation of these methods, along with strengths and limitations, are given in Sections 3.4 and 3.5.

Figure 2. Schematic diagram of research design

Research Aim	To establish the dominant factors influencing decisions to use antibiotics by GPs, community pharmacists and consumers in the Australian primary healthcare sector		
Research Questions	RQ1. What influences antibiotic use from the perspectives of GPs, community pharmacists and consumers?	RQ2. How do GPs and consumers trade-off on factors that influence antibiotic use?	
Morse Notation	**QUAL** → **QUAN**		
Research Design			
Research Cycle	**Deductive logic** → Literature review filtered through TDF to create interview guides	**Inductive logic + Mixing 1** → Semi-structured interviews + deductive and inductive coding to create DCEs	**Deductive logic + Mixing 2** Findings from semi-structured interviews and DCEs to hypotheses
Returning to address the Research Aim	To establish the dominant factors influencing decisions to use antibiotics by GPs, community pharmacists and consumers in the Australian primary healthcare sector		

3.4 METHOD 1: SEMI-STRUCTURED INTERVIEWS

The qualitative component of this research comprised of semi-structured interviews in order to capture the lived meanings and views of GPs, community pharmacists and consumers (Kvale, 2007c). This method was selected, rather than other types of interviews such as unstructured interviews, structured interviews, focus groups or group interviews, as it best served the exploratory nature of this phase of the research in the following ways:

Firstly, semi-structured interviews allowed for the exploration of a main set of questions while enabling flexibility for follow-up questions, probing questions, questions that seek clarification, further explanation or examples, unlike fully structured or unstructured interviews. In this research, the use of follow-up questions yielded interesting findings, which is reported in Chapter 4.

Secondly, unlike structured interviews, the sequence of questions asked in semi-structured interviews can be varied to take into account how the conversation unfolded with each participant. This flexibility in question sequence, enabled me to lead and in turn, be led, by the participant, which not only facilitated a more natural flow of conversation, but also increased the efficacy of information gathering during the interview.

Thirdly, for this research the semi-structured interviews were conducted one-on-one, rather than in a group setting. This arrangement allowed each participant the freedom of expressing their views without fear of being judged by fellow participants, ample time to put forward their perspectives, and preserved anonymity. It also greatly minimised the likelihood that participants were only disclosing what they deemed to be socially acceptable or desirable. Focus groups were therefore ruled out as the method of choice.

Finally, the intent of the qualitative component was to elicit a diverse range of views, attitudes and behaviours on antibiotic use — not participant consensus. Given these considerations, the one-on-one semi-structured interview was selected as the method for the qualitative phase of this research.

3.4.1 Development of interview guides

Three interview guides were developed, one for each participant group i.e. GPs, community pharmacists and consumers. Interview guides comprised of relevant contextual questions pertaining to the personal context of participants, main interview questions, possible follow-up and probing questions, as well as prompts for interactions i.e. for starting and wrapping up the interview session.

Each interview guide was piloted with at least two people of similar background as the intended participant groups i.e. two practicing GPs, two practicing community pharmacists, and three consumers. Data from these pilot interviews were not included in the data analysis, as the purposes of these pilots were to (a) refine the draft interview guides prior to being used in the research i.e. check clarity of the questions, (b) test that the main questions would adequately elicit useful responses to the research question, (c) ascertain how long an interview session would last, (d) serve as a practice run, and (e) obtain constructive feedback regarding the way I conducted the interview session and how the research interview was experienced by the participant.

Final versions of the interview guides for each of the participant groups are shown in Appendices C, D and E. Briefly, for GPs the main questions in the interview elicited their (a) decision-making processes when considering whether to prescribe antibiotics, (b) challenges regarding antibiotic prescribing — including handling patients' demands for antibiotics, (c) views on antibiotic resistance, (d) mitigating strategies for antibiotic resistance, and (e) personal behaviours regarding antibiotic use. Contextual information relevant to the research were elicited, such as the characteristics of (a) the GP — where they gained their qualifications, where they trained, number of years in practice, current working arrangements, and involvement in mentoring/supervising medical students or GP Registrars, and (b) the clinic — business structure and billing.

The main questions in the interview guide for community pharmacists elicited their normal practice in (a) managing a cough or common cold in a consumer, (b) consumer requests for antibiotics including the handling of repeat antibiotic prescriptions, (c) pharmacist views on and understanding of antibiotic resistance, (d) mitigating strategies for antibiotic resistance, and (e) the pharmacist's personal behaviours regarding antibiotic use. Contextual information relevant to the research were elicited and included those that described the characteristics of (a) the community pharmacist — where the participant gained their pharmacy qualification/s, place of training, place of practice, number of years in practice, current working arrangements, and involvement in mentoring or supervising pharmacy students and interns, and (b) the pharmacy — type of pharmacy, range of services provided, and general profile of users of the pharmacy.

The main questions in the interview guide for consumers elicited (a) their self-care strategies in managing a respiratory tract infection, (b) when they would consult a GP, (c) their expectations of the GP consultation, (d) their views and responses to the GP who advised that an antibiotic was not needed, (e) their views and responses if the GP seemed unsure of the need for antibiotics but prescribed it as a contingent measure, and (f) their views on the risks and potential side effects of antibiotics. The interview guide also included questions on consumer experience with antibiotics — both taking/adherence to antibiotics and the use of repeat prescriptions, and their views on antibiotic resistance. Contextual information relevant to the research were elicited, such as (a) personal characteristics — age, highest education level achieved, place/country of origin, number of years residing in Australia, (b) whether they have a regular GP, and (c) whether they use a regular pharmacy.

3.4.2 Sampling and recruitment for semi-structured interviews

Eligible participants for semi-structured interviews, were as follows: (a) GPs/GP Registrars and community pharmacists practising at a location within an hour's drive from the Brisbane Central Business District (CBD), and (b) consumers residing/working within an hour's drive from the Brisbane CBD and between the ages of 18 to 54 years old. The stipulation of being within an hour's drive of the Brisbane CBD, was so that the interviews could be conducted face-to-face. An age range of 18 to 54 years old for consumers was specified for the following reasons: (a) Australian data indicated a high rate of antibiotic usage in this age range for acute respiratory tract infections, coughs and sore throats[6] (Australian Bureau of Statistics, 1999), (b) a less than 5% prevalence of chronic diseases such as Type 2 Diabetes and Chronic Obstructive Pulmonary Disease, which may require treatment with antibiotics, and hence minimising the likelihood of introducing a confounding factor (Australian Institute of Health and Welfare, 2014), and (c) it represents the peak years of men and women in the Australian workforce (Australian Institute of Health and Welfare, 2015).

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[6] Prior to the recent August 2016 release of linkable MBS and PBS data for research purposes, the Australian Bureau of Statistics report referenced here, was the best available data which linked antibiotic consumption, medical indication, and age groups.

A national survey of consumers found that some of the reasons people use or ask for antibiotics were because of the belief that antibiotics would help quicken recovery (NPS MedicineWise, 2014b).

Constraints of time and budget were taken into account when planning the research. It was anticipated that approximately 50 interviews in total can be conducted, given that each hour of interview was estimated to generate at least 8 hours of work, including transcription and coding.

The exact number per participant type i.e. number of GPs, community pharmacists and consumers, was difficult to determine from the outset as the point of theme saturation where no further interviews are required, cannot be pre-determined. Hence, indicative numbers per participant group were agreed upon *a priori*, with the split favouring consumers (see Table 5 where possible options regarding the split in participant numbers are outlined in the column entitled "Estimated number of participants").

Table 5. Participant type and sampling strategy

Participants	Sampling	Estimated number of participants (n = 50)		
		Option A	Option B	Option C
General Practitioners	Convenience and snowball sampling	10	12	15
Community Pharmacists		10	12	15
Consumers (18 – 54 years old)		30	26	20
	Total	50	50	50

Convenience and snowball[7] sampling were used in the recruitment of all three participant groups. Recruitment strategies for each participant group are outlined below. Participants were recruited until no new relevant information was obtained — determined by reviewing documented post-interview reflections — or when the *a priori* sample size had been reached, whichever occurred sooner.

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[7] Snowball sampling — participants were asked to refer potential participants to the researcher.

GPs were recruited via community notices placed in electronic newsletters of two of the largest Primary Health Networks (PHNs) in Queensland in terms of population (Department of Health, 2016) i.e. the Brisbane North PHN and Brisbane South PHN. GPs were also invited to participate via recruitment emails to professional networks and Twitter. Tweets were sent from my Twitter account, reserved for professional use, which were retweeted by professional colleagues, CRE-RHAI, AusHSI, Brisbane North and Brisbane South PHNs. These strategies yielded 10 expressions of interest – 7 GPs and 3 GP Registrars, which were subsequently interviewed.

Community pharmacists were invited to participate via a recruitment email sent by the School of Pharmacy, Queensland University of Technology, to 396 community pharmacies within an hour's drive of Brisbane CBD — postcode ranges of 4000 to 4305 and 4500 to 4511. Other avenues included advertorials in two consecutive issues of the Pharmaceutical Society of Australia's Queensland Branch eNewsletter, emails to my professional network, and Twitter®. Tweets regarding community pharmacist recruitment were retweeted by interested Twitter® followers i.e. pharmacy colleagues or affiliated research groups. These recruitment avenues yielded 13 community pharmacists expressing interest to participate. One withdrew prior to the interview due to logistic issues related to the relocation of their Pharmacy to new premises. Therefore, 12 community pharmacists were subsequently interviewed.

Recruitment of consumers was via an email sent to staff and students by the Faculty of Health and the Institute of Health and Biomedical Innovation at QUT, as well as via Twitter®. Due to consideration of recruitment costs e.g. advertising in the local paper, recruitment of consumers was limited to the university population. While this population is not likely to be representative of the general population in terms of educational levels achieved, the university is a microcosm of diversity i.e. multi-ethnic, multi-cultural, people from rural/regional, as well as metropolitan areas. Having such diversity would enrich the findings of this research. These recruitment strategies yielded 49 expressions of interest — 3 did not respond to follow up emails to book an interview time, 13 were not included either due to over-representation of the younger age group or were later expressions of interest after saturation of concepts/themes had been reached. Thirty-three consumers were booked for an interview, but one did not present. Hence, 32 consumers were interviewed.

Overall, 54 semi-structured interviews were conducted — 10 GPs/GP Registrars, 12 community pharmacists, 32 consumers.

3.4.3 How interviews were conducted

The interviews were conducted one-on-one and face-to-face, rather than via telephonic or online technology, so that non-verbal communication from the participant could be observed and noted. Careful observation of non-verbals e.g. hand gestures, posture/positioning, and gaze, helped to either corroborate or cast doubt on the participant's response to particular questions. As this research is not focussed on semiotics, the analysis and reporting of these non-verbals have not been included.

Interviews were conducted in a conversational manner, following Rubin and Rubin's responsive interviewing[8] technique (Rubin & Rubin, 2012). During the interview paraphrasing was used to clarify and/or to confirm that the intended meaning had been interpreted accurately. I kept a calm, interested and non-judgmental stance throughout the interview, using minimal encouragers (verbal sounds such as "uh-huh", "yup") and nods while listening, and to signal my continuing interest in what the participant was saying. I found my previous training in educational visiting/academic detailing[9] and active listening[10] in a healthcare context, useful for the preparation and implementation of these interviews. Practiced self-awareness and reflexivity honed over many years in clinical roles, enabled me to easily move between the interview questions and the participant's experience when conducting the interviews.

Taken as a whole, the nature of these interviews for each participant group was iterative, to allow exploration of new or interesting concepts/themes in subsequent interviews with other participants from the same group (Rubin & Rubin, 2012). For example, new concepts/themes which surfaced in an interview was introduced as part

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[8] Responsive interviewing: A way of interviewing based on extended conversation. The researcher and participant become conversation partners, allowing the co-creation of knowledge and meaning through the participant's words and experiences.

[9] Education visiting/academic detailing: A one-on-one outreach education technique to support clinicians in providing better patient care, pioneered by Jerry Avorn. Academic detailing delivers evidence-based syntheses of clinical practice that is accurate, balanced, and current, in an engaging and highly interactive format, tailored to the clinician.

[10] Active listening: A way of listening deeply and responding appropriately, often used in counselling and training. Characteristics of active listening include: attending fully to the person speaking (focus of attention), empathetic para-phrasing and responding non-judgmentally.

of the conversation in the next or subsequent interviews, in order to elicit another's perspective — to discover if there is resonance or refutation, but also to lend richness to that concept.

As a way of corroborating concepts/themes said about another participant group, I introduced these as additional questions to the relevant group. For example, concepts/themes about GPs' prescribing behaviour mentioned by community pharmacists and/or consumers were added to GP interviews opportunistically.

3.4.4 Interview logistics: Time and sequence of interviews

Interviews were conducted between late April and mid-October 2015, in order to capture the pre and post winter months for Brisbane, Australia (where this research was being carried out) — typically the peak flu season. This period was selected as it also coincided with the national public health awareness campaign in 2015 — Winter is Coming. The campaign included (a) the #savethescript short film competition in partnership with Tropfest, poster advertisements at bus stops and in buses (Antibiotics are losing their power), and TV advertisements (Antibiotics are losing their power, which aired during the commercial breaks for MasterChef Australia 2015, a highly popular cooking program with a viewing audience of nearly 1.5 million). As part of the campaign, GPs would be sent a personalised report on their antibiotic prescribing patterns to coincide with Antibiotic Awareness Week, which included antibiotic type and volume prescribed, and de-identified comparative data of their peers. Resources for patients such as a brochure entitled "Colds, Coughs and Flu: What you can do", as well as symptom management checklists, were disseminated to GPs for use with patients. Posters and brochures were also made available to community pharmacies.

The expectation was that many consumers interviewed would be aware of these messages, either from the 2015 or previous campaigns[11], and that community

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[11] Since 2012, NPS MedicineWise and the Australian Commission on Safety and Quality in Health Care have jointly conducted annual campaigns to reduce the consumption of antibiotics, targeting consumers and health professionals during Antibiotic Awareness Week. Previously, NPS MedicineWise (then known as the National Prescribing Service) had conducted similar campaigns from 1999 to 2005.

pharmacists and GPs would have had recent interactions with consumers regarding the management of coughs and the common cold.

Specifically, community pharmacist interviews commenced first (23rd April 2015 to 21st May 2015), followed by consumer interviews (29th May to 26th June 2015). GP interviews were conducted last, from 16th September to 13th October 2015.

Sequencing of interviews for each participant group was carefully considered and the decision to interview community pharmacists, consumers and GPs, in that order, was based on the following rationale:

- Community pharmacists are often the first port of call for consumers seeking advice from a healthcare professional and/or seeking self-care solutions for a cough or cold. Hence, it was prudent to begin the interviews with community pharmacists.
- My professional background in pharmacy was conducive to building rapport quickly with community pharmacist participants. This allowed me to focus on the responsive interviewing technique to produce fruitful, data-rich conversations, both for the community pharmacist participant group and subsequent groups.
- Consumers were interviewed next, as some interview questions explored their awareness of public health campaigns which typically emerge in June, as outlined above, at the start of the southern hemisphere's winter months.
- GPs were interviewed in the months immediately post winter, so that conversations included their most recent experience with clinic consultations for upper respiratory tract infections.

3.4.5 Interview logistics: Participant related

Each potential participant was contacted upon receipt of their expression of interest. A standard procedure for interview bookings and confirmation (Appendix G) developed for this research was followed. The procedure included (a) negotiation of an interview timeslot and venue which was convenient for the participant[12], (b) ascertaining or confirming the participant's preferred contact details i.e. email and phone number, and (c) email confirmation of the agreed timeslot which included the Participant Information and Consent Form, as well as my contact details. Participants who chose to be interviewed at the Queensland University of Technology (QUT) Kelvin Grove campus were emailed a campus map, parking and transport options, if they were unfamiliar with the campus.

One interview was conducted with each participant, who was given the choice of being interviewed either at their place of practice/workplace or at QUT. Interviews which occurred at participants' place of practice i.e. GP clinic or pharmacy, were conducted in a private area within the practice. For example, the GP's office, the patient counselling room or the office area at the back of the pharmacy. There were four exceptions — three were community pharmacists who preferred to be interviewed at a café near the pharmacy, and one was a consumer who preferred to be interviewed at a café close to their workplace. Interviews held at QUT were conducted in a meeting room at the Institute of Health and Biomedical Innovation (IHBI).

Each participant completed and returned their signed consent form prior to the commencement of the interview. As part of good research practice and participant care at the beginning of each interview, I briefly reiterated the purpose of the interview, the conversational nature of the session, the approximate length of time that the interview would take (using this as an opportunity to re-confirm the availability of the participant as their schedules could have changed since the interview was booked), and to invite any questions they may have about the research. Assurance was provided that participants could choose to skip any questions asked — which signalled that they have some measure of control over the interview. Notwithstanding the signed consent form, I asked each participant whether they were willing to be audio-recorded, before switching on the digital recorder. All participants consented to be audio-recorded. At the end of each interview I invited participants to add any further comments they wished to make about the topic. The digital recorder was turned off after any

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[12] Particular care was taken to ensure interview timeslots for GPs did not encroach into their clinical time. For example, offering timeslots before or after clinics, or during their breaks.

additional remarks were made by the participant. To conclude the interview, I thanked the participant for their time and insights, and enquired whether they knew of others who would be interested to be interviewed.

The length of GP interviews took between 22 and 35 minutes, with an average of 29 minutes. Community pharmacist interviews took longer – between 32 and 62 minutes, with an average of 50 minutes. Consumer interviews were between 30 and 59 minutes, averaging 43 minutes. These interviews yielded over 900 pages of transcripts (11 font type, single-spaced).

Participants volunteered their time and were not remunerated. In line with university guidelines, appropriate participant incentives were offered. Each participant was given two movie vouchers or a movie gift card with the total value of $30. In addition, participants were offered a summary report of the research interviews. Interested participants were sent a short report in April 2016, after all interviews had been conducted and preliminary data analysis was completed (Appendix I). Five GPs, 11 community pharmacists, and 25 consumer participants received the short report.

Self-reflections were documented immediately after each interview using a template adapted from Miles, Huberman and Saldana (Appendix J, template adapted from (Miles, Huberman, & Saldana, 2014, p. 125)) regarding the interview process, observations of participants' non-verbal communication, and any new concepts/themes that could be explored in subsequent interviews.

3.4.6 Trustworthiness of qualitative research

Unlike quantitative work where research quality and rigour is determined by how well the study has demonstrated internal validity, generalisability, reliability and objectivity of its findings, qualitative research speaks of trustworthiness — whether others can trust that the research accurately reflects the situation being described. Guba's four criteria for ensuring and demonstrating trustworthiness — credibility, transferability, dependability and confirmability (Lincoln & Guba, 1985, p. 300), have been deemed the qualitative counterpart of quantitative research quality and rigour, and is widely used by researchers.

Credibility is gained through establishing a high level of confidence in the findings — in terms of (a) what was communicated by participants matched what was reported, and (b) the appropriate procedural conduct of research (Lincoln & Guba, 1985, p. 301). In my research, the following strategies were used to demonstrate credibility: member-checking was done in-process via regular para-phrasing, and a short report summarising the interviews were sent to all interested participants, to ensure their views were adequately captured. In addition, pertinent quotes from participants have been included in Chapter 4, to show how inductive codes were derived, and to demonstrate data-driven hypotheses. Where appropriate, competing/alternative explanations were offered and participant quotes that do not seem to "fit" the hypotheses have been surfaced. As a way to corroborate findings between the three participant groups, selected concepts gleaned from the community pharmacist interviews were introduced into the conversations with consumers. In turn, selected concepts from community pharmacist and consumer interviews were introduced into the conversations with GPs (the last participant group to be interviewed).

Transferability is the applicability of the research findings to other contexts (Lincoln & Guba, 1985, p. 316). While findings of qualitative research cannot be said to be generalizable, often due to non-representation of the population and/or the relatively small sample size when compared to quantitative research, they may be transferable to other situations or settings. The findings from these semi-structured interviews are transferable to metropolitan areas of other Australian states and territories, as they share similar diversity of population, primary health infrastructure and governance arrangements for training and for practice. For example, GP and pharmacist training for those trained in Australia are governed by the same national and accreditation standards set by the respective Boards — Medical Board or Pharmacy Board, and Councils — the Australian Medical Council and the Australian Pharmacy Council. Professional registration to practice as a GP or as a pharmacist, whether trained here or overseas, is nationally governed by the Australian Health Practitioner Regulation Agency (AHPRA).

Dependability or consistency of research processes, is demonstrated through a clear audit trail — a carefully conceived study, with clear research processes that are well documented and well conducted (Lincoln & Guba, 1985, p. 317). In my research, dependability was demonstrated through having standard procedures for key stages such as, recruitment (communication templates), interviews (booking and preparing for interviews, interview guides), and post-interview tasks (structured self-reflection notes, filing consent forms, transcription log). An adapted Jeffersonian Transcription

Notation (Appendix K) was used to ensure consistency during the transcription stage (Jefferson, 1984). A codebook was developed and used, to ensure consistency during deductive and inductive coding. Overall, a data management plan which was audited annually for compliance, was implemented.

Confirmability is the extent to which the research findings accurately reflect participant experiences and views, rather than researcher bias (Lincoln & Guba, 1985, p. 318). The findings of this research from the semi-structured interviews were coded according to a codebook. One percent of transcripts from each participant group was randomly selected for validation of coding by a second researcher (process detailed at the end of Section 4.1.1). Subsequent data analysis adhered to Fereday and Muir-Cochrane's clearly articulated steps to arrive at hypotheses (Fereday & Muir-Cochrane, 2006). Finally, a decision log was kept throughout the research to capture key decisions points and rationale for each decision.

3.4.7 Preparation of data for analysis

Interviews were fully transcribed verbatim from the audio recording. In order to better capture nuances of meaning, I used a naturalistic approach when transcribing where speech mannerisms such as emphases in intonation and hesitancy were noted, along with pauses, emotional expression such as laughter, sighs, as well as other non-verbal observations (Kvale, 2007e; Rubin & Rubin, 2012). An adaptation of the Jeffersonian Transcription Notation for transcribing was used (Jefferson, 1984). Notations used are shown in Appendix K.

Transcripts, and hence participants, were de-identified and labelled with a participant code. To preserve the anonymity of participants in research reports, only the participant code along with pertinent personal and practice characteristics were used. For example, GP02, GP for 6 years; or CS09, female, 31 years old. All transcripts were prepared in MS Word® format and uploaded into an information management software for qualitative research – NVivo® (Version 11.3.1.777; (2016)) for the purposes of coding and analysis. Contextual and demographic information for each participant (as described in Section 3.4.1 Development of interview guides) e.g. consumer age, gender, and highest education level achieved, were captured in an Excel® table and imported into NVivo® as a Source Classification Attributes matrix, enabling data queries for comparison between participants and analytic induction.

Details of coding and analysis are given in Chapter 4 (Section 4.1) along with how findings from the qualitative phase were used to inform the development of DCEs for the quantitative phase of the study (Section 4.6).

3.4.8 Strengths, limitations, and mitigating strategies

Strengths

Semi-structured interviews enabled the capture of participants' knowledge, lived experience and views, in their own words. Pre-determined outcomes were avoided, as these interactions, resulted in the co-creation of knowledge (Kvale, 2007b; Rubin & Rubin, 2012). The interviews were conducted one-on-one, which allowed participants to engage in unfettered commentary, to express their views openly and removed the social/professional need to conform to what other people/colleagues were saying.

The exclusivity of the interview session in its one-on-one, face-to-face format not only allowed follow up questions to be asked — in order to probe and explore with greater precision — but also afforded the opportunity to observe non-verbal communication from the participants.

Limitations and mitigating strategies

Positivists would deem limitations of semi-structured interviews as those inherent in its execution, in that each interview is unique and cannot be replicated by another researcher, or even the same researcher, with the same result. However, interpretivists would view non-replicability to be the nature of such research methods and hence, not a limitation per se. Non-replicability *does not* mean that the research was not well carried out or that the results were unreliable. Ways to ensure and demonstrate rigour and trustworthiness in qualitative research were well documented by Lincoln and Guba (1985) and applied in this research as previously described in Section 3.4.6.

The quality of the co-created knowledge in an interview is contingent on the skill of the researcher (Kvale, 2007d). My skills and experience in educational visiting/social marketing and active listening, served me well in the preparation and execution of these interviews. Conducting several pilot interviews prior to the actual interviews further enhanced my interviewing skills. In addition, the post-interview self-reflections documented immediately after each interview not only enabled me to improve in interview technique with each subsequent interview, but also to identify new questions for further exploration.

Scholars hold differing views regarding what constitutes an acceptable percentage of interview transcripts coded by a second or multiple coders to ensure reliability of codes (Barbour, 2001; Campbell, Quincy, Osserman, & Pedersen, 2013). Cited percentages of transcripts coded by more than one coder ranged from 0% (the argument being that even the same coder may be unable to perfectly code the transcript in the same way twice due to the complexity and nature of such qualitative analysis), to 100% (Barbour, 2001; Campbell et al., 2013; Glaser & Laudel, 2013). In order to balance resource constraints and code reliability, one percent of interview transcripts were coded by two researchers (outlined at the end of Section 4.1.1). Perhaps if all transcripts were coded by multiple coders a different number of codes or different descriptors for codes may have emerged due to the variety of backgrounds and worldviews of coders.

3.5 METHOD 2: DISCRETE CHOICE EXPERIMENTS

Discrete choice experiments (DCEs) have mainly been used in the field of health economics, such as in health technology priority setting from a societal perspective (Whitty, Ratcliffe, Chen, & Scuffham, 2014), for valuing health programs ranging from consumer to third-party payer perspectives (M. Ryan & Gerard, 2003), and for valuing SF-6D health states (Norman et al., 2013). Increasingly DCEs have been used in health services research(M Ryan, Gerard, & Amaya-Amaya, 2008), for example, to elicit patient preferences for health services (Gerard, Tinelli, Latter, Blenkinsopp, & Smith, 2012; Hall, Kenny, Hossain, Street, & Knox, 2013; M. Ryan, Bate, Eastmond, & Ludbrook, 2001; Wong et al., 2014) and health provider preferences for healthcare programs (Russo et al., 2016).

DCEs are based on an integrated behavioural theory of decision-making and choice behaviour — random utility theory — which states that utility can be described by a systematic (explainable) component and a random (unobservable) component (McFadden, 1974; M. Ryan & Gerard, 2003; M Ryan et al., 2008). DCEs also draw upon Lancaster's economic theory of value (Lancaster, 1966), which assumes that individuals derive utility not from the goods/service itself but from the characteristics (attributes) of the goods/service. When presented with choices, an individual would choose the alternative which maximises utility for themselves (Lancaster, 1966; McFadden, 1974; M Ryan et al., 2008). The results of DCEs are used to model preferences within a random utility maximisation (RUM) framework, represented by the following equation (McFadden, 1974; M Ryan et al., 2008):

$$U_{itj} = x_{itj}\beta_i + \varepsilon_{itj}$$

where,

U_{itj} is the utility individual *i* derives from choosing alternative *j*, in choice set t; x_{itj} is the vector of observed attributes; β_i is the vector of coefficients reflecting the desirability of the attributes; and ε_{itj} is the random error (unobservable).

Plainly stated, DCEs are structured surveys designed to elicit preferences from individuals in a way that can be quantified. It is a method for valuing different attributes that influence decision-making. The questions are framed to force a choice, to enable trade-offs to be quantified in making that choice, so as to understand the relative importance of the different attributes of interest (Lancsar & Louviere, 2008). In other words, the DCE is a way of finding out the strength of preference for attributes of goods or services.

DCEs use hypothetical scenarios where participants are asked to choose between two or more options. An example adapted from the WHO is shown in Figure 3 (World Health Organization, 2012b) where participants are asked to choose between Job A and Job B. In this example, there are four attributes that influence decision-making i.e. location, pay, housing and workload. Each attribute has two levels i.e. the location is urban or rural, pay per year is either $160,000 or $240,000, housing is provided or not, and the workload is either heavy or normal. The two jobs differ in a number of attributes. In making a choice between Job A and Job B, the participant is essentially trading off on these attributes.

It is worth pointing out that the attributes can be hypothetical, in that the salary for Job B in the example may be hypothetical and not reflective of the current market rates. This is useful for investigating and quantifying the probability of choice uptake, even when the attributes of goods or services described in the survey does not yet exist at that point in time (World Health Organization, 2012b).

Figure 3. Example of a choice set with four attributes and two levels from a DCE

	Job A	**Job B**
Location	Urban	Rural
Pay	$160 k/year	$240 k/year
Housing	No	Yes
Workload	Heavy	Normal
Which job do you prefer?	☐	☑

Continuing with the example in Figure 3, the participant has selected Job B. A series of such choice sets is posed to participants, with the levels of the attributes being varied each time to cover all possible permutations and combinations. Regression analysis is then used to uncover which attributes are more important in job selection.

The DCE was considered as the quantitative method for this study, as at the time, real-time patient level data was not available in the public domain for use by researchers.[13]

In the future, the NPS MedicineWise's *MedicineInsight* pilot currently underway will have de-identified real-time data for an estimated 2.5 million patients from GP desktops, to inform clinical practice improvement, discerning changes in prescribing behaviour and to inform policy making (NPS MedicineWise, 2013a).

At the time of planning this research in 2014, there were two sources of national data on antibiotic prescribing in the Australian primary healthcare sector:

- Family Medicine Research Centre at the University of Sydney — the Bettering the Evaluation and Care of Health (BEACH) reports (Britt et al., 2014, 2015), which collates general practice activity annually, from about 1000 GPs for 100 consecutive patients seen within a stipulated time period. However, the Australian government ceased funding the BEACH program from 30 June 2016, resulting in its closure after 18 consecutive years of what was a unique national

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[13] It was only in August 2016, that the Australian government released a de-identified subset of linkable Medicare Benefits Schedule (MBS) and Pharmaceutical Benefits Scheme (PBS) data for use by researchers.

study of GP prescribing practices involving over 11,000 GPs (Family Medicine Research Centre, 2016)

- Australian Statistics on Medicines (Department of Health, 2013), which consists of data on costs and volume from (a) subsidised prescriptions under the Pharmaceutical Benefits Scheme (PBS) and Repatriation Pharmaceutical Benefits Scheme (RPBS), and (b) a representative sample of community pharmacies to provide an estimate of the non-subsidised prescriptions i.e. private prescriptions and PBS prescriptions priced under the general patient co-payment

While these reports provided useful information on the conditions for which antibiotics were prescribed and the volume of antibiotics prescribed, they shed little light on key drivers influencing GPs to prescribe antibiotics, and none on how consumers use these antibiotic prescriptions.

As explained at the beginning of this section, DCEs have usually been used to reveal factors that drive selection of goods or services, and/or to test a hypothesis. However, DCEs can conceivably be used as an exploratory method to tease out trade-offs between given factors, rather than to test a hypothesis.[14] This research selected DCE as an exploratory method for the quantitative phase for the following reasons: (a) to build on the findings of the semi-structured interviews, (b) to elicit how GPs trade-off between factors that influence their prescribing behaviour, and (c) to elicit how consumers trade-off between factors that drive their antibiotic prescription-filling behaviour.

The use of DCEs as an exploratory method required adaptation, in that the attributes and levels were not characteristics of a product/good or service/test, but rather of the relevant personal and external circumstances related to the hypothetical scenario in the DCE. The trade-offs observed between factors, given the same hypothetical scenario,

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[14] Academic consultations during research design phase in 2014 with the following DCE experts: (a) Prof Jennifer Whitty — Professor of Health Economics, Norwich Medical School, University of East Anglia, UK (formerly at the School of Pharmacy, The University of Queensland, Australia), and (b) Prof Julie Ratcliffe — Professor in Health Economics, School of Medicine, Flinders University, Australia.

yielded valuable and useful applications for practice and for policy, discussed in Section 6.3.3.

3.5.1 Development of DCEs

Two DCEs were developed, one for GPs and another for consumers. A DCE was not developed for community pharmacists. Evidence from the literature (Chapter 2) and results from the semi-structured interviews (Chapter 4, Section 4.3) confirmed that community pharmacists in Australia have no *direct* influence on and are excluded from the decision-making process of when to use an antibiotic — unlike in countries where antibiotics are unregulated and available over-the-counter from community pharmacists. Therefore, a realistic scenario which was also relevant to policy and practice, could not be created for a community pharmacist DCE. This is established and discussed more fully in Chapter 4, Section 4.6.2.

There are several stages in developing, conducting and analysing DCEs (Bridges et al., 2011; Lancsar & Louviere, 2008; World Health Organization, 2012b). These are:

- Identification of attributes and levels;
- Deciding what choices to present to participants and experimental design (i.e. whether blocking is used);
- Development of the DCE survey;
- Administration of the refined DCE survey;
- Data entry and cleaning (i.e. preparation of data for analysis)
- Data analysis and interpretation

Expertise from Professor Jennifer Whitty, Professor of Health Economics at the University of East Anglia, UK, who is an established authority on DCEs, was sought in the development of both the consumer and GP DCEs.

3.5.2 Identification of attributes and levels

Prior to identifying attributes and levels for the DCEs, it was necessary to first clarify the decision points which would not only be realistic for participants, but also useful for policy and practice. Findings from the semi-structured interviews informed the identification of these decision points. The semi-structured interviews highlighted that there were several antibiotic "reservoirs" in the community — unused antibiotics, unused antibiotic prescriptions, delayed prescriptions[15], and repeat prescriptions[16], which provide consumers with opportunities for decision-making on whether, when and how they use antibiotics. For example, plausible decision points for consumers would be whether they chose to fill the antibiotic prescription and their behaviours thereafter in using the antibiotics. For GPs, a clear decision point would be in their decision-making of whether to prescribe an antibiotic, which in turn, contributes to the consumption of antibiotics in the Australian community.

Aspiring to an elegant design, a single hypothetical scenario was used for both the GP and consumer DCEs, which could incorporate the relevant decision points each would have to make. The hypothetical scenario was adapted from one used by Hardy-Holbrook et al. (Hardy-Holbrook et al., 2013), featuring an adult patient presenting with symptoms of a respiratory tract infection. The scenario for GPs included some clinical information, to more closely mimic reality.

The framing of the question for decision-making differentiates each DCE. Consumers were asked to choose between two situations where they would be more likely to fill a delayed prescription for antibiotics. This was to elicit trade-offs between attributes and levels influencing consumers' decision to fill — with intention to take, a delayed prescription for antibiotics. GPs were asked to choose between two situations where they would be more likely to prescribe antibiotics for a respiratory tract infection, which would reveal trade-offs between attributes influencing their decisions in this case. A secondary question was included in the GP DCE to ascertain the nature of the prescription — whether it was for immediate use or a delayed prescription (Figure 6

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[15] Delayed antibiotic prescription — a prescription given to a patient with instructions to use it only if their symptoms worsen or do not improve in a few days. The delayed prescription is usually given to the patient during the initial consultation, although some GPs prefer to leave the prescription with clinic reception for the patient to collect at a later date.

[16] Repeat prescriptions enable a regular re-supply of the prescribed medicine without the patient having to see the GP each time. The number of repeats is authorised by the GP on the original prescription. The Pharmaceutical Benefits Scheme (PBS) Schedule lists medicines and the maximum number of repeats subsidised under the scheme. Time intervals between supplies must meet PBS criteria.

shows the secondary question in one of the choice sets). Boxes 1 and 2, show the hypothetical scenario and question for decision-making, developed for the consumer and GP DCEs.

Box 1. Hypothetical scenario and question for decision-making — Consumer DCE
Imagine you have a runny nose, sneezing, a sore throat and a dry cough. You have managed these symptoms in your usual way, which may include a combination of rest, home remedies, vitamin supplements, commercial immune boosters, and cold/flu/cough products. As you are still feeling unwell, you decide to consult a doctor. After examining you, the doctor gives you a prescription for antibiotics because you can't come back for a reassessment in 2 days. <u>Question</u> Based on the scenario, as you leave the doctor's clinic, in which situation (A or B) would you be **more likely to fill the antibiotic prescription** (go to the pharmacy to get the antibiotics)?

Box 2. Hypothetical scenario and question for decision-making — GP DCE
An adult patient presents with a runny nose, sneezing, a sore throat and dry cough. They have managed these symptoms in their usual way, which may include a combination of rest, home remedies, vitamin supplements, commercial immune boosters, and cold/flu/cough products. As they are still feeling unwell, they decided to consult a doctor (you). The patient has no significant past medical history. On examination, their temperature (tympanic) is 37.8°C, throat appears slightly red and there is no exudate or cervical lymphadenopathy. Chest is clear. <u>Question</u> Based on the scenario, in which situation (A or B) would you be **more likely to prescribe an antibiotic** for the patient?

DCE attributes and levels relevant to these decision points were then identified from the TDF mapping of the literature review (Chapter 2) as well as those that emerged from the semi-structured interviews. Section 4.6 steps through the process in detail (Coast & Horrocks, 2007; Wong et al., 2014).

Five attributes of either two or three levels each, were identified for both the consumer and the GP DCEs. The two sets of attributes and levels, together with respective *a priori* assumptions, are shown in Tables 6 and 7.

Table 6. Attributes and Levels — Consumer DCE

Attributes	**Attribute text**	**Levels**	**Design Coding**	***A priori* assumptions**
Duration of symptoms	Duration: You have had symptoms for	1 week 2 weeks 3 weeks	0 1 2	In general, a positive preference for filling the script, the longer the duration of symptoms.
Life event	Life event: You have an important event or a deadline coming up	No Yes	0 1	In general, a positive preference for filling the script, if an important life event was coming up.
Time off	Time off: You are able to take time off from work/study to recover	No Yes	0 1	In general, a positive preference for filling the script, if not able to take time off to recover from symptoms.
Doctor's advice	Doctor's advice	Says it's probably a viral infection and antibiotics won't help Says you decide whether to take the antibiotics or not Says to start antibiotic treatment if you feel worse or no better in 2 days	0 1 2	In general, a positive preference for filling the script, if the doctor says to start antibiotic treatment if no better in 2 days.
Past experience	Past experience: You have taken antibiotics for similar symptoms before	No Yes	0 1	In general, a positive preference for filling the script, if the consumer had taken antibiotics for similar symptoms before.

Table 7. Attributes and Levels — GP DCE

Attributes	**Attribute text**	**Levels**	**Design Coding**	***A priori* assumptions**
Duration of symptoms	Duration: Patient has had symptoms for	1 week 2 weeks 3 weeks	0 1 2	In general, a positive preference for prescribing antibiotics, the longer the patient's duration of symptoms.
Life event	Life event: Patient has an important event or a deadline coming up	No Yes	0 1	In general, a positive preference for prescribing antibiotics (if indicated), if patient has an important life event coming up.
Reassessment	Reassessment: Patient is able to return for reassessment	No Yes	0 1	In general, a negative preference for prescribing antibiotics if patient is able to return for reassessment.
Familiarity with patient (medical history, existing doctor-patient relationship/rapport)	Familiarity with patient	New patient Regular patient	0 1	In general, a negative preference for prescribing antibiotics if this is a regular patient (assumption: the doctor had "trained" the patient that antibiotics are not always needed to get better. So time had already been invested to explain this previously).
Patient's expectations	Patient's expectations	Says they want antibiotics Says they don't want antibiotics unless necessary Says they want reassurance	0 1 2	In general, a negative preference for prescribing antibiotics if patient indicates they want reassurance (or that they don't want antibiotics unless necessary).

3.5.3 Choices to present and experimental design

In this section, I explain the processes and substantiate the decisions made concerning the experimental design, according to recognised research practices stated in the ISPOR Task Force Report (Johnson et al., 2013). The consumer DCE is first discussed in detail. The GP DCE follows much of the same rationale — exceptions or differences will be pointed out.

Consumer DCE

The consumer DCE contained a total of 5 attributes — 3 attributes of 2 levels each, and 2 attributes of 3 levels each. The number of attributes is in line with other DCE studies. Marshall et al. reports that 70% of conjoint analysis studies include between 3 and 7 attributes (Marshall et al., 2010). Given the number of attributes and levels for the consumer DCE, there were 72 choice profiles, as

Number of choice profiles = $2^3 \times 3^2 = 72$

The consumer DCE presented a pair of choice profiles per choice set, and participants would choose between the two choice profiles. Hence, for a full factorial experimental design, there would be 2556 choice sets, as

Number of choice sets = $(72 \times 71) / 2 = 2556$ for full factorial design

While desirable from a data modelling perspective, a full factorial design presenting 2556 choice sets would be too burdensome for any one participant to complete. Instead, a fractional factorial design was selected, so as to reduce cognitive and time burdens for participants. In the fractional factorial design each participant would only be presented with a subset — a small block, of choice sets.

A D-optimal design — the optimal orthogonal in the differences design (OOD), was decided upon to estimate main effects (Choice Metrics, 2014). As indicated by its name, the OOD is orthogonal and optimally efficient. It assumes zero priors, which was appropriate for this research. The OOD is also optimised for estimation using either multinomial logit (MNL) or mixed logit (MXL) models (Choice Metrics, 2014).

Effects coding was used due to the largely qualitative nature of the attribute levels (Choice Metrics, 2014; M Ryan et al., 2008).

The syntax[17] created for input into the NGENE® software (Version 1.1.2; (2014))to generate an experimental design with two blocks and effects coding, was:

Box 3. Syntax — Consumer DCE

```
Design
; alts = sitA, sitB
; rows = 24
; block = 2
; orth = ood
; model:
U(sitA) = b1 +
b2[0|0].effects*A[0,1,2] +
b3[0].effects*B[0,1] +
b4[0].effects*C[0,1] +
b5[0|0].effects*D[0,1,2] +
b6[0].effects*E[0,1]
/
U(sitB) = b2*A + b3*B + b4*C + b5*D + b6*E
$
```

NGENE® returned an experimental design with 36 rows (as one with 24 rows could not be found), a desirable D-optimality of 100% — indicating efficiency, and a correlation matrix of zero (C matrix). The experimental design was manually checked for level balance and minimal overlap — which were achieved.

An experimental design with 36 rows meant that each block would consist of 18 choice sets. Of these, one choice set per block was duplicated, so that participant consistency

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[17] The number of rows for DCEs must be (a) at least 10, (b) greater than the number of parameters being estimated, and (c) divisible by the number of levels per attribute — 2 and 3 in this case (Prof Jennifer Whitty, academic consultation, June 2016). As the choice sets would be presented in 2 blocks, 24 rows would yield a design with 2 blocks of 12 choice sets each.

in trade-offs could be checked — bringing the total number of choice sets per block to 19. Nineteen choice sets is well within the range of 2 to 35 in published conjoint analysis studies, where the majority (93%) presented 20 or less choice sets (Marshall et al., 2010).

The choice sets selected (one in Block 1, the other in Block 2) for intra-participant consistency checks were those in which one of the choice profiles was most aligned to the *a priori* assumptions outlined previously. Hence, from the original set of 18 choice sets, choice set #18 (NGENE® design output row 32) was duplicated for Block 1, while choice set #3 (NGENE® design output row 13) was duplicated for Block 2. To be useful as a consistency check, the duplicate choice sets must not be obvious to the participant i.e. presented consecutively or too close together in the DCE survey sequence. The ISPOR Task Force Report is silent on best practice in the selection and placement of duplicate choice sets within the DCE survey (Johnson et al., 2013). Published studies have duplicated the first or second choice set, as the final or penultimate choice set. For the consumer DCE comprising of 19 choice sets per block (including the duplicate), the selected choice sets to duplicate were placed as choice set #3 and choice set #18, in the survey sequence.

GP DCE

The GP DCE comprised a total of 5 attributes — 2 attributes of 3 levels each, and 3 attributes of 2 levels each. Hence, 72 choice profiles were available (Choice Metrics, 2014), as

$$\text{Number of choice profiles} = 3^2 \times 2^3 = 72$$

Similar to the consumer DCE, the GP DCE presented a pair of choice profiles per choice set, and participants would choose between the two choice profiles. Hence, for a full factorial experimental design, there would be 2556 choice sets (Choice Metrics, 2014), as

$$\text{Number of choice sets} = (72 \times 71) / 2 = 2556 \text{ for full factorial design}$$

The decisions and rationale for the experimental design are the same as that for the consumers. The syntax created for input into the NGENE® software (Version 1.1.2; (2014)) to generate an experimental design with two blocks and effects coding, was:

Box 4. Syntax — GP DCE

```
Design
; alts = sitA, sitB
; rows = 24
; block = 2
; orth = ood
; model:
U(sitA) = b1 +
b2[0|0].effects*A[0,1,2] +
b3[0].effects*B[0,1] +
b4[0].effects*C[0,1] +
b5[0].effects*D[0,1] +
b6[0|0].effects*E[0,1,2]
/
U(sitB) = b2*A + b3*B + b4*C + b5*D + b6*E
$
```

NGENE® returned an experimental design with 36 rows (as one with 24 rows could not be found), a desirable D-optimality of 100% — indicating efficiency, and a correlation matrix of zero (C matrix). The experimental design was manually checked for level balance and minimal overlap — which were achieved.

The choice sets selected (one in Block 1, the other in Block 2) for intra-participant consistency checks were those in which one of the choice profiles was most aligned to the *a priori* assumptions outlined previously. Hence, from the original set of 18 choice sets, choice set #16 (NGENE® design output row 32) was duplicated for Block 1, while choice set #7 (NGENE® design output row 11) was duplicated for Block 2. For the GP DCE comprising of 19 choice sets per block (including the duplicate), the selected choice sets to duplicate were placed as choice set #3 and choice set #18, in the survey sequence.

Forced choice

In both the consumer and GP DCEs, the participants were asked to choose one of two choice profiles i.e. select either Situation A or Situation B. During the development phase of both DCEs, a "neither" option (opt-out) was considered, but not offered for the following reasons:

- A "neither" option would offer participants a choice which is likely to be deemed socially desirable. Hence, there was a high risk that trade-offs would not be observed, if participants often or always selected the "neither" option;
- Not offering the "neither" option would force a choice to be made between Situation A and Situation B;
- The intent of the DCEs were not to estimate or predict the demand for antibiotics, but in identifying the factors most likely to influence the decision to fill an antibiotic prescription — in the case of consumers, or to prescribe an antibiotic — in the case of GPs. Understanding how trade-offs in these DCEs are made will inform the creation of more precise key messages for public health campaigns, appropriate healthcare interventions, and healthcare/training resources to support GPs as stewards of antibiotic use

In order to mitigate the fact that a "neither" option was not offered, the decision questions posed to participants were deliberately worded to reflect the constraints of the DCE survey — stating what they say they may do, rather than what they would actually do. For example, in the consumer DCE, the decision question was: "Based on the scenario, as you leave the doctor's clinic, in which situation (A or B) would you be **more likely to fill** the antibiotic prescription?", rather than the more definitive, "... in which situation (A or B) would you fill the antibiotic prescription?" Similarly, the decision question for the GP DCE was: "Based on the scenario, in which situation (A or B) would you be **more likely to prescribe** an antibiotic for the patient?", rather than the more definitive, "... in which situation (A or B) would you prescribe ...?"

The use of "nested" choice sets was also considered in the development phase of the DCEs. "Nested" choice sets first present a forced choice i.e. choose between Situation A and Situation B, then ask "What would you really do?" — presenting the participant with the additional "neither" option (Figure 4). A draft DCE presented as an adaptation of "nested" choice sets was piloted using the same hypothetical scenarios outlined previously in Section 3.5.2. However, feedback from pilot participants indicated that (a) the "nested" choice sets were confusing, (b) it undermined the DCE and their decisions, as they had already chosen either Situation A or B with the intention to take the antibiotic, (c) it changed how they responded to subsequent choice sets after completing the first "nested" choice set. Given these considerations, "nested" choice sets were not used in the consumer and GP DCEs.

Figure 4. An example from the pilot of "nested" choice sets

Based on the scenario, as you leave the doctor's clinic, in which situation (A or B) would you be **more likely to fill** the antibiotic prescription (go to the pharmacy to get the antibiotics)?

	Situation A	Situation B
Duration: You've had symptoms for	1 week	2 weeks
Life event: You've an important event or a deadline coming up	Yes	No
Time off: You're able to take time off from work/study to recover	No	Yes
Doctor's advice:	Says to start antibiotic treatment if you feel worse or no better in 2 days	Says it's probably a viral infection and antibiotics won't help
Past experience: You've taken antibiotics for similar symptoms before	Yes	No
I would be more likely to fill the antibiotic prescription in … (Please select one)	Situation A ☐	Situation B ☐

In reality, what would you have done?

☐ Filled the antibiotic script in the situation I have chosen above, and taken it

☐ Filled the antibiotic script in the situation I have chosen above, but may not take it

☐ Would not have filled the antibiotic script in either situation

3.5.4 Development of the DCE survey

Following the identification of attributes and levels, as well as experimental designs for both the consumer and GP DCEs, the DCE surveys were developed. Each survey comprised of three parts:

- Section A — selected demographics (11 questions);
- Section B — DCE choice sets (19 choice sets); and
- Section C — questions pertaining to attribute attendance/non-attendance, multi-choice question/s using the same hypothetical scenario, questions to gauge participant perception of the survey (consumer survey: 5 questions plus a free-text box for additional comments, GP survey: 4 questions plus a free-text box for additional comments)

Each DCE survey[18] was preceded by screening questions to ensure that only participants meeting the inclusion criteria, participated. Consumers were eligible to participate if they were at least 18 years old and residing in Australia. Consumers who were adamantly against any use of antibiotics were not eligible to participate. GPs were eligible to participate if they were practising in Australia. GPs who worked primarily for an after-hours medical deputising service were not eligible to participate, as this research focussed on those practising in primary healthcare clinics. The GP DCE survey was open to both GPs and GP Registrars.

Each DCE survey was piloted to ensure appropriateness of the framing, attributes and levels, and clarity of instructions. The consumer DCE survey was piloted in two iterative cycles with two different consumers each time. Feedback from pilot participants indicated that the framing, attributes and levels were relevant and realistic. Suggestions for layout and instructions were used to further refine the survey after each pilot. Likewise, the GP DCE survey was piloted with a GP and GP Registrar and refined after each pilot.

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[18] DCE survey — refers to the whole research instrument comprising of Sections A, B and C as outlined in Section 3.5.4 above. DCE e.g. consumer DCE or GP DCE refers to Section B only — DCE choice sets.

Appendices J and K show the final version of the consumer and GP DCE surveys, prior to being html coded for upload onto the QUT approved online survey platform — Key Survey® (Version 8.7.5; (2016)). Figures 5 and 6 shows a choice set from the consumer and GP DCE surveys, respectively.

Figure 5. Consumer DCE Survey — Block 1 Choice Set 5

Based on the scenario, as you leave the doctor's clinic, in which situation (A or B) would you be more likely to fill the antibiotic prescription (go to the pharmacy to get the antibiotics)?

	Situation A	Situation B
Duration: You've had symptoms for	1 week	2 weeks
Life event: You've an important event or a deadline coming up	No	Yes
Time off: You're able to take time off from work/study to recover	No	Yes
Doctor's advice:	Says it's probably a viral infection and antibiotics won't help	Says you decide whether to take the antibiotics or not
Past experience: You've taken antibiotics for similar symptoms before	No	Yes
I would be more likely to fill the antibiotic prescription in … (Please select one)	Situation A ☐	Situation B ☐

Figure 6. GP DCE Survey — Block 2 Choice Set 17

Based on the scenario, in which situation (A or B) would you be more likely to prescribe an antibiotic for the patient?

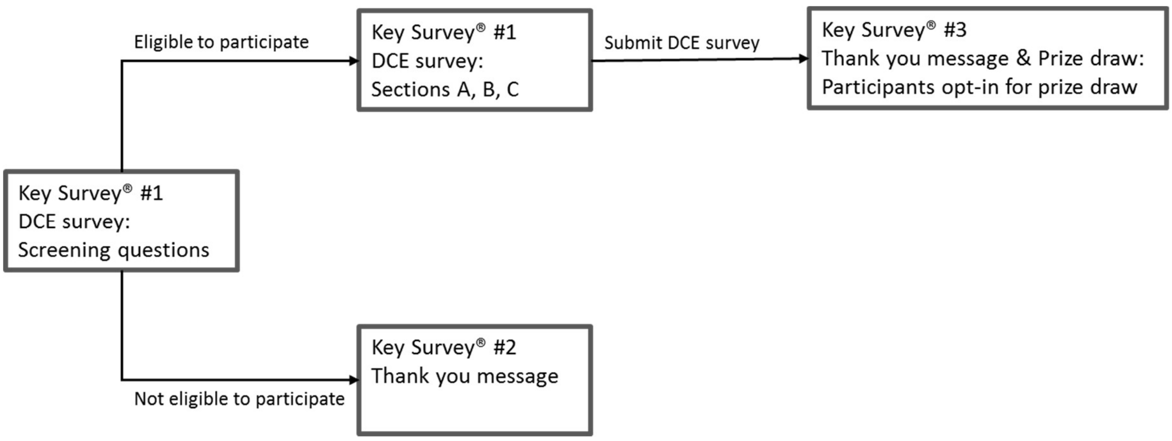
	Situation A	Situation B
Duration: Patient has had symptoms for	2 weeks	3 weeks
Life event: Patient has an important event or a deadline coming up	No	Yes
Reassessment: Patient is able to return for reassessment	Yes	No
Familiarity with patient	New patient	Regular patient
Patient's expectations	Says they want reassurance	Says they want antibiotics
I would be more likely to prescribe an antibiotic in … (Please select one)	Situation A ☐	Situation B ☐

And this antibiotic prescription would be?

☐ For immediate use

☐ A delayed prescription

For both the consumer and GP DCE surveys, survey logic was encoded to: (a) link the surveys, and (b) allow the following workflow on the Key Survey® online platform.



Put another way, each DCE survey comprised of three linked surveys in Key Survey®. Each DCE survey was tested to ensure that (a) the workflow was functional, and (b) participants would be randomly presented with choice sets from either Block 1 or Block 2 for Section B of the DCE surveys. The tested surveys were then approved and activated for public release, as per the QUT Key Survey® protocol (Gee, 2015, pp. 74-75).

3.5.5 Sample size

Currently there is no formal consensus on what constitutes an appropriate sample size for conjoint analysis studies, nor is there a definitive statistical formula for calculating sample size (Marshall et al., 2010). Therefore, an accepted rule of thumb within the field was used to calculate a minimum sample size — proposed by Orme (Marshall et al., 2010),

$$\frac{n \times t \times a}{c} \geq 500$$

where, n is the number of respondents, t is the number of tasks (or choice sets), a is the number of alternatives per task, and c is the number of analysis cells (the largest number of levels for any one attribute in the case of main effects) (Marshall et al., 2010). Solving for n, gives this equation:

$$n \geq \frac{500 \times c}{t \times a}$$

Given the following values (Box 7) for the consumer and GP DCEs, the minimum sample size per block was calculated to be 42. Therefore, the minimum sample size for each DCE survey was 84, as it comprised of 2 blocks.

$$n \geq \frac{500 \times 3}{18 \times 2} = 41.67$$

rounding up,

$$n \geq 42$$

Box 7. Values to calculate minimum sample size		
	Consumer DCE (per block)	GP DCE (per block)
t (number of tasks or choice sets)	18*	18*
a (number of alternatives per task)	2	2
c (number of analysis cells)	3	3
*The duplicated choice set is not included in this number. Hence, t is 18.		

3.5.6 Administration of the DCE surveys

Both DCE surveys on the Key Survey® platform (Version 8.7.5; (2016)) were publicly released on 25th July 2016 for two months, with survey closure initially set at 30th September 2016. The closure date for both surveys was extended by a month to 31st October 2016 due to: (a) low participation of the GP DCE survey evident by week 4 of the public release, (b) inclusion of the RACGP and ACRRM national conferences for GP DCE recruitment, and (c) inclusion of SONA — the QUT Psychology Research Management System for consumer DCE recruitment. Approval by the QUT Human Research Ethics Committee was obtained prior to the extension of the closure date and the inclusion of additional avenues for participant recruitment.

Participant recruitment for consumer DCE

The recruitment strategy used for the consumer DCE survey was via the university, consumer organisations and social media, as follows: (a) dissemination via the QUT Institute of Health and Biomedical Innovation (IHBI) email list, and IHBI social media avenues such as Yammer posts and IHBI LinkedIn page, (b) posting on the IHBI research webpage, (c) posting on SONA — the QUT Psychology Research Management System, (d) advertising in QUT Classifieds via the Student Guild, (e) flyers at all six QUT Health Clinics, (f) approaches to Consumers Health Forum (CHF) Australia — the national peak body for consumers in healthcare, (g) approaches to five state-based consumer organisations — Health Consumers NSW, Health Care Consumers' Association of the ACT, Health Consumers Alliance of South Australia, Health Consumers Queensland, Health Consumers' Council WA, (h) eNews of the Primary Health Care Research and Information Service (PHCRIS), and (i) posting on social media such as Facebook® and Twitter® at intervals, and to coincide with dissemination by some of the state-based consumer organisations e.g. Health Consumers Queensland, Health Consumers NSW.

At the research planning stage additional avenues for recruitment of consumers were explored, such as online consumer panels and "piggy-backing" on other researchers' consumer groups i.e. sending the survey to a consumer cohort already engaged in another study. Online consumer panels for DCEs were estimated to cost about

$20,000[19] and were therefore beyond the budget allocated for a PhD study. Piggy-backing on other researchers' consumer group was explored[20] and deemed unsuitable. The issues which surfaced were: (a) additional burden to the consumer group, (b) careful timing of the survey was required so as not to jeopardise the aims of the original research, (c) often these groups were part of ongoing research and consent to participate had already been obtained. More importantly, the approved research ethics for the original work was unlikely to have included a clause to enable the addition of surveys from another researcher or research group.

Participant recruitment for GP DCE

The recruitment strategy for the GP DCE survey included dissemination via professional networks, professional colleges/bodies, Primary Health Networks (PHNs), GP Registrar regional training organisations, GP conferences and social media. In other words, the recruitment was via the following: (a) Primary Health Care Research and Information Service (PHCRIS) eNews, and approaches to (b) General Practice Registrars Australia (GPRA) — the peak body representing 25,000 medical students, pre-vocational doctors and GP Registrars, (c) all eleven GP Registrar Regional Training Organisations nationally, (d) all thirty-one Primary Health Networks (PHNs) nationally, (e) The Royal Australian College of General Practitioners (RACGP), (f) the Australian Rural and Remote College of Medicine (ACRRM), (g) national conferences of the RACGP and ACRRM, and (h) posting on social media such as Twitter® at intervals, and to coincide with dissemination by RACGP and some of the PHNs e.g. Gold Coast PHN, Murrumbidgee PHN.

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[19] Academic consultations with DCE experts, Prof Julie Ratcliffe (2014) and Prof Jennifer Whitty (2014).

[20] Academic consultation with Prof Philip Baker in his role as Faculty Research Advisor (2014), Prof Nicholas Graves in his role as Associate Supervisor (2014), and the QUT Office of Research, Ethics and Integrity (2014).

3.5.7 Preparation of data for analysis

No data entry was required for the consumer and GP DCE surveys which were completed online through Key Survey®. Survey data collected via Key Survey® were displayed in spreadsheets which were re-formatted and cleaned as part of the process of preparing data for analysis. Completed surveys which contained unmatched duplicated choice sets were excluded from data analysis, as this may indicate that the respondent was not attending sufficiently to the choice sets. However, for completeness, model estimates for full datasets — matched and unmatched duplicated choice sets — are presented in Appendix N.

For DCE surveys that passed the consistency checks (matched duplicated choice sets), the responses to the repeated choice sets were excluded from data analysis i.e. only responses to choice set #3 were included and not responses to choice set #18, as #18 is a duplicate of #3. Data analysis was done using NLOGIT® (Version 6; (2016)) software (see Chapter 5, Section 5.1.1).

Data entry onto a spreadsheet was not required for hardcopies of GP DCE surveys disseminated at the RACGP and ACRRM national conferences, as no surveys were returned.

3.5.8 Strengths and limitations

DCEs allow preferences to be quantified, and hence, compared. Attributes that could potentially influence choice which may or may not currently exist, not exist consistently, or not made explicit, can be created and included. Further, multiple regression techniques allow an understanding of how participants trade-off on these attributes and levels, which can then be interpreted to inform policy and practice.

As a method DCEs are limited in that participants are asked to make decisions based on hypothetical scenarios. Hence, the findings of a DCE would need to be validated by other means e.g. real-time data if available. Additionally, DCEs rely on what participants say they would do (stated preference), not what they actually do (revealed preference). As such, comparison of the findings of the GP DCE against data from *MedicineInsight* when available in the future, will yield valuable information.

3.6 HUMAN RESEARCH ETHICS

An ethics application for low/negligible risk research in line with the National Statement on Ethical Conduct in Human Research was submitted to the QUT Human Research Ethics Committee (HREC) for consideration (The National Health and Medical Research Council, Australian Research Council, & Australian Vice-Chancellors' Committee, 2007). Ethics approval was originally granted on 8th April 2015 — HREC approval number: 1500000190 (Appendix O).

The QUT HREC subsequently approved all variations to the original application as follows: (a) 24th September 2015 — addition of GP Registrars as part of GP cohort, and (b) 5th September 2016 — addition of the QUT Psychology Research Management System (SONA) as an avenue for recruitment for consumer DCE surveys, and distribution of hardcopies of GP DCE surveys at the national RACGP and ACRRM conferences.

3.7 DATA MANAGEMENT

A data management plan was prepared and adhered to, in line with the university's requirements, to ensure appropriate and secure handling of research data. An annual review was completed in 2015 and 2016 (data collection years) to ensure currency of the plan.

3.8 SUMMARY

This chapter began with a brief discussion and justification of pragmatism as the research paradigm and the mixed methods research design selected. A schematic diagram illustrated the research design, research cycle and the points at which "mixing" occurred — and clearly showed how these elements taken together, addressed the research aim and research questions. Justification of the selected qualitative method — semi-structured interview, the development of the interview guides, sampling and recruitment, the conduct of interviews, and the preparation of data for analysis, were detailed. The justification of the selected quantitative method — DCE, the development of the research instruments — the DCE surveys, sampling and recruitment, the conduct of the DCE surveys, and the preparation of data for analysis, were then discussed. Research issues such as the low uptake of GP DCEs were flagged, along with mitigating steps — extension of survey closure date and hardcopies of the survey disseminated at two national GP conferences. The strengths and limitations of both methods were detailed in their respective sections.

In the next two chapters, the results from the semi-structured interviews (Chapter 4) and DCEs (Chapter 5) are reported.

Chapter 4: **What influences antibiotic use from the perspectives of GPs, community pharmacists and consumers? — Data analysis and results of semi-structured interviews**

In this chapter, data analysis and results of the qualitative component — semi-structured interviews, are presented in answer to Research Question 1: What influences antibiotic use from the perspective of GPs, community pharmacists and consumers? The chapter begins with a description of the data analysis — from coding and categorisation, to the development of main concepts and themes. Next, research findings from each of the participant groups are reported separately, before being drawn together into a cohesive whole which elucidates how these concepts/themes could be linked across participant groups, using a model developed from the data — the Enabling Antibiotic Eupraxis (EABE) model. This is followed by a bridging section at the end of the chapter (Section 4.6), which briefly describes how selected concepts/themes were then used to shape the development of the quantitative research instrument — the discrete choice experiments (detailed development of the discrete choice experiments has been provided in Chapter 3, Section 3.5.4).

Sampling and recruitment, and the determination of sample size, were dealt with in Chapter 3, Section 3.4.2. Time and sequencing of interviews were detailed in Chapter 3, Section 3.4.4. Justification for trustworthiness of findings was given in Chapter 3, Section 3.4.6, while verification of coding is explained in this chapter, at the end of Section 4.1.1.

Parts of this chapter have been presented at the 9th Health Services and Research Policy Conference, Melbourne, Australia, December 7 – 9, 2015, under the auspices of the Health Service Research Association Australia and New Zealand (HSRAANZ). An abstract was published in the conference proceedings (Lum, Page, Nissen, Doust, & Graves, 2015).

4.1 DATA ANALYSIS

The transcripts were coded to identify categories and themes, where the analysis was focused on meaning rather than on linguistic form (Kvale, 2007a). A blend of deductive and inductive coding was used (Fereday & Muir-Cochrane, 2006). For deductive coding, a codebook was developed *a priori*, based on both the main interview questions and the Theoretical Domains Framework (TDF). Data-driven inductive coding was done using an eclectic combination of coding methods i.e. descriptive, initial, In Vivo, and theming the data (outlined under Inductive coding in Section 4.1.1) (Saldana, 2013). Following first cycle coding, code mapping was used as a transition method to surface categories. Three iterations of code mapping were completed to theme the data into higher order concepts/themes (Fereday & Muir-Cochrane, 2006; Saldana, 2013). A model arose out of the third iteration, both to explain the phenomenon of what influences antibiotic use, as well as to enable a theory-informed practice of mitigating antibiotic resistance.

Though the coding and analysis are described in a linear way, the actual processes were iterative in nature, particularly for inductive coding. For example, refining inductive codes as coding progressed, checking refined codes against earlier transcripts coded, and making any necessary adjustments to ensure consistency in interpretation.

4.1.1 Coding — First cycle

Deductive coding

Deductive coding was based on the codebook developed *a priori* from the TDF and main interview questions. A total of 34 codes were defined and described, as shown in the following table.

Table 8. Codes developed *a priori* for deductive coding from the Theoretical Domains Framework and main interview questions

Label	Definition/Description
TDF D1 Knowledge	An awareness of the existence of something. For example, GP's knowledge of clinical features, sequelae and treatment of bacterial and viral infections. For example, consumer's knowledge of management of common side effects of antibiotics.
TDF D2 Skills	An ability or proficiency acquired through practice. For example, more experienced GPs have well established strategies for dealing with patients wanting antibiotics.
TDF D3 Social/Professional role and identity	A coherent set of behaviours and displayed personal qualities of an individual in a social or work setting. For example, GP's role and responsibility to manage diagnostic uncertainty. For example, consumer's role as a parent/carer.
TDF D4 Beliefs about capabilities	Acceptance of the truth, reality or validity about an ability, talent or facility that a person can put to constructive use. For example, pharmacist's or consumer's view that GPs are better placed to make the decision whether an antibiotic is needed or not.
TDF D5 Optimism	The confidence that things will happen for the best or that desired goals will be attained. For example, the view that medical technologies will help to overcome antibiotic resistance.
TDF D6 Beliefs about consequences	Acceptance of the truth, reality or validity about outcomes of a behaviour in a given situation. For example, GP's or pharmacist's view of the potential adverse impact of getting the management of a patient wrong. For example, consumer's view of how antibiotics affect their body.
TDF D7 Reinforcement	Increasing the probability of a response by arranging a dependent relationship, or contingency, between the response and a given stimulus. For example, consumer's strategy for remembering to take antibiotics as prescribed by using visual cues or apps.
TDF D8 Intentions	A conscious decision to perform a behaviour or a resolve to act in a certain way. For example, GP's intention to prescribe antibiotics according to Therapeutic Guidelines (which are accepted as best practice nationally in Australia).
TDF D9 Goals	Mental representations of outcomes or end states that an individual wants to achieve. For example, consumer's practice of keeping healthy in order to avoid falling ill.
TDF D10 Memory, Attention and Decision processes	The ability to retain information, focus selectively on aspects of the environment and choose between two or more alternatives. For example, GP's processes for making treatment decisions. For example, pharmacist's processes for making self-care recommendations to consumers.

TDF D11 Environmental context and resources	Any circumstance of a person's situation or environment that discourages or encourages the development of skills and abilities, independence, social competence, and adaptive behaviour. For example, time constraints for GPs to educate the patient on why an antibiotic is not needed to treat their current illness.
TDF D12 Social influences	Those interpersonal processes that can cause individuals to change their thoughts, feelings or behaviours. For example, consumer being positively influenced by their GP due to good doctor-patient relationship established. For example, influence on the consumer from friends, family or life partner, regarding attitudes toward or behaviours around antibiotic use.
TDF D13 Emotion	A complex reaction pattern, involving experiential, behavioural and physiological elements, by which the individual attempts to deal with a personal matter or event [definition adapted from the TDF]. For example, feelings of frustration, fear of being negatively evaluated by another person, and so forth.
TDF D14 Behavioural regulation	Anything aimed at managing or changing objectively observed or measured actions. For example, GPs receiving personalised feedback reports on their antibiotic prescribing patterns from NPS MedicineWise via the Federal Department of Health. For example, GP explaining to patient why antibiotics have to be used in a certain way, in order to increase adherence to prescribed antibiotics.
AB behaviours	Behaviours related to antibiotic use, including disposal. For example, adherence and handling missed doses.
AB side effects experienced	Side effects experienced due to taking antibiotics, and how consumers managed them.
AB prescribing challenges	Challenges experienced by GPs regarding antibiotic prescribing. For example, when the patient expects or demands antibiotics.
ABR affect health	Views from multiple sources i.e. consumers, pharmacists, GPs, on the extent antibiotic resistance could affect their personal health or family's health.
ABR and prescribing decisions	Whether GPs think about antibiotic resistance when making prescribing decisions
ABR community and timeframe	Views on whether antibiotic resistance is an issue that would affect the community, and how far into the future i.e. is this an issue now or some (stated) time in the future?
ABR meaning	The meaning attributed to the phrase “antibiotic resistance”, by people i.e. consumers, pharmacists, GP. For example, what comes to mind when you hear the phrase “antibiotic resistance”?
ABR What consumers can do	Views from multiple sources i.e. consumers, pharmacists, GPs, on what consumers can do to help address antibiotic resistance.

ABR What GPs can do	Views from multiple sources i.e. consumers, pharmacists, GPs, on what GPs can do to help address antibiotic resistance.
ABR What pharmacists can do	Views from multiple sources i.e. consumers, pharmacists, GPs, on what pharmacists can do to help address antibiotic resistance.
Addressing AB expectations	How GPs address patient expectations or demands for antibiotics.
Approach to AB use	Their personal approach to antibiotic use as a private individual i.e. consumers, pharmacists and GPs in their personal life.
Clinical approach and DM	GP's clinical approach and decision-making processes when thinking through whether the patient needs antibiotics for respiratory tract infections.
Consumer responses AB not prescribed	Consumer's responses to GP's decision not to prescribe an antibiotic (antibiotic not needed) or the doctor said no antibiotics were needed.
Delayed AB	Views on the use of delayed antibiotic prescriptions. For example, consumer's views and responses if the GP prescribed delayed antibiotics as a contingent measure. For example, GP's views on the usefulness (and place, if any) for delayed antibiotic prescriptions.
Patient expectations	Consumer's expectations regarding the GP consultation.
Perspective risk of AB	Views on the risks of using antibiotics. For example, GP's perspective on the risk of prescribing antibiotics; consumer's perspective on the risk of taking antibiotics.
Repeat scripts	Views on the use of repeat antibiotic prescriptions. For example, pharmacist's handling of repeat antibiotic prescriptions presented for dispensing by the consumer, months after the original prescription was dispensed. For example, GP's views on the usefulness/need for repeat antibiotic prescriptions.
Self-management strategies CC	Self-management strategies for the common cold: what the pharmacist would usually advice consumers to try; what self-management strategies consumers would usually use.
Time lag seeking GP consult	How long people would wait before seeking a GP consult. For example, how long consumers would wait before seeking a GP consult.

Inductive coding

Inductive coding was data-driven — additional codes not previously defined in the codebook — were created for segments of meaningful data found in the interview transcripts. The following eclectic combination of coding methods were used: descriptive, initial, In Vivo, and theming the data (Saldana, 2013). Each coding method is briefly explained below and illustrated with a code from the research interviews.

Descriptive coding captures in a word — usually a noun — or short phrase, the topic of a passage (Saldana, 2013, p. 88). An example of a descriptive code from the consumer interviews is "Leftovers" — which describes what people do with leftover antibiotics.

Initial coding, sometimes referred to as open coding, is where qualitative data is broken down into discrete parts and closely examined, after which a comparison is made regarding similarities and differences (Saldana, 2013, p. 100). Categories, including those in development, can be coded (Saldana, 2013, p. 100). An example from the interview transcripts is "Information needs" — which is what consumers wanted to know, regardless of whether or not they asked the GP or pharmacist during a consultation.

In Vivo coding or verbatim coding, uses words or short phrases from the research participants themselves, thereby surfacing more clearly the participant's voice (Saldana, 2013, p. 91). Working with interview transcripts, In Vivo coding was used for iconic phrases, metaphors and evocative word choices. For example, the "dark arts of selecting antibiotics" (GP07, line 151).

Although themes are usually thought of as outcomes of coding, Saldana proposes that it can be useful to label and analyse portions of data i.e. "theme the data", as part of first-cycle coding (Saldana, 2013, p. 175). Theming the data, is the use of an extended phrase or sentence to either (a) capture the essence of a segment of data, or (b) organise a group of repeating ideas (Saldana, 2013, pp. 175-176), in order to summarise what is going on (the phenomenon), to provide an explanation, and/or to suggest a rationale for why something is done (Rubin & Rubin, 2012, p. 194). An example of a theme from the research interviews is "Knowledge-Practice dissonance", where knowledge about antibiotic resistance does not translate into practice for a proportion of people — whether GPs, pharmacists or consumers. Using these first-cycle coding methods, 187 codes were additionally defined, as shown in Table 9.

Table 9. Inductive codes which emerged from interview transcripts

Label	Definition/Description
AB choice rationale	Consumers want to know the GP's rationale for choosing that particular antibiotic over another one, or why different infections seem to be treated by the same antibiotic.
AB colours	Consumers curious about the symbolism of the different colours of antibiotic tablets/capsules. For example, do the colours mean anything?
AB counselling	Counselling provided by the pharmacist or GP to a patient when dispensing/prescribing an antibiotic. Information received by the consumer about the antibiotics.
Abdicating responsibility	GPs act to absolve themselves from being responsible for the patient's health outcome by giving patients a delayed antibiotic prescription, thereby delegating the final decision to the patient.
AB lost effectiveness	The antibiotic has lost its effectiveness; no longer effective.
AB prescribing behaviours	Antibiotic prescribing behaviours observed by consumers and/or pharmacists*.
AB prescribed on reassessment	Antibiotics were only prescribed on second visit or reassessment visit, as symptoms had progressed further.
AB script as validation	The prescribing/receipt of antibiotics validates the patient's concerns about their symptoms.
AB treatment	Consumer seeks antibiotic treatment, if bacterial infection.
ABR not forefront issue	Antibiotic resistance is not an issue that is forefront in people's consciousness.
ABR synergy	Tackling antibiotic resistance needs to involve all parties — GPs, pharmacists and consumers.
Active engagement in campaigns	The extent to which pharmacy staff is promoting/advocating the campaign when interacting with consumers.
Access without script	Ability to access medicines such as antibiotics without a prescription, from community pharmacies.
Adherence	Adherence to prescribed antibiotic regimen.
Advising in context	Advice shaped by knowledge of patient's medical history e.g. the pharmacist is familiar with the regular patient's medical history or has access to this information.
Affecting work	Being unwell starts affecting work.
Alcohol and AB	Consumers wanted to know if they can drink while on antibiotics.
Allergy check	Whether the GP and/or pharmacist checked on allergies when prescribing/dispensing antibiotics.

Ascertain AB warranted	Pharmacists determining if antibiotics are clinically warranted (late presentation of an antibiotic prescription, whether original or a repeat prescription).
Audio-visual media	Raise awareness of antibiotic resistance using TV, cinema ads, movie script, podcasts.
Avoid falling sick	Self-care strategies to avoid falling sick in the first place.
Bacteria resistant	Bacteria is resistant to the antibiotic.
Bad experiences of delaying GP consult	Adverse consequences e.g. deterioration, pneumonia, previously experienced due to delaying a GP consult.
Barriers education	Barriers to educating patients.
Barriers to GP consult	Barriers to seeking GP consult e.g. may be difficult to book an appointment, time, cost, effort to get there, delay in getting seen (clinic running late).
Battle metaphors	Explaining antibiotic resistance using battle or war metaphors.
Better safe than sorry	GPs who feel that the safer option is to prescribe antibiotics if there is a chance it could be bacterial.
Body resistant	Body is resistant to the antibiotic.
Brand substitution	The need for pharmacists to reinforce/re-clarify medication name during counselling when generics are dispensed to avoid confusion.
Bulk-billing	Whether bulk-billing was a factor in choosing their regular GP.
Cheap treatment	Cheaper to fill antibiotic prescription than to buy products for symptom management.
Choice of pharmacy	The consumer's choice of pharmacy to use e.g. for advice, to fill a prescription.
Clinic billing affects appointment duration and cost to patient	The type of clinic billing affects how much time a GP can spend with a patient and also how much the patient is charged.
Clinic billing affects GP remuneration	Clinic billing and contractual arrangements with GP will affect GP's remuneration. For example, salaried vs. contracted GP; percentage of billing revenue in GP's contract.
Co-morbidities	Patient's co-morbidities e.g. chronic obstructive pulmonary disease or asthma, makes the issuing of a delayed antibiotic prescription a reasonable course of action.
Communication difficulties	Language difficulties giving rise to communication difficulties, either on the part of the GP or the consumer.
Concerned despite AB warranted	Consumers who are concerned about taking antibiotics even when the need for it is warranted.

Conditioning	Experiential or cultural conditioning or assumptions, impacting how a person uses antibiotics.
Confidence in new solutions	Confidence (or otherwise) that medical technology, science, innovations — would be able to fight or resolve antibiotic resistance.
Conflation of concepts	Conflation of concepts pertaining to antibiotic resistance in the community, with antibiotic resistance in an individual.
Conflict of interest	Pharmacists' conflict of interest (perceived or otherwise). For example, there is no incentive for refusing to fill an antibiotic prescription.
Constrained by travel	The issuing of delayed antibiotic prescriptions in the circumstance where the patient is unable to travel back to clinic, or will only have access to a pharmacy later.
Consumer response refusal to fill repeat	Consumer's response to the pharmacist not filling the repeat antibiotic prescription, mitigated with patient education.
Continuity of care	Ensuring GP has access to relevant information in order to provide care.
Convenient location	Pharmacy is convenient to either where the consumer works, where they happen to be, what they happen to be doing e.g. shopping centre.
Dark arts of selecting antibiotics	GP speaking about rationale of antibiotic selection (GP07, line 151).
Debate	Current debate about whether you need to finish the course of antibiotics.
Decision-making cognition and intuition	The cognitive and intuitive weighing up of information in order to arrive at a course of action. For example, the process undertaken by GPs when making a decision whether or not to prescribe an antibiotic.
Definitive instructions	Consumer wants to be given definitive/specific instructions about what to do e.g. whether to take the antibiotics, when/whether to use the repeat antibiotic prescription.
Delegation of decision	Decision of when/whether to use antibiotics is essentially delegated to the patient, when GPs do not/are not able to provide definitive instructions.
Discard	Consumer discards repeat antibiotic prescriptions before it expires.
Discerning-Undiscerning consumer	Many do not have the ability to discern between good medical practices and potentially harmful ones e.g. that the prescribing of an antibiotic may not be in the consumer's best interest.

Dispensing instructions	GP's annotation on the antibiotic prescription instructing pharmacists either not to dispense before a certain date, or not to dispense after a certain date.
Disease immune	The disease/infection becomes immune to antibiotics.
Disposal	How people dispose of antibiotics.
Doctor-Patient relationship	The doctor-patient relationship. For example, preserving an existing good relationship, building a relationship, or not aggravating a new or existing relationship.
Dose rationale	Consumers want to know the GP's rationale for the dose chosen e.g. do men and women get different doses, do their bodies process antibiotics differently.
Doubts about GP's decision to prescribed	Things that led the consumer to doubt the GP's decision to prescribe an antibiotic e.g. quick consultation, not thorough but then prescribes antibiotics.
Doubts about pharmacist's role	Consumer doubts pharmacist's role in diagnosing and recommending treatments (for minor ailments).
Duration	Counselling patient about duration of treatment (GP and/or pharmacist); pharmacist finding out what the GP has told the patient. Information received by the consumer about the duration of treatment.
Duration rationale	Consumers want to know the GP's rationale for duration of treatment.
Enable appropriate AB access	Where there is a genuine clinical need, to have ways of enabling access to repeat or longer courses of antibiotics.
Evidence-free zone	GP speaking about negotiating clinical uncertainty (GP07, line 161) and/or where there is relatively weak evidence base for treatment of respiratory tract infections.
Experience outweigh EBM	GP's clinical experience could sometimes outweigh EBM, especially if there had been adverse consequences for the patient.
Experience of GP consult	A description of the consumer's experience of the GP consultation.
Expired repeats	Repeat antibiotic prescriptions are kept on file in the pharmacy or at home, which are never used and expires.
Explain AB unwarranted	GP explains why antibiotics are not immediately warranted i.e. rationale for not prescribing antibiotics right away.
Explaining ABR	How the GP or pharmacist conveys the concept of antibiotic resistance to patients
Extent of issue and practical consequences	Unaware of the extent of antibiotic resistance in the community and the specific consequences (practical consequences).

Farmed animals	Antibiotic resistance in food-producing animals possibly affecting human health.
Fighting an enemy with weapons that aren't good enough	Consumer (CS15, line 331) describing how they would explain antibiotic resistance to others.
Gamification	Use principles of gamification to create/raise awareness/educate on antibiotic resistance.
Generic vs Brand names	Consumers not aware of which antibiotic due to medicines having both generic and brand names, unless they looked carefully/intentionally.
Good GP	Description of what a good GP is.
Government	Government sponsored or sanctioned ads/campaigns.
GP's advice	What the GP says about the need, or otherwise, for antibiotics; or about treatment decisions.
GP Registrars' patient base	A description of GP Registrars' patient base and lag time to build patient base.
Green mucous	That green mucous indicates a bacterial infection and that antibiotics are needed.
Handling delayed presentation	How the pharmacist handles a request to dispense a repeat prescription for antibiotics, presented months later.
Handling missed doses	What people do if they have missed doses of antibiotics.
How common	Pharmacists' views on how often they see repeat antibiotic prescriptions.
Hyperbole	Perception that the Media hyped up the issue of antibiotic resistance beyond what it is.
I don't want to have to deal with that in the next 20 years	GP (GP04, line 201-202) speaking about dealing with antibiotic resistant infections in the community.
IMG	Possibility that International Medical Graduates (IMGs) or Overseas Trained Doctors (OTDs) from countries with a strong medical hierarchy, would communicate selectively with patients based on socio-economic status of the patient.
Important life events	The need to get well quickly due to pressing or important life events prompted the visit to the GP, perhaps sooner than what would have normally been the case.
I'm not going to give you antibiotics	Consumer (CS04, line 259) recounting visit to a GP. GP recounting what happened or what would happen if they said this.
Inaction	Inaction due to being unsure of the extent of the antibiotic resistance issue and specific consequences.

Incentives	Incentives for behaviour change. For example, provision of financial assistance if the behaviour change will cost people more money.
Inference	Inferred that antibiotic resistance is an issue due to seeing many campaigns or mentioned in the media.
Influence of specialists	Refers to exposure of GP Registrars to prescribing preferences of hospital specialists and/or consulting specialists regarding what to prescribe.
Information leaflet	Consumer Medicines Information (CMI) for antibiotics.
Information needs	What consumers wanted to know, regardless of whether they asked the GP or pharmacist during the consultation.
Issue specific	Consumers may use a different GP for different issues e.g. for sexual health consumers would see a female GP; for minor issues may see any GP rather than regular GP.
Instructions from GP	Whether the GP had given specific instructions on when or whether to use the repeat prescription.
Invisible	Consumer speaking about antibiotic resistance (CS16, line 718) i.e. people cannot see antibiotic resistance, unlike car crashes (speed kills). Antibiotic resistance is a harder message to sell.
It doesn't look like you're trying to scam them	GP01, line 161-163, regarding why they would issue a delayed antibiotic prescription rather than insist on another visit for reassessment.
Just in case	Consumer given an antibiotic prescription by the doctor "just in case".
Knowledge-Practice dissonance	Knowledge about antibiotic resistance does not translate into practice for a proportion of people — whether GPs, pharmacists or consumers.
Leftovers	What people do with leftover antibiotics.
Low meds user	Consumers who are not on much medication or do not take much medication.
Make a judgment call	GP07, line 102, speaking about negotiating clinical uncertainty.
Makes my job harder	GP05, line 207, speaking about the first thing that comes to mind regarding antibiotic resistance.
Making deposits in relationship bank	An example of how GPs and/or patients invest/make deposits in the doctor-patient relationship.
Media and campaigns	Consumer exposure to public health campaigns about prudent antibiotic use and/or accompanying media messages promoting such, and/or sensational headlines.

Medical certificate	Seeing the GP to obtain a medical certificate for some time off work/study.
Medical treatment overseas	Consumers seeking medical treatment overseas e.g. in home country or medical tourism.
Misinformation	Incorrect, incomplete or misleading information.
More serious health concerns takes precedence	More serious and immediate health concerns e.g. chronic illness, cancer, takes precedence over antibiotic resistance, as currently not being affected.
Negotiating clinical uncertainty	The GP's ability to deal with and/or manage clinical uncertainty e.g. diagnostic uncertainty,
No definitive trigger	There is no single symptom which, if it gets worse, would indicate that is when the antibiotic should be taken.
Patient education	Patient education by pharmacist or GP.
Past experience with AB	People's previous experience with taking antibiotics, including consequences such as side effects.
Permissible circumstances	Circumstances in which GPs feel that issuing a delayed prescription for antibiotics is permissible.
Perspective CC complications	Consumer perspectives on complications from the common cold.
Pharmacist's advice	What the pharmacist said (to the consumer).
Pharmacist uncertain	Situations where the patient's condition cannot be identified by the pharmacist with certainty.
Pharmacist underlying concerns	Underlying concerns that lead pharmacists to refer the patient to a GP.
Prefer reassessment	Consumers preferred to have a reassessment to determine if another course of antibiotics is needed rather than be given a delayed prescription or repeat prescription for antibiotics. GPs preferred to reassess rather than write delayed or repeat prescriptions for antibiotics.
Preparing the ground	The GP conducts the consultation in such a way that the patient feels valued and listened to, which leads to increased trust. Patient perceives the GP is on their side and acting in their best interest.
Prescribing antibiotics	How GPs prescribe antibiotics — the practicalities i.e. guidelines used, dose considerations and so forth.
Prescribing habits formed early	Prescribing habits usually formed early in GP's career and may not have changed.

Prescribing practice of other GPs	Prescribing practices of other GPs e.g. prescribing antibiotics when not required, makes it hard for GPs who want to do the right thing (conserve antibiotics).
Price	Would choose a cheaper pharmacy.
Print media	Raise awareness of antibiotic resistance through newspapers, magazines, bus stop posters, bus ads, posters, flyers.
Prioritise own health	Would put aside broader concerns about how the use of antibiotics affect the community, in order to treat themselves first. Competing priorities — own health and health of loved ones over the community.
Professional etiquette	Various ways GPs extend professional etiquette to other GPs e.g. GP acceding to patient demand for antibiotics as their regular GP "always prescribes" antibiotics for them; not critically questioning prescribing decisions; not seen to be negatively evaluating the abilities of their colleagues.
Propagated myths	Popular beliefs or assumptions about antibiotics or antibiotic use.
Proposed PBS changes	Views on Drug Utilisation Sub Committee (DUSC) proposed Pharmaceutical Benefit Scheme changes i.e. remove repeats for antibiotic prescriptions on PBS; shorten the period of validity for antibiotic prescriptions.
Proxy decision maker	Making a decision whether to use antibiotics on behalf of others e.g. dependents who are very young or very elderly.
Quarantine	Quarantine restrictions at Australian airports, including of people who are ill e.g. traveller screening at airports during pandemics.
Quick consult	The GP conducted the consultation quickly and perceived by the patient as not thorough.
Raising awareness	Ideas on how to raise public awareness of antibiotic resistance.
Reassessment motives	Motives for reassessment of a patient. For example, GPs prefer to reassess rather than prescribe delayed antibiotics. For example, some consumers suspect reassessment is for monetary gain.
Reassurance	Consumer wants or is seeking reassurance from GP.
Reduce validity period	Reduce the period of validity for oral antibiotic prescriptions.
Referral to GP	Pharmacists would refer the patient to a GP given these symptoms/patient's condition. Consumers would self-refer to a GP given these symptoms/conditions.
Regular GP	Whether the consumer has a regular GP.

Regulatory changes	Regulatory and systemic changes regarding the access to and supply of antibiotics.
Reinforcing wrong beliefs	GP's prescribing practices inadvertently reinforces consumer's wrong beliefs about the need for antibiotics.
Reliance on AB	Consumer resorts to antibiotics as first line treatment, as these have worked in the past.
Remove repeats	Removal of repeats for oral antibiotics from the PBS.
Resources for consumers	Resources to raise consumer awareness of antibiotic resistance which may or may not be mediated via the pharmacist e.g. patient education, podcasts.
Resources for GPs	Resources for GPs. For example, to educate consumers/patients about antibiotic resistance or to explain that an antibiotic is not needed. For example, resources to equip GPs for addressing patient expectations for antibiotics.
Resources for pharmacists	Training and other resources for pharmacists to upskill or be familiarised with the issue of antibiotic resistance.
Respecting patient's time	GP respecting patient's time by issuing a delayed antibiotic prescription as an option, rather than insisting they return for a reassessment.
Reticence about seeking clarification	Consumer's reticence about seeking clarification from GPs about when to use delayed antibiotic prescription.
Review asthma management	Review of asthma management.
Requests AB OTC	Consumers asking to purchase antibiotics over-the-counter i.e. without a prescription.
RUM Program	Return of Unwanted Medicines (RUM) Program: whether the pharmacy offers this service and if people bring in antibiotics for destruction.
Script used for next illness	Consumers use existing repeat prescription for antibiotics the next time they become ill.
Seek GP's expertise	Consumer is seeking GP's expertise in diagnosing their health issue and suggesting a course of action/treatment.
Seeks immediate solution CC	Consumer seeks immediate solution to get rid of common cold e.g. products to ameliorate symptoms.
Seeks second opinion	Consumer seeks another healthcare professional's opinion regarding prescribed antibiotics or treatment decision. For example, going to another GP, or going to the pharmacy and queries the need for the prescribed antibiotics.
Self-assessment of severity	Self-assessment of severity of symptoms prior to seeking GP consult.

Self-management SE	Self-management of antibiotic side effects experienced.
Shared expectations	Shared expectations and goals for health management, between GP and consumer/ patient.
Sharing	Sharing antibiotics with others or accepting shared antibiotics.
Side effects	Pharmacist and/or GP counselling the patient about antibiotic side effects and its management. Information received by the consumer about side effects of antibiotics and its management.
Social media and internet	Raise awareness of antibiotic resistance using social media and/or the internet.
Society immune	The society becomes immune to antibiotics.
Solution without seeing GP	Consumers seeking solution (any) that does not involve going to the GP.
Specific referral for AB	Pharmacists would refer the patient to a GP for antibiotics given these symptoms/patient's condition.
Staffing	Lack of staff making it difficult for pharmacists to spend time educating patients.
Standing firm	GP standing firm on their decision not to prescribe antibiotics despite patient expectations or demand.
States expectations	Consumer states expectations regarding the GP consult and/or antibiotics.
Tests not feasible	Tests to determine if antibiotic treatment is required may not be available or may take a long time for results to be returned.
Time	Lack of time brought about by high workload and/or staffing pressures to educate patients.
Time pressure on GPs	Time pressure on GPs. For example, to keep consultation within allotted time and/or to get through the patients in the waiting room.
Took antibiotics despite doubts	Consumer took the antibiotics despite doubts about GP's decision to prescribe antibiotics.
Trust	Trust has been established with the GP.
Trustworthy GP	Consumer felt that the GP was trustworthy, even though not their regular GP.
Unable to present	Patient is unable to return to clinic for reassessment if condition worsens.
Unaware of duration	Patient is not aware of duration of antibiotic treatment, with consequences impacting adherence.
Unconvinced of rationale	Consumer does not seem convinced of GP’s rationale for the treatment decision.

Used a previous script for next illness	Consumer used old/previous script (whether unused original script or a repeat script) to self-medicate the next time they became ill.
User experience of Australian healthcare	A description of the participant's experience of the Australian healthcare system, whether in primary care or hospital care, which came up in the interview.
User experience of Overseas healthcare	A description of the participant's experience of healthcare systems Overseas, whether in primary care or hospital care, which came up in the interview.
Validation	Consumer feels validated that they are not bringing a non-existent problem to the GP.
Wary of AB	Consumers who are more mindful of what medicines they take and/or those who are aware of antibiotic resistance, may limit their use of antibiotics as much as possible.
Want quick recovery	People want to get better quickly and believe they need antibiotics to do so.
Weak evidence base	GP's knowledge of weak evidence base for delayed antibiotic prescriptions led to avoidance of issuing such prescriptions.
What people do with repeats	Descriptions of what people do with their antibiotic repeat prescriptions.
Why people seek AB	GP, pharmacist and consumer views on why/what drives consumers to seek antibiotics.
Wise advocate	Denotes GP as wise advocate for patient's health. For example, not prescribing antibiotics when not needed, and the ability to gently convince the patient that this is in their best interest.
Workload	Workload barriers to spending time educating patients.
You get the patients you deserve	GP08, line 168-173 and GP06, line 391-400, speaking about the need to adequately address patient expectations.
You're going to run out of antibiotics	GP09, line 205, speaking about antibiotic resistance when making prescribing decisions.
*Note: All references to pharmacists in this table refers to community pharmacists.	

To test the reliability of the codes, while being mindful of the constraints of doctoral research — time, budget and human resources — and the volume of interview data collected, one percent of interview transcripts was randomly selected for coding confirmation by another researcher. The Microsoft Excel® random number function was used to select 5 interview transcripts for coding — one each from GP and community pharmacist interviews and three from consumer interviews. Deductive and inductive coding were done simultaneously for each transcript. The coded transcripts were then given to another researcher (my principal supervisor) for coding confirmation.

The level of agreement between both researchers was high for deductive coding, as was the level of agreement for segments of data that were coded inductively. However, some labels for inductive coding needed to be refined and adjusted collaboratively. Remaining disagreements on codes or coding were resolved via discussion to reach a consensus.

The rest of the interview transcripts were then coded, using the same deductive codes and the refined inductive codes, with expectations for the addition of new inductive codes as these emerged from subsequent interview transcripts. Table 9 shows the final list of inductive codes after first cycle coding.

Coding saturation — the point where no new codes emerged from the data being coded — was reached after 6 GP interviews, 6 community pharmacist interviews and 10 consumer interviews (Hennink, Kaiser, & Marconi, 2016).

4.1.2 Code mapping — Transition

Code mapping was used as a transition method following first cycle coding, to surface categories — not only those elicited by the main interview questions, but also relevant emergent topics from the interviews. Several iterations of code mapping were undertaken. The first iteration simply grouped first cycle codes under each category — main interview question or emergent topic. Some codes were grouped under more than one category, where appropriate. For example, the TDF Domain code — "TDF D1 Knowledge" — is relevant to most categories, and "Script used for next illness" is relevant to categories 5, 6, and 9. Table 10 shows the list of categories, followed by the complete first iteration of code mapping under each of the eleven categories identified.

Table 10. List of categories for each participant group

Categories	GPs	Community Pharmacists	Consumers
1. Process for clinical decision-making	✓	✓	
2. Prescribing challenges	✓		
3. Patient education vs. Information needs	✓	✓	✓
4. Patient expectations	✓		✓
5. Delayed antibiotic prescriptions	✓		✓
6. Repeat antibiotic prescriptions	✓	✓	✓
7. Views on antibiotic resistance	✓	✓	✓
8. Mitigating antibiotic resistance	✓	✓	✓
9. Antibiotic use behaviours	✓	✓	✓
10. Self-care strategies for respiratory tract infections			✓
11. Views on risks of taking antibiotics			✓

Code mapping: First iteration

The first iteration of code mapping for each of the eleven categories are given below.

CATEGORY 1. PROCESS FOR CLINICAL DECISION-MAKING

Related codes:

Clinical approach and DM

Decision-making cognition and intuition

Experience outweigh EBM

Good GP

Negotiating clinical uncertainty

Make a judgment call

TDF D1 Knowledge

TDF D2 Skills

TDF D3 Social, Professional role and identity

TDF D10 Memory, Attention and Decision processes

CATEGORY 2. PRESCRIBING CHALLENGES

Related codes:

AB prescribing behaviours

Prefer reassessment

AB prescribed on reassessment

Clinic billing affects appointment duration and cost to patient

Clinic billing affects GP remuneration

Evidence-free zone

GP Registrars' patient base

Influence of specialists

Knowledge-Practice dissonance

Patient expectations (large category mapped separately as Category 4)

Prescribing antibiotics

Better safe than sorry

Dark arts of selecting antibiotics

Prescribing practices of other GPs

Prescribing habits formed early

Professional etiquette

Tests not feasible

Time pressure on GPs

TDF D1 Knowledge

TDF D2 Skills

TDF D3 Social, Professional role and identity

TDF D4 Beliefs about capabilities

TDF D6 Beliefs about consequences

TDF D10 Memory, Attention and Decision processes

TDF D11 Environmental context and resources

TDF D12 Social influences

TDF D13 Emotion

CATEGORY 3. PATIENT EDUCATION VS. INFORMATION NEEDS

Related codes for Patient education:

AB counselling

Brand substitution

Duration

Debate

Side effects

Active engagement in campaigns

Advising in context

Allergy check

Barriers education

Staffing

Time

Workload

Conflation of concepts

Explaining ABR

IMG

Propagated myths

Green mucous

Misinformation

Raising awareness

Audio-visual media

Gamification

Government

Print media

Social media and internet

TDF D1 Knowledge

TDF D2 Skills

TDF D3 Social, Professional role and identity

TDF D4 Belief about capabilities

TDF D7 Reinforcement

TDF D8 Intentions

TDF D9 Goals

TDF D12 Social influences

TDF D14 Behavioural regulation

Related codes for Information needs:

AB choice rationale

AB colours

Alcohol and AB

Definitive instructions

Dose rationale

Duration rationale

Unaware of duration

Generic vs. Brand names

Information leaflet

Media and campaigns

Hyperbole

TDF D1 Knowledge

TDF D3 Social, Professional role and identity

TDF D4 Belief about capabilities

TDF D7 Reinforcement

TDF D8 Intentions

TDF D9 Goals

TDF D12 Social influences

TDF D14 Behavioural regulation

CATEGORY 4. PATIENT EXPECTATIONS

Related codes:

Addressing AB expectations

Explain AB unwarranted

Preparing the ground

Shared expectations

Caving in

Reassurance

Standing firm

Validation

AB script as validation

Wise advocate

You get the patients you deserve

Bad experiences of delaying GP consult

Consumer responses: AB not prescribed

Discerning-Undiscerning consumer

Doctor-patient relationship

Making deposits in relationship bank

Doubts about GP's decision to prescribe

Quick consult

Seeks second opinion

Took AB despite doubts

Unconvinced of rationale

Good GP

GP's advice

I'm not going to give you antibiotics

Knowledge-Practice dissonance

Proxy decision maker

Regular GP

Bulk billing

Continuity of care

Issue specific

Trust

Seek GP's expertise

AB treatment

Review asthma management

States expectations

User experience of Australian healthcare

Experience of GP consult

AB prescribed on reassessment

Communication difficulties

Trustworthy GP

Pharmacy

Choice of pharmacy

Convenient location

Price

Conflict of interest

Doubts about pharmacists' role

User experience of overseas healthcare

Access without script

TDF D1 Knowledge

TDF D2 Skills

TDF D3 Social, Professional role and identity

TDF D4 Beliefs about capabilities

TDF D6 Beliefs about consequences

TDF D7 Reinforcement

TDF D8 Intentions

TDF D9 Goals

TDF D11 Environmental context and resources

TDF D12 Social influences

TDF D13 Emotion

TDF D14 Behavioural regulation

CATEGORY 5. DELAYED ANTIBIOTIC PRESCRIPTIONS

Related codes:

Abdicating responsibility

Delegation of decision

Doctor-patient relationship

Making deposits in relationship bank

Dispensing instructions

It doesn't look like you're trying to scam them

Just in case

No definitive trigger

Permissible circumstances

Co-morbidities

Constrained by travel

Unable to re-present

Proxy decision maker

Reassessment motives

Reinforcing wrong beliefs

Respecting patient's time

Reticence about seeking clarification

Script used for next illness

Time lag seeking GP consult

Weak evidence base

TDF D1 Knowledge

TDF D3 Social, Professional role and identity

TDF D4 Beliefs about capabilities

TDF D5 Optimism

TDF D6 Beliefs about consequences

TDF D10 Memory, Attention and Decision processes

TDF D13 Emotion

TDF D14 Behavioural regulation

CATEGORY 6. REPEAT ANTIBIOTIC PRESCRIPTIONS

Related codes:

Ascertain AB warranted

Consumer response: refusal to fill repeat

Handling delayed presentation

How common

Instructions from GP

What people do with repeats

Discard

Expired repeats

Script used for next illness

Time lag seeking GP consult

Unaware of duration

TDF D1 Knowledge

TDF D8 Intentions

TDF D10 Memory, Attention and Decision processes

CATEGORY 7. VIEWS ON ANTIBIOTIC RESISTANCE

Related codes:

ABR affect health

Medical treatment overseas

ABR and prescribing decisions

I don't want to have to deal with that in the next 20 years

You're going to run out of antibiotics

ABR community and timeframe

Confidence in new solutions

Farmed animals

Quarantine

ABR meaning

AB lost effectiveness

Bacteria resistant

Battle metaphors

Fighting an enemy with weapons that aren't good enough

Body resistant

Disease immune

Makes my job harder

Society immune

ABR not forefront issue

Extent of issue and practical consequences

Inaction

Inference

Invisible

More serious health concerns takes precedence

Prioritise own health

TDF D1 Knowledge

TDF D4 Beliefs about capabilities

TDF D5 Optimism

TDF D6 Beliefs about consequences

TDF D11 Environmental context and resources

TDF D12 Social influences

TDF D13 Emotion

TDF D14 Behavioural regulation

CATEGORY 8. MITIGATING ANTIBIOTIC RESISTANCE

Related codes:

ABR Synergy

ABR what consumers can do

ABR what GPs can do

ABR what pharmacists can do

Patient education (large category mapped separately in Category 3)

Resources for consumers

Resources for GPs

Resources for pharmacists

Regulatory changes

Incentives

Proposed PBS changes

Enable appropriate AB access

Reduce validity period

Remove repeats

Confidence in new solutions

TDF D1 Knowledge

TDF D2 Skills

TDF D4 Beliefs about capabilities

TDF D5 Optimism

TDF D6 Beliefs about consequences

TDF D7 Reinforcement

TDF D8 Intentions

TDF D9 Goals

TDF D12 Social influences

TDF D14 Behavioural regulation

CATEGORY 9. ANTIBIOTIC USE BEHAVIOURS

Related codes:

Approach to antibiotic use

Adherence

Conditioning

Disposal

RUM program

Handling missed doses

Leftovers

Requests AB OTC

Sharing

Script used for next illness

Self-prescribing

Solution without seeing GP

Took AB despite doubts

Why people seek AB

Cheap treatment

Reliance on AB

Want quick recovery

TDF D1 Knowledge

TDF D4 Beliefs about capabilities

TDF D9 Goals

TDF D11 Environmental context and resources

TDF D12 Social influences

CATEGORY 10. SELF-CARE STRATEGIES FOR RESPIRATORY TRACT INFECTIONS

Related codes:

Avoid falling sick

Barriers to GP consult

Perspective CC complications

Referral to GP

Medical certificate

Pharmacist uncertain

Pharmacist underlying concerns

Self-assessment of severity

Specific referral for AB

Seeks immediate solution CC

Self-management strategies CC

Time lag seeking GP consult

Affecting work

Important life events

TDF D1 Knowledge

TDF D2 Skills

TDF D3 Social, Professional role and identity

TDF D4 Beliefs about capabilities

TDF D5 Optimism

TDF D6 Beliefs about consequences

TDF D8 Intentions

TDF D9 Goals

TDF D10 Memory, Attention and Decision processes

TDF D11 Environmental context and resources

TDF D12 Social influences

CATEGORY 11. VIEWS ON RISKS OF TAKING ANTIBIOTICS

Related codes:

Approach to antibiotic use

Past experience with AB

AB side effects experienced

Self-management SE

Perspective: risk of AB

Wary of AB

Concerned despite AB warranted

Low meds user

TDF D4 Beliefs about capabilities

TDF D6 Beliefs about consequences

Code mapping: Second iteration

The second iteration further reduced first cycle codes into concepts and/or themes, as shown below, while retaining the categories used in the first iteration of code mapping.

CATEGORY 1. PROCESS FOR CLINICAL DECISION-MAKING

Cognition and clinical examination

Experience and intuition

CATEGORY 2. PRESCRIBING CHALLENGES

Practical and time constraints

Knowledge-Practice dissonance in antibiotic prescribing behaviours

Prescribing practices of medical colleagues

CATEGORY 3. PATIENT EDUCATION VS. INFORMATION NEEDS

Health professional mediated patient education vs. Consumer information needs

Public campaigns vs. Consumer awareness

CATEGORY 4. PATIENT EXPECTATIONS

Establishing and addressing patient expectations for the consultation

Managing relationships

Discerning-Undiscerning consumer

CATEGORY 5. DELAYED ANTIBIOTIC PRESCRIPTIONS

Integrity and responsibility

Support for issuing delayed antibiotic prescriptions

Opposition to issuing delayed antibiotic prescriptions

CATEGORY 6. REPEAT ANTIBIOTIC PRESCRIPTIONS

Intentional vs. Unintentional

Problematic sequelae

CATEGORY 7. VIEWS ON ANTIBIOTIC RESISTANCE

Meaning of antibiotic resistance

Pessimism vs. Optimism

Impact of antibiotic resistance: Professional, Personal, Societal

CATEGORY 8. MITIGATING ANTIBIOTIC RESISTANCE

Individual initiatives: Professional and Personal

Government and Commonwealth funded initiatives

CATEGORY 9. ANTIBIOTIC USE BEHAVIOURS

Consumer behaviours

Health professional behaviours as consumers

Motivations for seeking antibiotics

CATEGORY 10. SELF-CARE STRATEGIES FOR RESPIRATORY TRACT INFECTIONS

Self-care and self-management of respiratory tract infections

Triggers for self-referral to GP

CATEGORY 11. VIEWS ON RISKS OF TAKING ANTIBIOTICS

Past experience with using antibiotics: Non-event vs. Negative event

Safe to use vs. Concerned

Code mapping: Third iteration

The third iteration further reduced the categories from eleven to three — categorising the categories using new labels (Saldana, 2013, p. 198). The three meta-categories are: (a) clinical processes and challenges, (b) consumer attitudes, behaviours, skills and knowledge, and (c) engaging with antibiotic resistance. These meta-categories with the eleven categories — now displayed as subcategories — are shown in Figure 7.

Figure 7. Meta-categories of what influences antibiotic use from the perspectives of GPs, community pharmacists and consumers

CATEGORY A. CLINICAL PROCESSES AND CHALLENGES

Subcategories:

Processes for clinical decision-making

Prescribing challenges (overlaps with Category C)

Delayed antibiotic prescriptions

Repeat antibiotic prescriptions

CATEGORY B. CONSUMER ATTITUDES, BEHAVIOURS, SKILLS AND KNOWLEDGE

Subcategories:

Patient expectations (overlaps with Category A)

Antibiotic use behaviours

Self-care strategies for respiratory tract infections

Views on risks of taking antibiotics

CATEGORY C. ENGAGING WITH ANTIBIOTIC RESISTANCE

Subcategories:

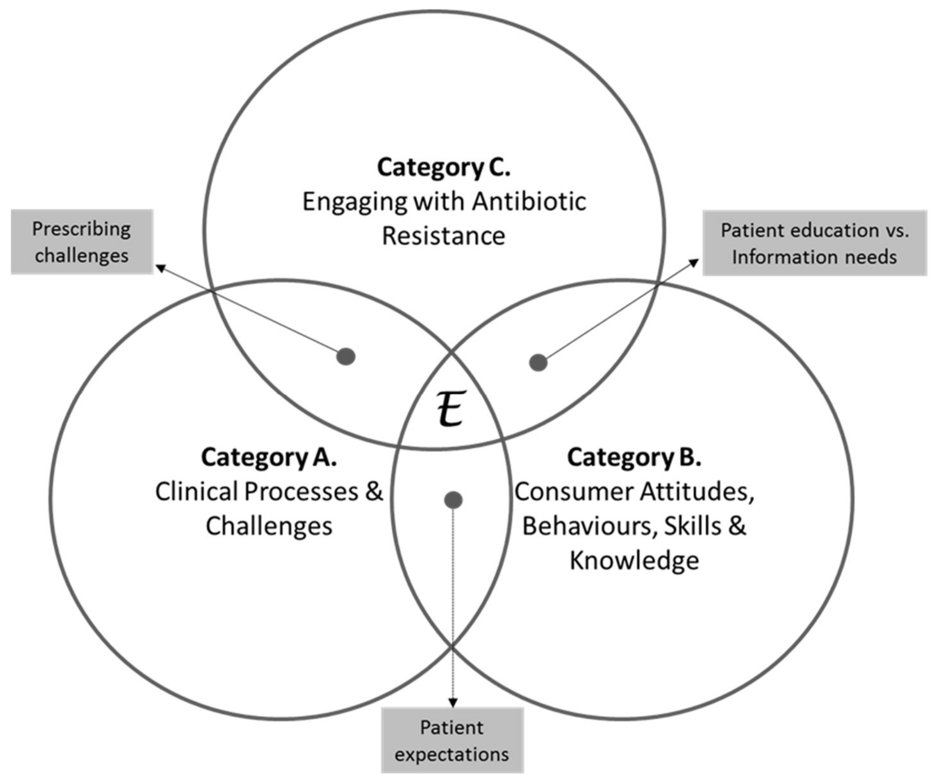
Views on antibiotic resistance

Mitigating antibiotic resistance

Patient education vs. Information needs (overlaps with Category B)

Overlaps and linkages between the three meta-categories i.e. related concepts and/or themes across the three participant groups are illustrated in Figure 8. This became the Enabling Antibiotic Eupraxis (EABE) Model, which is discussed in Section 4.5.

Figure 8. Overlaps and linkages between the three meta-categories



4.2 GENERAL PRACTITIONERS: INTERVIEW FINDINGS

4.2.1 About the participants

A total of 10 GPs, of which 3 were GP Registrars in their final year of training, were interviewed in the Brisbane or Greater Brisbane Area. There was an equal number of male and female GPs interviewed in this participant group — 5 men and 5 women. All were trained in Australia. Their number of years of practice as a GP, including as a GP Registrar, ranged from 4 to 24 years — 4 were early career GPs (in practice for 5 years or less), 4 were mid-career (6 to 15 years), and 2 had practiced for more than 15 years. Eight GPs/GP Registrars worked 30 or more clinical hours per week. Two GPs/GP Registrars identified as being part-time, working less than 30 clinical hours per week. The characteristics of the clinic where these GPs practiced is summarised in Figure 9.

Figure 9. Characteristics of clinics in which GPs interviewed worked

Clinic type:	1 worked in a Corporate clinic; 3 in Sole-owner Multi-GP clinics; 2 in Multi-GP clinics; 4 in Government Health Service clinics.
AGPAL Accreditation:	8 worked in AGPAL accredited clinics; 2 did not.
Billing:	3 worked in a mixed billing clinic; 1 in a private billing clinic; 6 in bulk-billing clinics.
Location:	All clinics were located in the suburbs.
Socio-economic status (SES)[21] of community served:	4 were serving lower SES communities; 4 were serving mixed SES communities; 2 were serving higher SES communities.

There were nine main concepts/themes which emerged out of the GP interviews — previously shown in Table 10: process for clinical decision-making, prescribing challenges, delayed antibiotic prescription, repeat antibiotic prescription, patient

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[21] Socio-economic status by postal area code were taken as a guide to relative disadvantage as per the Socio-Economic Indexes for Areas (SEIFA) by the Australian Bureau of Statistics (Australian Bureau of Statistics, 2013). SEIFA ranking within State or Territory as deciles were used, with deciles 1 and 2 representing the most disadvantaged, deciles 9 and 10 being the least disadvantaged. For the purposes of describing the characteristics of the population which the GPs interviewed served, lower SES was represented by deciles 1 to 3, mixed SES by deciles 4 to 8, and higher SES by deciles 9 and 10.

expectations, antibiotic use behaviours, patient education, views on antibiotic resistance and mitigating antibiotic resistance. These concepts/themes mirror the main interview questions asked of this participant group, as well as those which emerged from the GP interviews. Each concept/theme is discussed in turn below, beginning with those pertaining to the participants' professional role as a GP, before exploring concepts related to personal views and behaviours.

Quotations from the interviews are included where relevant, to provide evidentiary warrant or to illustrate a point. Quotations are presented in the format in which the transcripts were done i.e. using an adaptation of the Jeffersonian Transcription Notation (Appendix K).

Reporting of interview results for community pharmacists (Section 4.3) and consumers (Section 4.4), follow the same presentation format.

4.2.2 Process for clinical decision-making

Cognition and clinical examination

GPs described the complex process of medical decision-making — in this case, when considering whether antibiotics are warranted for a respiratory tract infection — as working through a mental algorithm comprising several elements (Box 8). Key elements named by GPs included: symptoms and clinical features of the patient's presentation of illness, patient's age and general health, length of illness, additional information upon clinical examination, medical history including co-morbidities, the likelihood of a bacterial infection, predisposition to certain bacterial infections due to being indigenous Australians or geographical location, the patient's concerns and experience of the illness (e.g. how unwell the patient feels). As part of the mental algorithm, GPs also sifted through differentiating features indicative of a list of common respiratory infections which require treatment with antibiotics e.g. pneumonia, bacterial sinusitis, streptococcal infection of the throat (Box 9) (Antibiotic Expert Groups, 2014). Decisions as to whether further investigations are warranted e.g. throat swab, chest x-ray, are also made at this point.

Box 8.

"So there's a whole variety of algorithms that are going on at the same time! ((smiles)) So keeping in mind that most respiratory infections are not going to be bacterial, so antibiotics are actually not indicated, they're going to do nothing. Um, so trying to figure out whether it's more likely to be a viral or bacterial infection; um, the severity of the infection." (GP02, GP for 6 years, line 85-89)

Box 9.

"It's my job to filter in my head, is this actually one of those few conditions where there is evidence for antibiotics?" (GP07, GP for 4 years, line 82-83)

Procedurally, the medical decision-making process described for respiratory tract infections is not dissimilar to GPs weighing up treatment or management options for other types of illnesses — perhaps differing only in the details of diagnostic tests used, criteria for diagnosis, methods of assessment and monitoring, and frequency of review, taking into account the need for involvement of other medical (e.g. specialists) or allied health colleagues (e.g. dietitian, podiatrist, speech therapist, physiotherapist, occupational therapist, clinical nurse, clinical pharmacist). However, uncertainty of diagnosis for respiratory tract infections (whether the pathogen is viral or bacterial) compounded with the element of patient expectations for antibiotics — whether actual or perceived by the GP — exerts a measure of prescribing pressure on the GP. This pressure to prescribe antibiotics for a respiratory tract infection, was felt more acutely by early career GPs — GP Registrars and newly qualified GPs — who may not yet have well-practiced strategies and professional confidence to holistically address the patient's expectations for antibiotics:

> "... and I guess I could just say: No, I'm absolutely a hundred percent not giving it [antibiotics] to you. But maybe that's where clinical experience comes in to hand, because I feel like well, I haven't been doing this for twenty years. So, maybe they [patients] actually do know better than me, and then you kind of- I guess then: "Well, I don't want you to

> suddenly get sick because I haven't given you something [antibiotics], so here you go." (GP04, GP Registrar final year, line 165-170).

The concept of patient expectations and its impact on prescribing decisions and prescribing behaviours, is discussed more fully in Section 4.2.6.

Experience and intuition

It is evident that medical decision-making processes involves cognitive processes, given that clinical reasoning relies heavily on knowledge, the ability to retain information (memory), attention, and the ability to differentiate and choose between two or more alternatives. Given this reliance on cognition, it is perhaps surprising that GPs also recognised that medical decision-making necessitates the involvement of intuition, as evidenced by the following quote.

> "... you have to do it fairly <u>quickly</u> and <u>intuitively</u>, it's quite a lot of information to sort of try to pack into your ratio of whether you should prescribe or not." (GP08, GP for 20 years, line 139-140)

The intuition spoken of here is arguably that of a practiced intuition, in that it is a heuristic or pattern recognition that is refined through clinical experience.

An early career GP used a related but different term — "gut instinct" or "instinct" — as shown in the following quotes.

> "... but it's a- it's tough- you know, it's kind of gut instinct you know, do they look sick, do they look well..."; and
>
> "... and try and treat each patient, but um, on our instincts and our clinical knowledge." (GP10, GP Registrar final year, line 171-172 and line 355-357)

The choice of words by this GP Registrar, using "instinct" rather than "intuition", signals their self-awareness that they currently lacked the depth and breadth of clinical experience, which was corroborated in other parts of the interview (see quote from GP10 in the discussion on negotiating clinical uncertainty in this section).

Conversations during the interviews on processes for clinical decision-making and patient expectations, led to an emergent concept — the notion of what it means to be a good GP (Box 10 shows a representative quote). As part of their social/professional role and identity, a good GP is someone who (a) has the skills to deal with uncertainty i.e. the ability to weigh up risks and benefits when making treatment decisions and the ability to ascertain likelihoods and consequences of risks, (b) practices evidence-based medicine when evidence for a particular course of action is available, (c) has good communication skills, and (d) is able to establish rapport with the patient to build good doctor-patient relationships. A good GP is also a wise advocate for the patient, in that he/she makes treatment decisions in the best interest of the patient. Hence, when antibiotics are not warranted, "... good GPs talk to you about not using antibiotics." (GP09, GP for 24 years, line 354-355)

> Box 10. Description of a "good GP"
>
> "... the skill of being a good GP is to deal with risk, deal with uncertainty, deal with likelihoods and I think um, that is what I spend a lot of time talking about and thinking about. And so, ... so to me it's all a matter of weighing up the harms and benefits..."
>
> (GP08, GP for 20 years, line 128-130)

Negotiating clinical uncertainty — deciding on a course of action when there is ambiguity either in the patient's presentation, in clinical guidelines or in the evidence (or lack of evidence) — is part and parcel of GPs' work. When making decisions in these situations, GPs weigh up risks and benefits in at least two ways for each course of action being considered: (a) the likelihood of the pathogen i.e. whether bacterial or viral, (b) the impact on the patient's health outcomes if the GP gets it wrong. The figure below illustrates this in a 2 x 2 matrix[22]:

	Impact on patient's health (bacterial infection requiring antibiotics)	Impact on patient's health (viral infection)
GP prescribes antibiotics	1. **Desirable impact —** GP prescribes antibiotics and the patient needs antibiotics.	2. **Adverse impact —** exposing patient to side effects of antibiotics and antibiotic resistance: GP prescribes antibiotics and the patient does not need antibiotics.
GP does not prescribe antibiotics	3. **Adverse impact** — patient's health deteriorates: GP does not prescribe antibiotics and the patient needs antibiotics.	4. **Desirable impact** — GP does not prescribe antibiotics and the patient does not need antibiotics.

Quadrants 1 and 4 are desirable, in that in both cases the GP's decision is aligned with the patient's need or otherwise, for antibiotics. Quadrants 2 and 3 illustrate cases where, retrospectively, the GP has made the wrong decision to the detriment of the patient.

> "So, you also have the potential impact if you get it wrong, and it's on both sides. So there's also potential impact on giving an antibiotic and it being viral and you get side effects from the antibiotic and resistance; all that sort of stuff [**Quadrant 2**]. There's [*sic*] impacts the other way round, where you're pretty sure it's viral but once in a while you know you'll be wrong [**Quadrant 3**], and if that person has lots of co-morbidities or perhaps is very health illiterate or has no transport or is

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[22] Adapted from related work I conducted as a Research Assistant to my Principal Supervisor, Dr. Katie Page, investigating how consumers value the different consequences using the Value of Consequences method.

> likely- going out bush or something like that, impacts of that could be worse." (GP08, GP for 20 years, line 132-138)

The ability to negotiate diagnostic uncertainty, which then impacts on the course of treatment, is a challenge and can be a source of frustration especially for early career GPs.

> "… well, I feel like it's a grey area anyway. … we try and explain to patients, but … whether it's because I'm a GP Registrar or whatever, I feel it's pretty grey anyway. So I feel frustrated in myself. Sometimes I'm like, what should I do, you know" and "… it's a <u>bit</u> better as a GP Registrar, but I'm aware I'm about to leave that public protection and so, you feel a bit on your own and you- I mean you read guidelines but no one can kind of really hold your hand and tell you exactly when you should give it [antibiotics]. So I still struggle with that a lot." (GP10, GP Registrar final year, line 291-293 and 375-378)

All things being equal, the willingness to take a wait-and-see approach differs between GPs, perhaps due to different tolerance levels for uncertainty. The two quotes that follow demonstrate this difference, and that being cautious takes on different meanings and expressed as different behaviours for each GP.

> "I usually err on the side of caution and not prescribe, and say uh: 'Look it might get a bit worse, we'll see how you go, if you're any worse tomorrow, come back and we'll have another look at you.' " (GP02, GP for 6 years, line 209-211)

> "Sometimes there, there is an area of grey in medicine. Um, and it's not apparent, you know, this definitely is the diagnosis requiring antibiotics. And sometimes you err on the side of caution, because the potential benefit outweighs the risk. OK. And then you find out subsequently [in actual] fact that probably <u>was</u> an URTI, and I probably didn't need to prescribe antibiotics in that situation. … <u>but</u>, yeah, so the grey area can be difficult." (GP03, GP for 13 years, line 239-244)

The use of shared decision-making was mentioned as a strategy for managing clinical uncertainty collaboratively with the patient:

> "So there are some situations where it's uncertain. If it's been going on for a long time you know, a couple of weeks; that makes it trickier. Sometimes with bronchitis, you're not sure if it's mycoplasma. Sometimes if there's otitis media there is some evidence of benefit, you know [to use antibiotics]. You would then … negotiate it with the patient. So you know what the harms and benefits are, and you discuss them [with the patient] and you present them. And see which way they're landing; and then in that situation it's not unreasonable to prescribe antibiotics, in my view." (GP06, GP for 11 years, line 324-330)

However, in dealing with grey areas in medicine e.g. where there is a lack of evidence, GPs will often have to make a judgment call. GP07 gives the example of managing a chronic cough as a grey area:

> "So when someone comes to me and they've had a productive cough for 3 weeks, my interpretation is their- I know it's acute bronchitis and I know it's- a lot of those is still viral or they still resolve without antibiotics. But … I sometimes feel they haven't done studies on that sample population and … I make a judgment call in that group, in that grey area." (GP07, GP for 4 years, line 98-102)

4.2.3 Prescribing challenges

Practical and time constraints

The need to keep consultations within (or as close as possible to) the allotted appointment duration means that GPs need to be efficacious with their use of time. One of the common challenges cited by GPs is the lack of time to properly educate patients who demand or expect antibiotics when it is not clinically warranted. In order to adequately address these patient expectations, experienced GPs have well-honed consultation processes which persuade the patient that they are acting in the patient's best interest. Even so, these processes take time. For less experienced/early career

GPs, time constraints may be felt more acutely, especially for those working in non-bulk-billing clinics where the cost to patients is significant for longer appointments. GPs who work in bulk-billing or mixed billing clinics report the contrary:

> "… 15-minute [appointments], as a rule. This practice is very good on encouraging patients to book long, if they've got more than one problem. And from what I hear, it's a lot better than other practices … … and because it's bulk billing, well the Registrars are all bulk billing. … To book a private patient a long appointment is a big deal. I mean privately, I think it's about $120 or $90 or something. So I think private clinics probably don't book as many patients but they book them all short. Whereas … I guess I have a freedom 'coz I'm bulk billing. If I want to spend longer with the patient I can and it doesn't affect the patient's billing." (GP10, GP Registrar final year, line 121-132)

A practical consideration which may influence prescribing patterns and which reinforces the problem of time constraints, is the contractual arrangement between the clinic and the GP. For example, some GPs are remunerated with a pre-negotiated percentage of clinic billings in addition to base pay. Others have a percentage of billings attributed to their caseload being taken by the clinic as payment for the use of facilities and clinic staff. In either case, there is a financial imperative, arguably more so for early career GPs, to build up a regular patient base and/or to see as many patients as possible as evidenced by the following quotes.

> "… and a lot of patients too, they come here expecting a certain service, so I might give it [antibiotics] to them because of their expectations, but not encourage them to take it, and explain to them about resistance and why. But still patient expectation does come into it." (GP01, GP for 1 year, line 96-99)

> "… and some will do very short, very brief appointments. So I remember working in another practice, where sometimes a 2-minute appointment — all you have time [for] is a script and my colleague sometimes wouldn't shut the door, there's no time, you just get them through … that's a very different way of practising." (GP02, GP for 6 years, line 497-501)

Other challenges when deciding whether or not antibiotics are needed are when tests to assist in diagnosis (to ascertain whether the pathogen is viral or bacterial) are not available or not feasible (Box 11) i.e. will take too long for results to be returned, for timely treatment. Making a decision in an "evidence-free zone" (Box 12) is another challenge which was discussed under negotiating clinical uncertainty in Section 4.2.2 above.

Box 11. Prescribing antibiotics — better safe than sorry

"... situations dictate that they can't have those investigations, the safe option I feel would be then to cover them with antibiotics, in case of that chance that it is bacterial" and "... so if I'm concerned, ... so in this situation where I'm unclear whether it's more likely viral or bacterial, if I'm fence-sitting, and I can't get them to have investigations ... then yeah, I'd give it [antibiotics] to them and say start them." (GP05, GP Registrar final year, line 73-75 and line 79-81)

Box 12. Making decisions in an "evidence-free zone"

"... a lot of the time we make decisions ... in an evidence free zone. For instance, someone comes in and they've got acute bronchitis and they're coughing a bit of green- a bit of phlegm, but it's been there for more than a week, it's not especially productive, they're young. And then you've got the decision, do I need antibiotics at all? Probably not. Um, if I do use antibiotics, do I use a typical one like Amoxycillin or do I think: could it be mycoplasma, one of those atypical infections in a young person; and should I use Rulide® or doxycycline or erythromycin?" (GP07, GP for 4 years, line 161-167)

Knowledge-Practice dissonance in antibiotic prescribing behaviours

The dissonance between knowledge and prescribing practices was apparent from the interviews. Sometimes, despite GPs discerning that the presenting infection is highly likely to be viral and the knowledge that unnecessary use of antibiotics causes antibiotic resistance — antibiotics are still prescribed. GPs are aware that in doing so, a breach of best practice has occurred. Self-acknowledgement of this dissonant behaviour resulted in a range of emotions described in the interviews — frustration or disappointment in themselves, a sense of guilt, feelings of having been manipulated, and exhaustion.

GPs spoke of "caving in" to patient expectations to prescribe antibiotics, due to exhaustion. The quote below conveys a sense of futility in trying to persuade the patient otherwise, resulting in the GP taking the "path of least resistance":

> "I admit there's been times I've prescribed antibiotics that I actually don't think is appropriate. Um, but the person is so::: <u>adamant</u> about it or <u>difficult</u> to deal with or just completely insistent about it, that ... sometimes it's exhausting actually trying to convince them that they don't need them [antibiotics], so the path of least resistance is just to write a script, and like — There! Get out of my room." (GP04, GP Registrar final year, line 125-130)

GPs are especially vulnerable to knowledge-practice dissonance, if they have not previously thought through (and practiced) strategies — both processual and verbal — in dealing with patient expectations for antibiotics. Retrospective rationalisation may ensue, to assuage the GP's conscience, and to keep their professional role and identity as a good/caring GP intact.

> "But if you haven't really thought about it [antibiotic resistance] or it's not a number one issue for you, and there are lots of competing demands for GPs; then yeah, you'll find it very difficult to resist the patient who's asking for it in front of you. You'll tell yourself all sorts of stories about how it's really not that dangerous for them, which it probably isn't; and ... it's just one script and ... this is an easy, quick end to a consult." (GP06, GP for 11 years, line 351-356)

A subtler form of knowledge-dissonance ("soft option" in quote below) was displayed in relation to prescribing delayed antibiotics, when GPs held views and knowledge of the weak evidence base to support such prescribing behaviours, but yet decided to do so. In these instances, caveats were used to delineate the circumstances under which issuing delayed antibiotic prescriptions is permissible.

> "I <u>know</u> the evidence is not for it. I sometimes, <u>sometimes</u> I do it as my soft option. I know I'm not supposed to, I know it actually would- my understanding of the evidence is that the patients would be happier to come back and see me, um, if they're worried about it getting worse. Um, but I know I do. I do delayed antibiotics, particularly for workers or for people who are- live a certain distance from the clinics. Some of our people live out past [name of suburb], so that's 30 or 40 minutes' drive from here. ... but I know it's not the best evidence, the best practice." (GP07, GP for 4 years, line 128-134)

Patient expectations, addressed in Section 4.2.6, is a key prescribing challenge reported by GPs.

Prescribing practices of medical colleagues

The selection of antibiotics, whimsically referred to as "the dark arts" by a GP (GP07, GP for 4 years, line 151), is influenced by senior medical colleagues such as GPs or hospital specialists — who sometimes recommend inappropriate antibiotics for the primary healthcare sector, either in terms of not being funded on the Pharmaceutical Benefits Scheme (PBS), having too broad a spectrum for common bacteria found in the community setting, or both.

> "... specifically, I'm thinking about ... one of my GP Registrar colleagues when I was training ... and their supervisor's a bit weird. And absolutely told the patients they needed this different special antibiotic ... clarithromycin or something ... he [the supervisor] was chastising her, the Registrar ... for picking a standard amoxicillin."; and

> "... I remember in Emergency when I was doing my training up in [hospital name], they had a lot of moxifloxacin, a very broad spectrum antibiotic, um, which is there on the guideline but it's not funded [on

> the PBS]. … they [hospital doctors] … just felt that that's the strongest antibiotic, we'll give it to every patient. When they ran out, they started writing scripts for moxifloxacin, not realising that they were expensive private scripts for patients, … so yeah, they were telling- writing letters to GPs saying please prescribe moxifloxacin if this recurs. And of course we can't access that under PBS." (GP07, GP for 4 years, line 151-179)

GP Registrars are perhaps more susceptible to the influence of hospital specialists, due to the recency of being under an inherent medical hierarchy while on hospital rotation for training. However, more experienced GPs have also reflected on the fact that their prescribing had been somewhat shaped by specialist medical colleagues such as Ear, Nose and Throat specialists, Respiratory physicians and Cardiologists. To further compound the issue, hospital specialists often treat a different type of patient compared to those who present to general practice, in that the suspected pathogens are often different and perhaps more virulent — requiring stronger antibiotics.

> "… and also Ear, Nose and Throat specialists and Respiratory physicians are seeing a different population. … they wouldn't see, you know, 95% of the people I see. They're just going to see a subset … this kind of specific subset which isn't reflective of the community thing. So in actual fact … Ear, Nose and Throat specialists should be working with us … not telling us this is the right antibiotic to use." (GP09, GP for 24 years, line 177-182)

Undesirable prescribing practices of other GPs present another dilemma and a source of frustration for GPs who are conserving antibiotics. At best, the patient is confused with the mixed messages regarding the use of antibiotics from different GPs (Box 13). At worst, patients are perversely encouraged to seek GPs whom they know habitually prescribe antibiotics, even when not required.

Box 13. A source of frustration for prudent GPs

"I'm hoping my colleagues will stop prescribing antibiotics to my patients when they've got a cold ((laughs)). It's very frustrating. They [other GPs] don't talk about it, they just give it. And then my patients come back and say, 'Oh, we went over there we got antibiotics, great. But they didn't even listen to my chest, they didn't check my temperature, they didn't do anything, they just said, Oh, you've got a terrible infection you must take this [antibiotic].' Uhhhh::: ((frustrated soft sigh)) ((laughs)) Little bit frustrating!

Again I don't mean to sound like I'm being disrespectful to my colleagues and things like that. But I know there's just a few people who're like that, it's not everyone. [Speaking about GPs pulling together in the same direction] Yes. 'Coz then there's no confusion amongst patients as to why you did not prescribe when this other doctor said I needed to have it. So everyone gets confused." (GP02, GP for 6 years, line 471-482)

The phenomenon of extending professional etiquette was observed when interview conversations with GPs veered into critique or comment about prescribing practices of other GPs (as seen in Box 13 previously). While there is a level of frustration that not all GPs are pulling in the same direction — hence somewhat undoing the patient education prudent GPs have done — GPs were largely careful not to negatively evaluate the decisions and abilities of their colleagues. Instead, GPs extended professional courtesy by suggesting or speculating on reasons why other GPs could have prescribed antibiotics: (a) the patient changed their story, (b) the GP started their career when antibiotic resistance was not such an issue and that prescribing habits formed early are not easy to change, and (c) the GP did not have the benefit of hospital rotations unlike current GP training programs, where the reality of the consequences of antibiotic overuse is evident daily.

GPs may also extend professional etiquette to other GPs through the following ways — especially if they are simply filling in e.g. as a locum GP or the patient could not get an appointment with their regular GP: by (a) acceding to patient demand for antibiotics as their regular GP "always prescribes" antibiotics for their presenting condition, and/or (b) not critically evaluating previous prescribing decisions.

4.2.4 Delayed antibiotic prescriptions

Integrity and responsibility

The question of whether to issue a delayed antibiotic prescription for a respiratory tract infection, is a contentious one. While there are reasonable grounds for such prescriptions, such as (a) the inability of the patient to present for reassessment should their health deteriorate due to finances, time and/or travel constraints, and (b) co-morbidities e.g. chronic obstructive pulmonary disease, delayed antibiotic prescriptions can also represent an abdication of responsibility on the GP's part. Essentially, in the case of respiratory tract infections when there is uncertainty as to whether the pathogen is viral or bacterial (and the delayed prescription was issued under these circumstances), the patient makes the final decision on when and whether to start antibiotics.

GPs who do not subscribe to this practice, think that it is unfair to delegate the decision on when and whether to use antibiotics to the patient — perhaps reflecting a view that GPs should take more responsibility for treatment decisions (Box 14). To complicate matters, often in these cases there is no single, definitive symptom that would trigger the warrant for antibiotics. Thus, it is difficult for GPs to provide meaningful advice to guide the patient to a course of action, apart from general statements such as "... and in 3 or 4 days if you're not any better, then you could try the antibiotics." (GP10, GP Registrar final year, line 208-209)

Box 14. Unfair to delegate treatment decision to patient

"I think to some extent it's placing an onus on the patient themselves ... [it] is already a very difficult decision for a highly trained, experienced health professional to make ... It's fairly unfair I think. And it's very hard to, in most cases, for respiratory things for example, to describe the circumstance in which you would like them to take it. Because you know, we know that all the symptoms, things like fever and cough and production of cough and that sort of thing, aren't all that discriminatory anyway. And in fact, that's why we, in our heads use them as a bit of an algorithm, there's no single symptom which if it gets worse that's when you take the antibiotic. So it's very hard to, I think, explain that to a patient and expect them to make a rational decision." (GP08, GP for 20 years, line 211-221)

On the other hand, some GPs seem comfortable with letting the patient decide (discussed in subsection: Support for issuing delayed antibiotic prescriptions), and may view the refusal to prescribe delayed antibiotics to be an overly paternalistic approach.

Prescribing delayed antibiotics also calls into question the problem of professional integrity, especially if GPs capitulate to patient demands or expectations. Experienced GPs make the distinction between having consciously made a medical decision — "Does this person need antibiotics or not?" — and dealing with patient expectations for antibiotics. Failure to separate the two acts can lead to using a delayed antibiotic prescription as a means of assuaging the patient, which in turn compromises the GP's professional integrity and chips away at their professional identity.

> "Does this person need antibiotics or not? ... if there were no other societal pressure, what would I do here? What is the right thing to do? And so I think it's really critical to make that decision."; and
>
> "...because if you ... decide that they don't need antibiotics, which almost always they don't, or frequently they don't, um, then you've got a bit of an integrity issue ... if you go and prescribe them." (GP06, GP for 11 years, line 225-228 and line 228-230)

Support for issuing delayed antibiotic prescriptions

GPs who are open to the practice of issuing delayed antibiotic prescriptions seem to do so for the following reasons: (a) as a way of investing in the doctor-patient relationship, (b) as a way of respecting and involving the patient in collaborative management of their health — respecting the patient's time and ability to judge if antibiotics are needed, as demonstrated by the two quotes that follow:

> "... but I think you sometimes need to do that [give delayed antibiotic prescriptions] to maintain the relationship with the patient. And then, if they've got trust in you, you can then educate them. And then they won't necessarily expect them [antibiotics] in the future." (GP01, GP for 1 year, line 119-121)

> "... and I'll often say to them, 'if it was me, I'd most probably take this home and sit on it, and <u>not</u> use it and just see if my own body would handle this, even though you are sick, your own body could still fight this; but this is how I'd approach it ...' So trying to give them that option and stuff like that. I think it's really hard when people [GPs] say, no, no look, you know, you've got to come back and see me. ... if it's right on the cusp, and you're dealing with adults, I do think that you can respect the adult and say [that], because the other thing is people have had to take time off work to come in and see you." (GP09, GP for 24 years, line 89-96)

In each of these instances, there is also an element of optimism and trust on the GP's part — both in the patient's capabilities to judge for themselves and that the patient would make the right decision.

> "I feel that the patients [of] this particular clinic are very reasonable people and make sensible decisions." (GP01, GP for 1 year, line 159-160)

Another concern of some GPs is to avoid being negatively evaluated by patients and being accused of harbouring questionable motives. By withholding the prescribing of antibiotics and insisting that they return for a reassessment in the event their symptoms worsen, patients may think that the GP is financially motivated:

> "... [by writing a delayed antibiotic script] it doesn't look like you're trying to scam them into another appointment if they don't get better or anything like that. So you keep the relationship." (GP01, GP for 1 year, line 161-163)

Opposition to issuing delayed antibiotic prescriptions

Apart from the issues of compromised integrity and abdication of responsibility discussed previously, prescribing delayed antibiotics potentially confuses patients by giving them a mixed message. As one GP puts it: "... it sends a mixed message. I don't think you need antibiotics, but here's a script."[23]

GPs who prefer decisive action argue that by putting off the treatment decision, the benefits of antibiotics would be lost to the patient:

> "If they [antibiotics] were going to have any benefits you should give them straightaway, rather than delaying a couple of days. ... you get a 16-hour benefit on- for sore throat and otitis media, and it's within a couple of days. So if you wait a couple of days you're missing out [on the benefits of treating with antibiotics]." (GP06, GP for 11 years, line 269-272)

GPs who oppose or rarely prescribe delayed antibiotics prefer that patients return for a reassessment of treatment needs. In instances where there is uncertainty of diagnosis (between viral and bacterial) and the GP has made a judgment call that antibiotics are not needed at that point, rather than issuing a delayed antibiotic prescription the patient is given a range of signs and symptoms which, should they occur, would warrant a return to the clinic for reassessment.

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[23] A systematic review (Spurling et al., 2013) not surprisingly showed that a strategy of no antibiotics for respiratory infections reduced antibiotic use by a larger percentage as compared to a strategy of delayed antibiotics. Hence, assuming the no antibiotic approach was reasonable clinically, avoiding the prescription of delayed antibiotics would both help to reduce antibiotic use and maintain the GPs' professional integrity.

"I mean that situation occurs commonly [uncertainty of diagnosis]. … … so I provide the patient with safety net information. So for example, if I send them away with a diagnosis of a viral URTI, I will say to them, … 'if you find that in, you know, 2 or 3 days' time you've still got temperatures above this level, … or if you're finding that you're getting short of breath or getting pain in your chest especially if you take a deep breath in, or you're just finding that you're generally deteriorating, then please come back and see me.' … essentially saying I've got an open door and if you're feeling worse, come back." (GP03, GP for 13 years, line 173-182)

Having said that, even GPs who adamantly avoid prescribing delayed antibiotics conceded that they would do so, if the patient was unable to present for reassessment should their health deteriorate due to finances, time and/or travel constraints.

4.2.5 Repeat antibiotic prescriptions

Intentional vs. Unintentional

Repeat antibiotic prescriptions are stipulated by the GP when issuing the original antibiotic prescription. A repeat prescription enables a patient to obtain another course of antibiotics without having to consult a GP. Hence, these prescriptions are usually only issued if (a) the GP intentionally prescribes a duration of treatment which requires more than one course of antibiotics, (b) when the dosage required means a repeat prescription is needed to obtain the correct quantity of tablets/capsules for a course of treatment, or (c) when a standby antibiotic prescription is needed in the event of an acute relapse/exacerbation e.g. patients suffering from chronic obstructive pulmonary disease.

However, since the advent of computer generated prescriptions, GPs may inadvertently include a repeat prescription where none was intended, due to prescribing software defaults. Unless these defaults are inactivated by the GP, the prescription generated would usually indicate the maximum number of repeats allowed under the PBS. This is perhaps desirable for prescription medication used to treat chronic illnesses e.g. hypertension, diabetes (but even then, it can be argued that a medication review at least every 3 months would not be amiss), but creates a situation that tempts inappropriate usage of antibiotics. Some GPs may not be aware that these software defaults are in place or they may not remember to deactivate it when generating an antibiotic prescription.

> "... but I find it horrendous, the thought that it happens a lot, particularly junior doctors coming to practice will not even realise there's such a thing as a default tick box. Virtually not realising that they're prescribing repeats, or if they are [realising it], just think, oh well, everyone else must be doing it, so I'll do it as well." (GP08, GP for 20 years, line 235-239)

Problematic sequelae

Repeat antibiotic prescriptions — both intentional and unintentional repeats — can create subsequent problems for the patient and the GP. A patient with a repeat antibiotic prescription in hand, may choose to self-medicate the next time they became ill, regardless of whether they think it is the same infection or a different one. GPs could then be faced with problematic sequelae such as having to deal with late presentation of the patient (having unsuccessfully tried to self-medicate with antibiotics), perhaps more resistant bacteria, or inability to perform necessary tests for verification of the pathogen due to the patient being exposed to antibiotics. The quote that follow is from a GP who is now against "just in case" antibiotic prescriptions, due to adverse sequelae, which is applicable to repeat antibiotic prescriptions:

> "... I used to do that, but then what happened would be, they'd come back 8 months later with an entirely different infection and they go, 'Oh, I've had this script that you gave me just in case back then, I thought that would be good for my bladder infection. So I just started taking it.' And now, I've got this problem that I haven't had a urine test done before they started taking this random antibiotic, which is not the right one anyway for their bladder infection, or miscellaneous other infections. So I prefer patients not to have their hands on ((laughs)), um, boxes of antibiotics or spare scripts, when they could do silly things with it." (GP02, GP for 6 years, line 236-243)

4.2.6 Patient expectations

Establishing and addressing patient expectations for the consultation

It is important for GPs to discern and establish the patient's agenda for the consultation, preferably at the beginning of the session, rather than assume that the patient expects antibiotics (Box 15). Some patients, but not all, state their expectations clearly and at the outset. GPs interpret the following statements by patients to be veiled requests for antibiotics: "I just want to nip it in the bud", "I just want something to stop it in its tracks" (GP04, GP Registrar final year, line 120-121). Other patients are more explicit: "... got a sore throat and runny nose, I want antibiotics before it goes to my chest" (GP05, GP Registrar final year, line 96-97).

Box 15. Establishing the patient's agenda "... finding out what the patient wants to start with, is a good start. Because they might not actually be wanting antibiotics; they want reassurance or just a check-up. But in the back of our mind, we might be thinking, 'Oh, they want antibiotics', what are we going to do; and that puts stress on us. But getting their reason for attending is important. ... if they really want antibiotics, try to assess why they want those antibiotics ..." (GP02, GP for 6 years, line 116-122)

GPs also reported that some patients are clear about not wanting antibiotics if not required, and are simply seeking confirmation and assurance: "I want to check up, but I'm hoping not to have antibiotics" (GP02, GP for 6 years, line 231).

The rest of Section 4.2.6, will focus on patient expectations for antibiotics.

When addressing patient expectations for antibiotics, experienced GPs have well-honed strategies to do so efficaciously. One GP describes it as "preparing the ground" which comprises at least these components: (a) taking a thorough medical history, (b) conducting a thorough clinical examination, (c) consciously making a clinical decision for treatment and management i.e. whether antibiotics are required, (d) communicating the decision to the patient with confidence, empathy, and in a manner which conveys that the GP has made the decision in the patient's best interest. GPs emphasised that as part of managing patient expectations and maintaining the GP's autonomy of the prescribing decision, it is important to have explicitly/consciously made a decision about the need or otherwise for antibiotics, prior to communicating this decision to the patient in an appropriate manner.

> "...what you need to do <u>then</u> though, is take a thorough history, take a thorough examination, if::: well you obviously don't want to miss things but also to indicate to the patient that the decision you're about to tell them you've made, is based on your thorough history and examination of them. It's not of uh, some ideology, public health ideology, or some other thing that's determining whether or not you give them antibiotics. It's all got to be about them. And part of the reason for that is they're sick, you know. They're feeling really unwell and they want to know that you've got their best interest at heart. And so once you've done that, you have to then decide whether they need antibiotics or not <u>in your head</u>. OK, so do they really need antibiotics or do they not? I think that's a crucial step that a lot of doctors don't take." (GP06, GP for 11 years, line 214-223)

According to the GPs interviewed, GPs suffer from a lack of confidence in terms of refusing to prescribe antibiotics when it is not indicated. Reframing the consultation and instituting "preparing the ground" processes as described previously, will help GPs demonstrate that they are an advocate for the patient and that they are not simply refusing to prescribe antibiotics due to a strongly held public health ideology. These strategies also help to establish and build trust in the doctor-patient relationship — the GP comes across as a wise advocate for the patient, standing firm in their conviction that an antibiotic is not required and doing so in a manner which validates the patient's concerns without capitulating to inappropriate patient demands. GP06 offers an example of how a wise advocate would communicate to the patient, their decision not to prescribe an antibiotic:

> "So I frame it in terms of ... 'I've looked at you very carefully. And it's really clear to me that this is an infection that is not going to benefit from antibiotics.' In fact I would be running pretty much all the risks

and the harms of antibiotics, and none of the benefits, you know 'the harms of antibiotics being diarrhoea and vomiting and rash, I wouldn't want to give you any of those [side effects].' ... and the other thing I say to them is, 'if I thought I could help you with antibiotics, I would give them to you in a second.' " (GP06, GP for 11 years, line 241-248)

On the contrary, GP07 points out how *not* to communicate i.e. minimising the patient's concerns undermines the patient advocacy message:

> "I see with student doctors and junior doctors ... the biggest problem is when they say [to the patient/parent] it's just a cold, [signalling to the patient/parent] go away, this child is not sick enough for treatment. ... [instead] you want to say, yes this child is sick and unwell ... and I'm doing everything in my power to get them better; antibiotics is just not part of that." (GP07, GP for 4 years, line 122-125)

GPs found that patients were responsive to the wise advocate approaches outlined above as they feel heard and validated, and were appreciative of the GPs' expertise:

> "... a patient does accept if you've done all those things before. Because they think 'I've been listened to, and he's you know, making this decision in my interest.' " (GP08, GP for 20 years, line 191-192)

GPs reflected on the fact that "you get the patients you deserve", in that over time, patients come to understand the GP's clinical approach and stance. The fact that the patient returns and/or considers the GP their regular doctor indicates that they appreciate the approach taken by the GP. The following quote illustrates this point:

> "... there's an adage in general practice that you ... get the patients you deserve. But I think what that means is, patients tend to gravitate towards you if they are comfortable with your style. And um, so of the more regular patients I have, I mean I've sort of been practicing pretty much the same way all my career; and there is a choice, luckily, of various doctors. So the patients I have tend to ... have heard my spiel a

few times and ((chuckles)) know what I think ..." (GP08, GP for 20 years, line 168-174)

Capitulating to patient expectations for antibiotics may have other practice ramifications for GPs. For example, it calls into question how they would deal with patient demands/expectations for other types of medicines, such as those with potential for abuse:

> "You get the patient population who[m] you deserve. If you're always capitulating then you'll get a whole pile of patients who demand things of you. I mean, would you do that with Valium® [a common benzodiazepine which can be addictive]? Some doctors do, you know. They just accede to those demands. Would you do it with MS Contin® [an opioid]? Maybe some doctors would and then you get a whole pile of patients who are demanding MS Contin® and antibiotics for colds, and is that the patient population you want? Whereas ... you decide ... what you think is right medically, and stick to it and explain it clearly, then your patients will respect you for that ... and you'll have a patient cohort who come back and see you because of your integrity and maybe they're the sort who[m] you want as your patients." (GP06, GP for 11 years, line 391-400)

Managing relationships

An essential part of appropriately addressing patient expectations for antibiotics is the GP's ability to establish rapport with the patient, and to build and maintain (or at least not aggravate) an existing doctor-patient relationship. However, dealing with regular patients could be a two-edged sword — on one hand, regular patients would have shared expectations with the GP regarding the use of antibiotics (see also Consumer findings, Section 4.4.4), on the other hand there could be other dynamics at play given the familiarity of the patient with the GP. GP10 speaks about dealing with regular patients who present with respiratory tract infections:

> "So … it doesn't affect my clinical approach to them and whether I think they're sick or not, but it does affect all those other, you know, just emotional things … the manipulation that the patient ((grins)) gives you." (GP10, GP Registrar final year, line 193-196)

Discerning-Undiscerning consumer

What does the practice of good medicine look like to the consumer? It depends. Consumers who are aware of antibiotic resistance and their role in conserving antibiotics (e.g. not demanding antibiotics for coughs and colds) will appreciate GPs who are prudent with antibiotics — the discerning consumer (see also Consumer Section 4.4.4). Consumers who are less aware, may interpret the same circumstances otherwise — the undiscerning consumer. GPs who are wise advocates would probably be able to educate these less aware consumers. However, GPs who capitulate to patient expectations are inadvertently reinforcing the incorrect belief that antibiotics are effective for coughs and colds:

> "I'm thinking of this particular patient, and I said, you know, 'I remember seeing you last time and I gave you that script; and do you think it helped?' And she said, 'Oh::: well yeah, I think it did.' So ((scrunches face)) yeah, that particular one, she's not going to- she's just so set in her beliefs." (GP10, GP Registrar final year, line 225-228)

The undiscerning consumer may take the prescribing of antibiotics as: (a) validation of their concerns, and (b) an indication that they had been heard.

> "…the "unknowing" ((makes quotation marks with fingers of both hands)) patient then thinks, 'Ah right, the doctor must have been listening to what I said because, here, I've got a script to prove it.' But in that sense you can get away with far less of a history, far less of an examination and just sort of plonk your stethoscope on the shirt and say, gosh I think you need an antibiotic. And the patient … particularly the less educated patient, won't actually have the capacity to realise that that's actually not good medicine. … So I think it's a bit of a trap GPs

> can fall into, particularly if they're very pressured for time." (GP08, GP for 20 years, line 195-204)

4.2.7 Antibiotic use behaviours

Consumer behaviours

Consumer behaviours observed by GPs such as self-medicating with a previous antibiotic script without having consulted the GP anew, was discussed in Section 4.2.5 (Repeat antibiotic prescriptions). Addressing consumer behaviours such as sharing antibiotics with others, need to be handled skilfully by GPs when disclosed, so that patient-doctor trust is maintained or enhanced. GP09 raised the often overlooked positive intentions of the patient, and how to sensitively handle the disclosure of sharing antibiotics:

> "Well, I say, well, thanks for coming in and talking to me about it, you know. And like, I would try to say, be careful sharing things and stuff. But in certain populations that sharing is considered like an act of love. And so, so you have to raise it with that in mind." (GP09, GP for 24 years, line 258-260).

Antibiotic use behaviours from the perspective of consumers are detailed in Section 4.4.5.

Health professional behaviours as consumers

As private individuals, GPs reported being low or very low users of antibiotics themselves — using antibiotics mainly for pneumonia, tonsillitis, skin and/or dental infections — and only when clinically warranted. A few avoided antibiotics with detrimental consequences to their health. The aversion to antibiotic use was led by their desire to avoid adverse consequences of taking antibiotics, and perhaps also optimism that their immune system would be able to overcome the infection without medical intervention. Thus, unduly delaying seeking medical attention, despite being aware that the manifestation of clinical features indicated a bacterial infection:

> "I'm aware of the side effects of antibiotics. Um, and I'm aware that um, there are lasting effects for months afterwards taking a course of

antibiotics, and I am aware of resistance. So I was hoping I wouldn't need that [antibiotics]. But I waited too long. So if I had seen myself as a patient, I would have prescribed antibiotics in that situation because I was systemically severely unwell. Fevers in the 40s the whole time, and classic bacterial pneumonia." (GP02, GP for 6 years, line 388-393)

An interesting question to pose is: to what extent does the GP's own approach to antibiotic use personally, affect their prescribing practice? Although this research was not designed to answer the question, the following preliminary observations from the data are offered. Many GPs in this interview sample identified as low prescribers of antibiotics — with objective data to substantiate their claim e.g. GPs received a personalised report in 2015 generated by NPS MedicineWise and sent via the Department of Health on antibiotics prescribed. These GPs were also low users of antibiotics themselves. Perhaps a strongly held ideology, whether acknowledged or implicit, to conserve antibiotics pervades both the personal and professional, so that GPs who are low (personal) users of antibiotics would also be low prescribers of antibiotics, compared to their peers. Divergent cases would need to be found in order to assess the credibility and validity of this observation, so as to develop the hypothesis further. The following quote illustrates the proto-hypothesis:

> "I hate taking them [antibiotics]. I don't take them if I can avoid it. So, I was actually talking to some friends about this recently. And may- and I think probably my own personal opinion <u>does</u> actually skew my GP hat. ... I know for me, that most years if I get a bad cold, I will get a bit of bronchitis from it and end up with a pretty hacking impressive sounding cough for a couple of weeks. But I don't feel clinically unwell with it, I know it will get better." (GP04, GP Registrar final year, line 361-365)

In the same vein, favourable personal experience with antibiotics seem to shift GPs toward being more sympathetic to prescribing antibiotics:

> "One of them was my personal illness, where ... I had a fever and productive cough for a long time and I got significantly better after some- I felt I got better in myself after antibiotics. And um, that probably was it, probably was it. I realised that I was a mantra of no

> antibiotics at all for URTIs, and then I, I kind of realise well, some prolonged URTIs they might, you know, there may be indications or there may be a grey area where we can consider it. Yeah." (GP07, GP for 4 years, line 232-237)

Finally, it is perhaps reassuring to find that GPs as individuals, also behave like consumers in these ways: (a) more likely to seek GP consult for a course of antibiotics if there is an important life event coming up e.g. medical school exams (although arguably, this was prior to becoming qualified as a GP), and (b) imperfect adherence to prescribed antibiotics e.g. missing doses and taking longer to finish the course of antibiotics.

4.2.8 Patient education vs. Information needs

Health professional mediated patient education vs. Consumer information needs

GPs mediated at least two types of patient education: (a) when an antibiotic was warranted — how to use the antibiotics prescribed e.g. dosage, frequency and important side effects to note, (b) when an antibiotic was not warranted — educating the patient on why an antibiotic was not required for treatment of their presenting illness and would not be in their best interest.

GPs view the importance of properly addressing patient expectations for antibiotics as a way to disrupt the vicious pathway of: patient expectations leading to pressure on GPs to prescribe antibiotics, which in turn leads to antibiotic resistance in the community. Although some GPs are yet to be convinced that prescribing patterns in primary healthcare contribute directly to antibiotic resistance in the community, many GPs acknowledge the profession's role in creating the problem of patient expectations for antibiotics.

> "I think … a lot of GPs cop out and say, oh::: the patient demands it and I feel like I should give it. My point is that, I think doctors have created this problem. We were the ones that were over prescribing antibiotics to start with and have, um, created a generation of people who expect antibiotics. So it's up to doctors to re-educate … … I don't think it needs

> to get to a confrontation. If you educate, you put up enough barriers and explain it's in the patient's best interest ... people usually would be happy with safe prescribing patterns, yeah." (GP07, GP for 4 years, line 206-215)

GPs explain the concept of antibiotic resistance to patients in the following ways: (a) using the returned pathology results which shows cultures and sensitivities for various antibiotics, and (b) in plain language describing the consequences of inappropriate use of antibiotics. In these explanations, there can be a conflation of concepts — resistance to antibiotics at the societal level is conflated with resistance to antibiotics at the individual patient level. While the two are inter-related, in that resistance to antibiotics at the personal level contributes to resistant bacteria at the societal level, patients are usually more concerned with the former.

Consumer information needs is discussed in Section 4.4.10.

Public campaigns vs. Consumer awareness

Public campaigns by governmental or Commonwealth funded agencies such as NPS MedicineWise and the Australian Commission on Safety and Quality in Health Care, should be continued. GPs value the public awareness created through these national campaigns, and pointed out the importance of conveying accurate information to the general public to curtail propagated myths e.g. green/coloured mucous is an indication that antibiotics are needed (they are not).

GPs also mentioned the resources for GP-mediated patient education during these campaigns have been helpful e.g. NPS MedicineWise brochures on "Colds, Coughs and Flu: What you can do", "Common colds need common sense: Not antibiotics", symptom management pad with checklist for GPs to prescribe a customised plan for the patient, and Antibiotic Resistance Fighter posters. One GP was also aware of the social media campaign by NPS MedicineWise for consumers.

There was cautious hope that patient education through these national campaigns would reduce or resolve inappropriate patient demand and/or expectations for antibiotics:

"... the public need to be better educated and stop coming and asking for them ... and then it [antibiotic resistance] would probably be solved. ... it would be nice, you know, ... ads on TV where this is- you have the common cold, antibiotics are not for the common cold. That would be nice, and I think that would go a long way in stemming antibiotic resistance. Um, people are coming in with gastro, you don't need antibiotics for gastro. Just watch and wait, it will get better with time, very unlikely you need antibiotics. But people come in [asking for antibiotics] and then, lo and behold they'll get *Clostridium difficile* and they'd be multi-resistant, and then they'll be in hospital, and then we have all kinds of problems. Now that's a big issue..." (GP05, GP Registrar final year, line 351-357)

Linked to public campaigns was the suggestion of spreading the message of what constitutes a good GP. Essentially, educating the public that a good GP would act in your best interest and would not prescribe antibiotics unnecessarily nor would they do so on demand.

"... good GPs talk to you about not using antibiotics [when not required]. You know, we need a message like that. Yeah. A good GP tells you not to smoke, lose weight ((chuckles)), and you know, you don't need antibiotics..." (GP09, GP for 24 years, line 354-358)

GPs reported noticing a shift in consumers i.e. moving away from seeking antibiotics, perhaps due to increased awareness generated by these campaigns, but also a move towards seeking alternative/natural remedies and self-care solutions:

"I've only been practising since 2010 but I've noticed even in that time the public is a lot more aware of the fact that antibiotics aren't these fantastic, life-saving happy pills that we should take all the time ((chuckles))"; and

"... we're having a bit of a turn away from western medicine to start with, and people prefer natural therapies, or go to the health food shop and get something — echinacea, garlic-based for their cold. They're happy with that, which is good. It makes my job a bit easier. Obviously not poisoning themselves with anything ((laughs)). But we do have a few

> groups of people who really don't want antibiotics and they're clear about that." (GP02, GP for 6 years, line 221-223 and line 225-229).

Consumer awareness is discussed in Section 4.4.10.

4.2.9 Views on antibiotic resistance

Meaning of antibiotic resistance

When asked about what comes to mind when they hear the phrase "antibiotic resistance", most GPs associated it with making their job more difficult. The overarching emotion was one of worry, resignation, helplessness and frustration.

> "((sighs)) That I'm going to get a pathology result that says resistant to everything and I won't know what to give them. Oh, it's just frustrating. It's just frustrating. Um, it just makes the job harder... the other thing I guess comes to mind is that, that knowledge that you're giving this antibiotic that you're pretty confident it will work, and then now, we have to think, maybe it won't work, and if they come back and they have ongoing symptoms, is it because the bug was resistant or is it because I got the diagnosis wrong?" (GP05, GP Registrar final year, line 204-212)

Pessimism vs. Optimism

GPs expressed anxiety about having to deal with an increasingly intractable problem using a dwindling armamentarium of antibiotics. Interestingly, despite widely reported efforts in national and global media about tackling antibiotic resistance via a multi-pronged approach — rapid diagnostics, new medical technologies and discoveries in reducing virulence of resistant bacteria, reduction of antibiotics in veterinary and agricultural industries — GPs did not seem to be optimistic about these advances. Perhaps, the significant time lag between discovery to marketable product is too great to offer much hope for the practicable future. In addition, GPs recognise that unless the fundamental problem of human behaviour is addressed, the success of new solutions may only be short-lived and could introduce new, unforeseen problems.

Impact of antibiotic resistance: Professional, Personal, Societal

By far, GPs are most concerned about the impact of antibiotic resistance in their professional role as doctors, and thus, the societal fallout as well. As discussed in "Meaning of antibiotic resistance" above, there is a sense of inevitability in having to deal with an increasingly difficult problem. This anxiety was seen equally in those just beginning their career as GPs, as well as those with decades of experience. The following quotes are from both ends of the experience spectrum, with each having consulted on cases of resistant bacteria in their clinical practice:

> "I am genuinely worried about antibiotic resistance. I saw someone this year who had just a UTI, didn't even get them that frequently. And her *E.coli* was resistant to every form of oral antibiotic. ... it was resistant to multiple of the IV antibiotics as well. And you know, this is just someone walking around in the community, she hadn't even been in hospital or anything like that ...... and so we had to ... give her IV Ceftriaxone every day for 5 days. And you just kind of like, well that stuff is scary, and I don't want to have to deal with <u>that</u> in the next 20 years." (GP04, GP Registrar final year, line 194-202)

> "Well, I hope I don't see it in my- you know, I've got another 10 or 15 years of career to go. I hope it isn't in my 10 or 15 years, but it could be. There's gonorrhoea resistant [to] antibiotics ... antibiotic resistant gonorrhoea floating around the place in Thailand. We've got a lot of antibiotic resistance there. If that gets into some of our communities, we're going to be in trouble." (GP09, GP for 24 years, line 315-319)

4.2.10 Mitigating antibiotic resistance

Individual initiatives: Professional and Personal

GPs identified various ways in which they can help mitigate antibiotic resistance in the community. These are everyday actions that any GP can take. Examples include: (a) writing a "do not dispense after this date <insert date>" to reduce the likelihood of patients using the prescription at a later date inappropriately for a different illness, (b) having a well-practiced procedure for addressing patient expectations, (c) being able to confidently communicate the medical decision that an antibiotic was not warranted, and (d) providing a written symptom management plan as a way to end the consult.

> "Now, they often are very disappointed they're not getting antibiotics, so I do like to give written materials like the NPS um … symptomatic management pad. Yes, so you rip one of them out [each sheet has a checklist for symptom management which can be tailored for the patient by the GP], and on the back it helpfully says, most of the time antibiotics aren't required. So it's not just me being a crap nasty GP ((laughs)) actually." (GP02, GP for 6 years, line 131-135)

Some GPs interviewed were also educators — trainers of GP Registrars and/or teach medical students. They observed that it was important to include sample verbal scripts in their training, to give trainees an idea of how to skilfully communicate the medical decision that an antibiotic was not warranted. A quote showing a sample communication script was included in Section 4.2.6 (Establishing and addressing patient expectations for the consultation).

> "And then you've got to give the students or doctors the tools and the scripts [what to say] the thing to say, to help them get through the next couple of minutes when they're explaining to the patient why they don't need antibiotics." (GP06, GP for 11 years, line 234-236)

GPs would like better/more evidence-based guidelines, especially in areas where there are gaps in research, not only to provide a measure of confidence for prescribing decisions or for clinical guidance, but also as a strategy to address patient expectations for antibiotics:

> "…that would also empower you to say no [to the patient expecting antibiotics] as well … because you can say, I've made this decision based on this evidence, um, using them appropriately, like appropriate antibiotics for appropriate infections like the Therapeutic Guidelines."
> (GP01, GP for 1 year, line 249-252)

On a personal level as a private individual, GPs use antibiotics judiciously, as discussed in Section 4.2.7 Health professional behaviours as consumers.

Government and Commonwealth funded initiatives

Public campaigns were discussed in Section 4.2.8. Other government initiatives are regulatory in nature, such as proposed changes to the PBS regarding antibiotics, by the Drug Utilisation Sub Committee (DUSC). Two proposals pertaining to the subsidy of oral antibiotics on the PBS were mentioned: (a) removing repeat prescriptions from the PBS for oral antibiotics, and (b) reducing the validity period of antibiotic prescriptions (Department of Health & Pharmaceutical Benefits Advisory Committee, 2015; Drug Utilisation Sub Committee, 2015).

GPs were in largely in favour of both these proposals (Box 16), with the caveat that steps be in place to enable appropriate access to antibiotics for patients who need longer term or repeat treatment e.g. patients with cystic fibrosis, chronic obstructive pulmonary disease, recurrent urinary tract infections, osteomyelitis. A reasonable period of prescription validity would be one month for most patients, and up to six months for those requiring longer term treatment.

> Box 16.
>
> "… so I think … the repeat and all those rules, need to reflect best practice, especially in this area given the enormous consequences of antibiotic resistance. I mean, you would think that in 20 years' time if we look back and people are dying of … sepsis, because we can't treat it, we'll go why on earth didn't we implement these changes. It doesn't make any sense at all. … so, yeah, I would totally support those measures." (GP06, GP for 11 years, line 421-425)

4.3 COMMUNITY PHARMACISTS: INTERVIEW FINDINGS

4.3.1 About the participants

Thirteen community pharmacists expressed interest to participate in the interviews. One cancellation was received prior to the appointed interview timeslot, due to unforeseen issues with the scheduled relocation of the pharmacy. Therefore, a total of 12 community pharmacists were interviewed in the Brisbane and Greater Brisbane Area – 5 men and 7 women. All were trained in Queensland, Australia, with most trained in metropolitan universities (i.e. The University of Queensland, Griffith University, and Queensland University of Technology) and one from a regional university (James Cook University). Their years of practice as a pharmacist excluding the 1-year pharmacy internship ranged from 2 to 31 years — 3 were early career pharmacists (5 years or less in practice), 6 were mid-career (6 to15 years), and 3 had more than 15 years of experience. Eight pharmacists identified as working full-time or approximately 38 hours per week. Five were employed as staff pharmacists, with the remainder holding both clinical and management roles — being either the proprietor or manager of the pharmacy. The box below shows the characteristics of the pharmacies in which the pharmacists interviewed worked.

Figure 10. Characteristics of Pharmacies

Pharmacy type:	3 multi-practitioner independent pharmacies, 9 multi-practitioner chain or banner group pharmacies.
Location:	9 located in the suburbs, 3 located in Brisbane CBD.
Socio-economic status (SES)[24] of community served:	1 was serving lower SES communities, 4 were serving mixed SES communities, 7* were serving higher SES communities.
*These pharmacists also had previous experience working in pharmacies serving lower and/or mixed SES communities.	

There were six main concepts/themes which emerged out of the community pharmacist interviews — previously shown in Table 10: process for clinical decision-making, repeat antibiotic prescriptions, antibiotic use behaviours, views on antibiotic resistance, mitigating antibiotic resistance, and patient education. These concepts/themes mirror the main interview questions asked of this participant group, as well as those which emerged from the community pharmacist interviews. Each concept/theme is discussed in turn below, beginning with those pertaining to the participants' professional role as a community pharmacist, before exploring concepts related to personal views and behaviours.

4.3.2 Process for clinical decision-making

Cognition

Consumers access community pharmacies as a first port of call for minor illnesses. Community pharmacists often provide advice to consumers on symptomatic

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[24] Socio-economic status by postal area code were taken as a guide to relative disadvantage as per the Socio-Economic Indexes for Areas (SEIFA) by the Australian Bureau of Statistics (Australian Bureau of Statistics, 2013). SEIFA ranking within State or Territory as deciles were used, with deciles 1 and 2 representing the most disadvantaged, deciles 9 and 10 being the least disadvantaged. For the purposes of describing the characteristics of the population which the pharmacists interviewed served, lower SES was represented by deciles 1 to 3, mixed SES by deciles 4 to 8, and higher SES by deciles 9 and 10.

management of respiratory tract infections — advice for self-care as well as recommendations for products which may assist in the alleviation of symptoms.

Clinical decision-making processes relevant to the role of community pharmacists are: (a) when discerning whether the symptoms reported by the consumer match the provisional diagnosis, for example, of a common cold or cough, (b) when deciding on appropriate advice for self-care, (c) when deciding on appropriate products to recommend for alleviation of symptoms, and (d) when deciding on whether a referral to a GP is required. All of these decision-making processes are largely based on information provided by the consumer and the pharmacist's clinical knowledge and experience, with perhaps a measure of practiced intuition — although not explicitly mentioned by the pharmacists interviewed.

Community pharmacists would refer consumers to GPs in the following circumstances: (a) the signs/symptoms reported by the consumer constitute red flags for more serious illness, (b) there is ambiguity/uncertainty in the diagnosis, (c) any other underlying concerns of the pharmacist.

4.3.3 Repeat antibiotic prescriptions

Intentional vs. Unintentional

Community pharmacists interviewed reported that repeat antibiotic prescriptions were becoming less common — as an estimate, about 50% of original antibiotic prescriptions dispensed in their pharmacies included a repeat prescription. It is often opaque to community pharmacists whether repeat antibiotic prescriptions were intentionally prescribed by GPs or were generated by the prescription software due to a default setting — where GPs have not inactivated this function, as discussed in General Practitioners: Interview Findings, Section 4.2.5. As such, if the dosage and treatment duration were both in line with prescribing guidelines, such as the Therapeutic Guidelines, community pharmacists deemed the repeat prescription to have been intentionally prescribed by the GP.

As a way to confirm intentionality of the GP, pharmacists would often flag with consumers that a repeat prescription was available, as part of the patient counselling process. Consumers who had been given (or perhaps, remembered that they had been given) instructions by the GP as to the need for/use of the repeat prescription would indicate their awareness of the arrangement. However, many consumers seemed to be unaware that the GP had ordered a repeat antibiotic prescription, and were also unclear as to the intended duration of their treatment (see also General Practitioners: Interview Findings, Section 4.2.5, for reasons GPs order repeat prescriptions). The quote below illustrates the issues outlined above, caused by the information vacuum between GP and pharmacist regarding repeat antibiotic prescriptions:

> "So we would say, you know [to the consumer], 'Did your doctor explain to you? Did he [or she] want you to continue ... the full course, did he give any instructions there?'. And nine times out of ten I would say, they [consumers] would say 'No'. They weren't given instructions about the repeat, whether it was important to take it or not. ... ... I felt it was, and I think it got worse when the computer generated scripts came up, because when the doctor had to <u>write</u> 'repeat x 1', <u>that</u> was presumably ... they would either explain to the patient a bit more so, or they were saying 'and you'll need this repeat ... .' But when it just happens automatically and they [GPs] you know, might not have really, necessarily <u>intended</u> the patient to have the repeat." (CP01, pharmacist for 30 years, line 285-296)

Problematic sequelae

In the case of community pharmacists, the problematic sequelae arising from repeat antibiotic prescriptions pertain to the handling of delayed presentation of the prescription. Consumer requests to dispense these prescriptions months after the original prescription, put pharmacists in the untenable position of having to ascertain that the antibiotic was still warranted. Pharmacists observed that many consumers who present repeat prescriptions after a long time lag were intending to self-medicate and avoid the cost and/or the inconvenience of seeking a GP consult.

The strategies used by community pharmacists when handling consumer requests to dispense repeat antibiotic prescriptions after a lag time of many months post-initial infection, fall into two broad categories: (a) strategies to ascertain whether they can clinically justify dispensing the prescription, and (b) strategies to persuade the consumer to contact or return to their GP for a review.

The pharmacist would carefully probe the consumer as to their reason for filling the repeat prescription and would query the consumer regarding symptoms experienced. The repeat prescription would be dispensed if the clinical warrant was clear, for example, an exacerbation of chronic obstructive pulmonary disease or a recurrent urinary tract infection. Occasionally, careful probing reveals the consumer's intentions to use the antibiotic inappropriately, and the pharmacist was able to prevent misuse by recommending a referral to a GP, as reported by CP10:

> "..... antibiotic repeats we are careful; we are careful with that. ... It was an old repeat [but still within 12 months of the original date of prescribing]. And, uh, I can't remember what the antibiotic was for, but the moment it's like old, meaning even beyond a couple of months, 3 or 4 months, I would query that. So, she brought the prescription in ... to me, and ... apparently it was her husband's prescription ... That was really tricky, how that happened. 'Coz I wouldn't have known. She was not going to tell me that [she was going to use it herself]. So, apparently, there was a repeat left, uh, an antibiotic repeat left for the husband, and then this is the ... what I call, using your partner's medication. Happens; quite common [using partner's medication — all types of medications], let me tell you ((laughs)). Surprisingly." (CP10, pharmacist for 30 years, line 212-222)

If the clinical warrant was not clear after querying the consumer, the pharmacist would try to convince the consumer to return to their GP for a review. The following quotes provide sample verbal scripts that pharmacists would use to communicate this advice to consumers:

> "Normally I will tell them, 'Look you know, unless it's exactly the same symptoms, there's a possibility of them [antibiotics] not working. Even if it is the same symptoms, doesn't necessarily mean exactly the same bug that's caused it. At the very least, give the doctor a call.' That

doesn’t cost them anything obviously, and they can touch base with the doctor. And the doctor might want to get them in."; and

"... And I normally explain that, 'Look if it’s not the right one, it’s going to get worse and then you’re going to waste money on the antibiotics.' That sort of thing." (CP07, pharmacist for 5 years, line 267 – 271 and line 283-284)

4.3.4 Antibiotic use behaviours

Motivations for seeking antibiotics

From the perspective of community pharmacists, consumers who seek antibiotics as their first recourse for a respiratory tract infection do so due to: (a) the belief that antibiotics will hasten their recovery, (b) past experience with antibiotics were generally positive i.e. recovered from illness and had no troublesome side effects from antibiotics, leading to an over-reliance on antibiotics, (c) the cheaper cost of procuring antibiotics due to being subsidised under the Pharmaceutical Benefits Scheme for concession card holders, compared to over-the-counter products for symptom management. Pharmacists who served (or previously served) in the lower socio-economic areas observed that the latter is especially true amongst the consumers who use their pharmacy, compared with consumers from higher socio-economic areas. Consumers who are concession card holders are generally bulk-billed by GPs, so there would be no out-of-pocket expenses for seeing a doctor to obtain an antibiotic prescription. Lower health literacy could also be a potential contributor to the consumer behaviour of seeking antibiotics. CP10 has worked in both types of socio-economic settings and offers the following observations:

"...And I think people, overall like I said, when we give them cold and flu medicine [over-the-counter products for symptom alleviation], they’re not asking me about antibiotics. Uh, we don’t even go there. It seems to me also that, they don’t want to take antibiotics, if they don’t have to. As opposed to ... and that’s to do with the demographic ... Because my experience with [name of a lower socio-economic suburb] pharmacies, ... a high pension/ concession area, [larger proportion of] lower socio-economic group of people — they'll want antibiotics. And that would be a cost factor as well." (CP10, pharmacist for 30 years, line 387-393)

Health professional behaviours as consumers

Community pharmacists as private individuals generally take antibiotics only when prescribed by a dentist or GP — citing dental infections and travel related antibiotic prophylaxis e.g. malaria prophylaxis, respectively. Most identify as low users of antibiotics themselves, with those who have young children being conscious of avoiding antibiotics as proxy decision-maker on their behalf, when not clinically required.

> "I've got .. [an] 8-month old now, day care, who's just coming home with <u>everything</u> you know, <u>all</u> the bugs. And she's already been on antibiotics once, which I'm not pleased about. But it's yeah, you know, as a [parent] have gone to the doctor and said to them, 'I don't really want to have antibiotics [for the child], but if you think that she needs them, then I'll give them to her.' Um, … in my mind it only makes things worse, unless it's really severe; especially with the littlies, it just knocks their immune system around." (CP06, pharmacist for 4 years, line 438-444)

Some pharmacists interviewed lament the fact that they were unable to inculcate prudence with antibiotics amongst older family members, such as their parents who have entrenched beliefs in antibiotics as a panacea for common ailments.

> "For me, I don't like taking antibiotics personally. I rather my body fight it off as it should. But there are people like, for example my [mum] as soon as she's sick, she's like ((snaps fingers)), 'Oh, antibiotics.' ((laughs)) …And you know, she normally gets the Augmentin Duo Forte® [a broad spectrum antibiotic], all that sort of stuff. And it takes weeks before she gets better. … we've sort of told her … And this is … it's pretty ironic right?"; and

> "… but for mum's mentality I think she just, as long as she gets better, she doesn't care what it is. She just wants to get better. So yeah, I think

> maybe for the older generation if I can put it that way; the older generation they saw it worked when they were younger. And so therefore, they stick to that." (CP03, pharmacist for 12 years, line 436-443 and line 447-450)

On the topic of adherence to prescribed antibiotics, some pharmacists confessed that they do not personally practice what they counsel consumers to do:

> "...It's really embarrassing! I'm the worst antibiotic user in the world ((chuckles)). I know, pharmacist in reality [are] very, very different; and I think you'll get that with every pharmacist you talk to. All my friends are <u>exactly</u> the same, all the pharmacists. So what we tell patients is very different to what we do ((laughs)). ... I never finish my course of antibiotics; because I <u>forget</u> every time. So the first two days I would take them ... and then I'll forget, ((laughs)) and that's it, because I feel great. So I don't [remember to] take them." (CP11, pharmacist for 6 years, line 561-570)

4.3.5 Views on antibiotic resistance

Meaning of antibiotic resistance

The phrase "antibiotic resistance" evoked the following from community pharmacists interviewed: (a) that the bacteria has acquired resistance to the antibiotic and therefore the antibiotic will no longer work, (b) "superbugs" in hospitals such as Methicillin- or multidrug-resistant *Staphylococcus aureus* (MRSA) and Vancomycin-resistant *Enterococci* (VRE), (c) the anticipation of adverse societal impact, and (d) the global emergence of antibiotic resistance and its association with low and middle income countries where misuse is perceived to be more rampant.

> "... that the antibiotics that we have are not working well against the bacteria, and that we're running out of options to treat people effectively." (CP06, pharmacist for 4 years, line 334-336)

Pessimism vs. Optimism

Although concerned about the issue of antibiotic resistance, community pharmacists seemed to be neither pessimistic nor optimistic about our collective ability to mitigate or address antibiotic resistance in Australia and the world. Limited beliefs about their capabilities to be an active part of the solution — powerlessness — gave rise to a sense of ambivalence about the situation in some pharmacists.

A difference in attitude was observed in pharmacist participants who worked in community pharmacies which offered a vaccination service. These pharmacists identified the vaccination service as one of the mitigation strategies for antibiotic resistance, and saw themselves as an essential part of the solution — especially those who were trained to vaccinate against the influenza virus as part of the Queensland Government Pharmacists Immunisation Pilot (QPIP)[25], rather than simply offering pharmacy premises as a venue for nurse-administered vaccinations. CP04 spoke about other benefits of offering these vaccinations in a community pharmacy setting:

> "...the main comment I get from people [consumers] is that it's so much more accessible and affordable. ... that would [help] achieve the two main goals ... more people get vaccinated; and the other would be to save the government money. ... we're not billing Medicare like the GPs are [for vaccinations]." (CP04, pharmacist for 8 years, line 71-75)

Impact of antibiotic resistance: Professional, Personal, Societal

Some community pharmacists were aware of antibiotic resistance as an issue, while others inferred that it was so from the public health campaigns they had observed

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[25]At the time of the community pharmacist interviews, the QPIP was ongoing. The QPIP ran in selected Queensland community pharmacies from January 2014 to March 2016, with appropriately trained pharmacists administering immunisations to adults, against influenza (Phase 1 of the pilot), measles and whooping cough (Phase 2). A total of 35,000 immunisations were given during the trial period. Subsequently, the State of Queensland legislated the administration of these vaccines by appropriately trained pharmacists from 24 March 2016 following the success of the QPIP, via an amendment to Section 171 of the Health (Drugs and Poisons) Regulation 1996 (State of Queensland, 2016, p. 163).

recently. Many were unclear as to the extent of the problem and the practical consequences of antibiotic resistance — which did not seem to be a forefront issue for community pharmacists. Perhaps, a lack of clarity about the issue of antibiotic resistance and their role in mitigating it contributes to inaction and/or apathy.

> "I don't know the extent of what it [antibiotic resistance] will cause. If I did read about it, or if I were informed of what the consequence would be, then I guess I'd be a bit more aware of it, concerned, and start advocating if it's like a really big issue." (CP02, pharmacist for 2 years, line 382-385)

Pharmacists who were aware of antibiotic resistance, spoke of this being a current issue in Australian hospitals, and were concerned about eventual societal impacts and for those who are immunocompromised. When asked, pharmacists estimated a timeframe of less than twenty years' lag time before antibiotic resistance would be more of an issue in the primary healthcare sector, if not actively addressed now.

> "I think it's affecting the community now; but more so in hospital settings though. Less in the community. But if ... we're not active about it [mitigating antibiotic resistance], it could definitely become a bigger problem 5, 10 years from now I think, in the community. I know in the hospital it's a big problem already." (CP04, pharmacist for 8 years, line 336-339)

Pharmacists who were attuned to the issue of antibiotic resistance are occasionally seeing early signs in their community practice. For example, consumers bringing in prescriptions for different types of antibiotics consecutively, to treat the same infection or consumers bringing in their pathology results which shows more instances of resistant bacterial being cultured.

Personally, community pharmacists were not unduly concerned for their own health or their family's health being adversely affected by antibiotic resistance — with the assumption that their current good health continues. Most associated their vulnerability to adverse impacts from antibiotic resistant bacteria with healthcare interventions such as major surgery or hospitalisation, should these be required.

4.3.6 Mitigating antibiotic resistance

Individual initiatives: Professional and Personal

Community pharmacists spoke about the need for — not just GPs, but consumers and other health professionals as well — acting together to reduce the overuse of antibiotics, as part of fighting antibiotic resistance. When reflecting on what community pharmacists can do as part of their day-to-day practice, the following were elicited: (a) being consistent or continuing with patient education — to raise consumer awareness of antibiotic resistance and to steer consumers away from seeking antibiotics as a first recourse to minor illnesses such as the common cold and coughs, and (b) getting pharmacy staff engaged and involved in public campaigns such as the Antibiotic Awareness Week held annually.

Pharmacists' personal approaches to antibiotic use as private individuals would also contribute to either mitigation or otherwise, of antibiotic resistance. This was discussed under the subsection Health professional behaviours as consumers in Section 4.3.4.

Government and Commonwealth funded initiatives

In line with GPs, most pharmacists interviewed were supportive of the proposed Pharmaceutical Benefit Scheme (PBS) changes, namely — removing repeat antibiotic prescriptions from the PBS for oral antibiotics and reducing the validity period of antibiotic prescriptions. The period of one month was also suggested as a reasonable period for the validity of antibiotic prescriptions.

Only one pharmacist interviewed expressed doubts about these measures, in that it may cost the Medicare Benefits Schedule (MBS) more, as was seen with another medication:

> "I think … it'll cost the government a lot of money. …They will need possibly more GP visits, and overload the health system in general which is already pretty you know, under stress already. So, yeah. And obviously GPs only have a maximum number of MBS claims … interventions or patients that they can see per day anyway. So might be maxing that out. Obviously that'll cost- like their GP visit will cost the

government a lot more than the PBS, $10 for an antibiotic or something like that. And you already see it with things like Nexium® 40mg."; and

"… Nexium 40mg is only approved on the PBS for one repeat. So it's supposed to be initial therapy for GORD [gastro-oesophageal reflux disorder] or reflux. And then after that they're supposed to go down on to the 20mg, which is available as 5 repeats. But there're still plenty of patients on 40mg long term. … so that's with one repeat, every 2 months you have to go see the doc, when your other conditions might be well managed." (CP07, pharmacist for 5 years, line 299-306 and line 308-312)

However, it can be argued that unlike Nexium®, antibiotics are usually meant for short-term treatments only and as flagged by the GPs, the government would need to institute other pathways to ensure appropriate access of antibiotics for consumers requiring longer term treatments, such as for osteomyelitis (see also Section 4.2.10).

Public campaigns will be discussed in Section 4.3.7 below.

4.3.7 Patient education vs. Information needs

Health professional mediated patient education vs. Consumer information needs

When consumers are prescribed antibiotics, community pharmacists would usually provide the following information as part of patient counselling: (a) how to use the antibiotic — dosage, frequency, timing in relation to food, and a reminder to complete the course, (b) common side effects and how to manage these, (c) major side effects which would warrant urgent medical attention, (d) additional advice regarding timing of antibiotics and/or precautions if the consumer was also taking other medications which could be affected by antibiotics e.g. oral contraceptives, and (e) whether there was a repeat antibiotic prescription available. Pharmacists would also check with the consumer regarding their allergies to medication prior to dispensing the antibiotic.

Pharmacists cite the following barriers to providing patient education and engaging patients in conversations about prudent use of antibiotics: (a) time constraints, (b) inadequate staffing of some pharmacies, (c) high workload, and (d) disinterested consumers.

"... most patients there's not the time, they're thinking of other things, um, I'm trying to make sure they understand that they've got to take this with food and finish the whole lot. ... I've got if you like, an agenda there to [accomplish] ... the scope of them taking this properly and understanding what they've got to do and to check that they're not allergic to macrolides or penicillin or whatever it is they're taking. So I'm very you know, fixed on that [counselling on the essentials]. And they're fixed on when the next bus comes and so there's not always long conversations about antibiotic resistance." (CP08, pharmacist for 23 years, line 716-723)

When explaining the concept of antibiotic resistance to consumers, not surprisingly, pharmacists usually expressed it as avoiding antibiotic resistance at an individual level, rather than at a societal level, with some using creative everyday metaphors to get the explanation across:

" 'Look bacteria can get like weeds and that sort of thing, you know. Certain weeds are resistant to certain pesticides. Bacteria's the same with antibiotics. So you start off with a hundred bacteria, maybe one or two of them might be resistant to this antibiotic. ... normally if you take a full course of antibiotics, the idea there is to get rid of all of a hundred of them. If you don't use the antibiotic properly, if you only take let's say half your course or something like that, you might kill the weak seventy-five, then those twenty-five still hanging around. And you might feel better, but you've still got those little twenty-five bacteria hanging around. And when you get another infection, those twenty-five which are stronger or more resistant to that antibiotic, when you treat it with that again [the same antibiotic], you might not kill any of them at all, or very little.' I find putting it into- as simple as possible; that's still pretty complicated for a layman to understand." (CP07, pharmacist for 5 years, line 496-506)

The information needs of consumers is discussed in Section 4.4.10.

Public campaigns

Not unlike GPs, many community pharmacists were aware and supportive of public campaigns to raise consumer awareness regarding prudent use of antibiotics, such as those run by NPS MedicineWise. Some pharmacists interviewed were actively involved during the annual Antibiotic Awareness Week or seasonal campaigns (e.g. Winter is Coming campaign by NPS MedicineWise in 2015), and used NPS provided print and social media material to engage their client base and walk-in consumers. Pharmacists pointed out that pharmacy staff needed to engage with consumers on the topic for these pharmacy-mediated public campaigns to be noticed. Simply putting the campaign poster up on the wall or having flyers in the pharmacy would not be as effective.

Pharmacists noted a level of complacency amongst some consumers, and suggested the need for this aspect to be addressed through public campaigns:

> "So consumers also need to take that [antibiotic resistance] seriously, rather than, 'Oh, it's not our problem, it's a developing countries' problem.' It's actually our problem as well." (CP03, pharmacist for 12 years, line 566-568)

Consumer awareness is discussed in Section 4.4.10.

4.4 **CONSUMERS: INTERVIEW FINDINGS**

4.4.1 About the participants

Forty-nine consumers expressed interest to participate in the interviews, out of which 32 were selected. The rationale for selecting a sample to interview from those who expressed interest were: (a) given the limited timeframe for this research, it was not feasible to interview all 49 consumers especially when factoring in transcription time (for each hour of interview recorded, transcription took another 4 to 5 hours), (b) to obtain a spread of ages from 18 – 54 years old, (c) to have as much diversity as possible i.e. place of origin and lived experience (rural, regional and metropolitan) and ethnicity.

A total of 32 consumers were interviewed — 9 men and 23 women. Their ages ranged from 23 to 53 years old (mean: 33 years old), with the majority (84%) in the age band between 21 to 40 years old. Participants originated from 17 countries including Australia. Years of residency in Australia ranged from 4 months to 53 years, with 66% having lived in Australia for 5 years or more. Thirteen participants were originally from Australia, out of which 4 were from or had lived in rural/regional towns. The achieved education level was high — all participants held at least a bachelor's degree. About two-thirds (21 participants) also held either a Masters or a Doctorate degree.

There were nine main concepts/themes which emerged from the consumer interviews — previously shown in Table 10 (List of categories for each participant group): delayed antibiotic prescriptions, repeat antibiotic prescriptions, patient expectations, antibiotic use behaviours, self-care strategies for respiratory tract infections, views on the risks of taking antibiotics, views on antibiotic resistance, mitigating antibiotic resistance and information needs. These concepts/themes mirror the main interview questions asked of this participant group, as well as those which emerged from the consumer interviews. Each concept/theme is discussed in turn below, beginning with those largely pertaining to health professionals, before moving on to those focussing on consumers.

4.4.2 Delayed antibiotic prescriptions

Integrity and responsibility

Consumers were split on the issue of delayed antibiotics — on whether this was a preferable course of action for GPs to take in instances where there was uncertainty in the diagnosis (i.e. whether the pathogen was viral or bacterial) and therefore ambiguity in the need for antibiotics. Many consumers had actual experiences of being given a delayed antibiotic prescription under the circumstances just described, and hence, were able to provide their perspectives on this issue.

Those in favour of the delayed antibiotic prescription cited personal convenience as the over-riding factor, in that they would not have to return to the GP for a reassessment if their symptoms worsened. Their preference for a delayed antibiotic prescription was particularly evident when the consumer either had an important upcoming event e.g. university exams, a wedding, or when they were about to travel interstate or overseas. One consumer mentioned that they would prefer a delayed antibiotic prescription if the weekend was coming up, as GP clinics may not be open throughout the weekend should they need to return for a review.

Consumers not in favour of a delayed antibiotic prescription, were overwhelmingly uncomfortable with the fact that they had to make the final decision, rather than the GP. Although highly educated and sophisticated, these consumers did not want the responsibility of deciding whether to use the antibiotic prescription or not. Nevertheless, these consumers were appreciative of the fact that the GP was being honest in expressing their uncertainty regarding the diagnosis and course of treatment.

> "... a bit confused, because I think when you go to the doctor you do want someone to be quite definitive. Whether they're right or wrong, you need that confidence that their decision is right. But I thought they're being honest to say they're not sure. But it was ... I didn't really like having that sort of choice in my hands." (CS03, female, 27 years old, line 380-383)

Another concern was that GPs did not or were not able to provide precise and definitive instructions on when to use the delayed antibiotic prescription (see also General Practitioners: Interview Findings, Section 4.2.4 Delayed antibiotic prescriptions). This consumer expressed their reticence in asking the GP for more specific instructions, perhaps for fear of being negatively evaluated:

> "... sometimes they're [GP] just like, 'Oh just keep it in case you need it.' I'm like, what- ((makes an incredulous face)) ... Well, how will I know if I need it? Like I actually- I just said, I don't think I do. ... And so I have a script sitting at home for that 'in case'. But then I don't want to just take them because things might have changed since they prescribed it anyway."; and

> "... feel sort of embarrassed if they're [GP] sort of assuming that you must know [when to take] or something. Like, I'm like, well maybe I should know [so did not ask for clarification] and ... so look a bit stupid." (CS06, female, 38 years old, line 152-157 and line 163-165)

Another way in which the delayed antibiotic prescription is a double-edged sword is how consumers interpret this act. By virtue of having been provided with a delayed antibiotic prescription, some consumers interpreted this to mean that the GP was leaning towards the judgment that antibiotics were warranted. In such cases, the consumer would fill the prescription immediately and commence treatment without delay. The exception would be, if the GP had given explicit instructions not to start treatment until after another 2 days of self-care and self-management. Hence, GPs' instructions need to be unambiguous in order to avoid misuse of antibiotics.

> "I'd probably get it filled, yep. ... and then I would see if after 24 hours or 48 hours if I was actually starting to make a recovery."; and

> "I would still have that thought in the back of my head that, well the doctor's got you know, reasonable thought that they have prescribed the [delayed] antibiotic, so they reasonably think- like I <u>trust</u> they reasonably think that this- it really could be a bacterial infection that is best treated with antibiotics." (CS19, female, 31 years old, line 301-302 and line 314-317)

How consumers handled delayed antibiotic prescriptions seemed also to be shaped by their experience of primary healthcare systems overseas. Consumers who had lived/worked in countries where GPs tend to prescribe multiple medications — perhaps due to fear of litigation for a missed diagnosis or perverse financial incentives — were more likely to not use the delayed antibiotic prescription.

4.4.3 Repeat antibiotic prescriptions

Intentional vs. Unintentional

When GPs do not explicitly discuss what to do with repeat antibiotic prescriptions (assuming one was given intentionally, let alone those issued unintentionally), consumers are left to decide for themselves with varying outcomes, some of which could contribute to antibiotic resistance. Proactive consumers may contact the clinic to enquire, while others would simply ignore the repeat prescription especially if they feel sufficiently recovered. The quote below was from a consumer expressing their frustration regarding the lack of discussion about the repeat prescription at the point of prescribing. This consumer subsequently rang the clinic to enquire about the need for the repeat antibiotic prescription:

> "I finish[ed] one [prescription] and I thought that's all over you know, but I see that I've got a repeat. And so, you know, 'Oh wait, do I need to do this?' [fill the repeat prescription and take the antibiotics]. And then you call up [the clinic] and then by the time you get to the pharmacy again, sometimes you've lost time. To me, that was kind of annoying when that happened."; and
>
> "I ended up getting the repeat. But it wasn't until about three days [later], so there was a three-day gap. So I was quite annoyed about that, 'coz I felt like that even though the doctor assured me that it wouldn't be a problem, I sort of felt ... from my small amount of knowledge, that it <u>would</u> be a problem. 'Coz ... I know that you're supposed to always take your antibiotics at the same time regularly, because that affects it. So I felt like having that three-day gap between the two sets might have made my whole set completely irrelevant or something." (CS02, female, 27 years old, line 186-190 and line 226-232)

Problematic sequelae

Unused repeat antibiotic prescriptions contribute to the potential "reservoir" of antibiotics accessible to consumers, much like unused delayed antibiotic prescriptions. Many consumers retain these prescriptions only to use them for another illness with similar symptoms, discarding them only when the prescription has expired and can no longer be dispensed (currently set at 12 months from date of prescribing).

4.4.4 Patient expectations

Establishing and addressing patient expectations for the consultation

Consumers who have regular GPs tend to have shared expectations regarding overall management of their health and health outcomes. Informed consumers with established doctor-patient relationships reported having had pre-emptive conversations regarding their preference to avoid antibiotic use where possible. Although it was not apparent whether these conversations were GP or consumer initiated, it provided a basis for future GP consultations whenever the need for antibiotic use came into question.

> "But if you're going to miss more than 1 day [of work] then I'll go and see a doctor to get a medical certificate. But you know, like, I'll say to them to make clear that I don't want antibiotics or anything. I don't need to say that if I see <u>my</u> GP. Because she knows that." (CS06, female, 38 years old, line 67-70)

Overwhelmingly, when describing what they expected from a GP consult should the consumer decide to see a GP for a respiratory tract infection, consumers said that they wanted to be listened to. Consumers also expected the GP to conduct a thorough clinical examination, explain their findings, treatment options, and decisions, and to answer any questions. These elements of the consultation taken together, seemed to increase consumer confidence in the professionalism, competence and trustworthiness of the GP. The first quote below illustrates a positive experience, while the quick consultation described in the second quote led the consumer to doubt the medical decision of the GP:

" ... she [the GP] really ... listen[ed] to me ... really attentive towards me. ... I really trusted her. ... Very professional ... she was very clear with me, ... she answered all the questions. But at the end, I can feel that she was really concerned about all the things. So I really trusted what the doctor said." (CS12, male, 25 years old, line 337-345)

"... I mean, you sort of just feel as if you've been palmed off a little bit= ... they're [GP] just prescribing you the antibiotic just to get you out the door. Yeah. I didn't really- 'coz they didn't really do a thorough examination. They listen [to] your chest with the stethoscope and they do your blood pressure, but um, it sort of felt like they were just trying to get through the people in the waiting room a little bit." (CS09, female, 31 years old, line 155-160)

Consumers sometimes seek a GP consult, not so much hoping, wanting or expecting antibiotics, but to seek their expertise in discerning whether there were more serious underlying health issues, for ascertaining whether the pathogen was viral or bacterial (and hence, whether treatment with antibiotics was warranted), and for reassurance. The GP advised this consumer to rest rather than resort to using antibiotics for a sore throat and fever:

"[I was] not surprised. It was as expected. I thought, oh that's good, I haven't you know- not going to get worse. I'd only gone in [to see the GP] because I was going to Sydney on the weekend and I just wanted to make sure ... I ... was going to be OK. So it was more just to check." (CS03, female, 27 years old, line 149-152)

Most if not all consumers interviewed would accept the GP's decision not to prescribe an antibiotic if this was clearly explained. Only a few expressed disappointment:

"I'd be disappointed that it couldn't be treated [with antibiotics]. But I also understand that there's no point in treating some things with antibiotics. ... So if that was clearly explained, I think I'd be less disappointed in the care that I receive from the doctor. But of course, I would always be disappointed in the fact that you just have to like, tough it out through a sickness, because there's no easy fix." (CS05, female, 29 years old, line 179-184)

4.4.5 Antibiotic use behaviours

Consumer behaviours

Consumers acknowledged that it was difficult to have perfect adherence to prescribed antibiotics. The most common behaviour was not completing the course of antibiotics, either due to a conscious decision to cease taking (Box 17), or forgetting to take when they felt better and hence, lost the main driver (feeling ill) to encourage adherence.

Box 17.

"I might have taken it for 3 or 4 days and then I stopped it, because I thought this was not a very serious situation. I thought I could [fight it] by my own body." (CS08, male, 28 years old, line 255-257)

Given that most consumers rely on GPs' instructions to guide them on appropriate use of antibiotics, GPs who omit to provide clear advice may inadvertently contribute to misuse. For example, omission to provide advice on the duration of treatment led this consumer to misinterpret the GP's intent, and led to non-completion of the prescribed course of antibiotics:

"... [the] doctor doesn't comment much about when you stop it ((taps table twice with palm of hand for emphasis)). So, the assumption is, you stop [taking antibiotics] when you feel good." (CS16, male, 26 years old, line 360-361)

Consumers found it challenging to remember to take the middle-of-the-day dose for antibiotics which has to be taken three or more times a day. Some consumers handled missed doses by working it in within the same 24-hour period. Others simply skipped the missed dose — either because that was easiest to do or because they were unsure how to handle missed doses — which resulted in taking longer to complete the course.

One consumer reported taking twice the antibiotic dose for their next dose, to make up for the missed dose earlier in the day.

> "I'll remember in the morning and then I'll remember at night, but that middle of the day- and often I can do middle of the day ((raps table)) for you know, a few days, but then, no, I end up- you get to the end and you're like, oh it's taken me 7 days to take a 5-day course or something. … I have no idea what effect that has, but I figured- I guess it's better to finish it." (CS06, female, 38 years old, line 254-258)

Some consumers were proactive in anticipating the likelihood of forgetting doses and implemented strategies, such as using phone apps as reminder systems:

> "I found it [adherence] so much of an issue that I actually downloaded an app on my phone ((grins)) that would beep and remind me to take them [antibiotics] three times a day. Because otherwise, yeah, I will forget." (CS10, female, 23 years old, line 238-240)

Consumers reported using leftover antibiotics from the last unfinished course the next time they were unwell with similar symptoms, sharing it with other people, and/or disposing unused leftover antibiotics as part of household waste when it expired. The following quotes illustrate these views.

> "Just keep [the leftovers]. Like next time somebody gets sick you start with that, you don't even go to the doctor ((chuckles))." (CS16, male, 26 years old, line 366-367)

> " … like when I was taking them [antibiotics] all the time, I would keep them [leftovers] because I would expect to take them very soon. … and then they run out of date … and I just had a big clean out last year ((chuckles)) and I just chucked them all out. And I probably should have taken them to the pharmacy but I didn't, I just chucked it." (CS04, female, 31 years old, line 350-353)

Most consumers were not aware of the Return of Unwanted Medicines (RUM) program for safe destruction of medicines, which is offered at no charge by community pharmacies. Methods of disposal reported by consumers interviewed were frequently via household waste or tipped down the sink (for liquids e.g. antibiotic mixtures/syrups).

Social influences were important in shaping consumer approach and behaviours in antibiotic use. Influences from family — parents (while growing up), friends and partner/spouse, were cited (Box18). The GP was another important influence, particularly for consumers who had established good doctor-patient relationship with a regular GP. For example, consumers reported that they were more likely to complete the course of antibiotics if the GP had explicitly instructed them to do so. Another consumer recounted that patient education from her GP previously, enabled her to recognise and resist inappropriate antibiotic use behaviours i.e. not accepting shared antibiotics from her twin sister and not using her own leftover antibiotics.

Box 18. Behaviour change due to spousal influence

"He [husband] would just say- 'coz I guess he's very against all the antibiotics and everything, and I think that's probably another influence on me that I have shifted from that, because … I would come back from [name of country, visiting family overseas] with a big sack of medication ((smiles)). And he said, 'Oh you shouldn't be doing this you know, you have to go and see the doctor' … and he said, 'you know the more you take [antibiotics], it's not going to work anymore…' " (CS04, female, 31 years old, line 492-497)

Motivations for seeking antibiotics

The relatively higher cost of products for symptomatic management of coughs and the common cold may motivate some consumers to seek antibiotic treatment, which costs less. This was true of consumers for whom costs of healthcare was a key concern. These consumers would also prefer to use bulk-billing clinics as far as possible in order to reduce out-of-pocket costs.

> "Because often I guess, those types of remedies like nasal sprays and … you know all those other types, they can … be a lot of them and they can be expensive [to purchase]. So whereas, antibiotics can just be quite

affordable, in terms of treatment options. … those alternatives aren't always that affordable. Like even just like cold and flu tablets are more expensive than antibiotics themselves." (CS05, female, 29 years old, line 194-203)

4.4.6 Self-care strategies for respiratory tract infections

Self-care and self-management of respiratory tract infections

Strategies used by consumers to manage the symptoms of a respiratory tract infection fell into these categories: (a) home remedies, (b) commercially available natural remedies, (c) immune boosters, (d) over-the-counter cough and cold products, and (e) increased rest and fluids. Popular home remedies included, fruit and vegetable juices, hot drinks made from single-ingredient or a combination of garlic, ginger, lemon, and/or honey, tea, and traditional remedies such as green bean soup or herbal soup. Commercially available natural remedies used by consumers which were procured either from pharmacies, supermarkets or health food stores included echinaceae (with or without Vitamin C and Zinc) tablets/capsules, garlic tablets/capsules, and olive leaf extract. Immune boosters used were a variety of vitamins and/or minerals e.g. multivitamins, Vitamin B, Vitamin C, and Zinc. Over-the-counter cough and cold products used were those commonly available in pharmacies and/or supermarkets, such as Codral® Cold & Flu tablets, Lemsip®, Panadol® and lozenges, to name a few. Consumers with underlying long-term respiratory conditions such as asthma, were especially mindful of following their asthma management plan during periods of intercurrent illness.

Consumers' self-care behaviours were also shaped by their workplace culture. Some workplaces expect staff to "power through" minor infectious illnesses such as coughs and the common cold, whereas other organisations deem it acceptable (and even desirable) for staff to take a few days off work to recuperate at home, and to minimise the spread of infectious pathogens to other colleagues. One consumer noted from their past experience that the doctors in the army seemed to prescribe antibiotics more freely, perhaps to prevent or minimise disruptions to soldiers' training schedule which can cause major logistical difficulties.

Triggers for self-referral to GP

Consumers were realistic about feeling miserable and unwell during a common cold or cough, and would tolerate their symptoms for up to 3 weeks (i.e. between 1 to 3 weeks) before seeking a GP consult. Self-care and self-management strategies were used in the meantime to alleviate these symptoms.

However, consumers are more likely to seek a GP consult if: (a) they were unable to take time off work/study to recover, (b) they had to maintain a high level of functionality — usually women with both work and family commitments, (c) an important upcoming event e.g. university exams, a wedding, (d) they need a medical certificate to take time off work to recover, and (e) persistence or worsening of symptoms. The consumer quoted below would usually self-manage for up to a week before seeking a GP consult, but could self-refer earlier if there were important upcoming life events:

> "... so it would depend on my symptoms, but also what I have to do [life context]. So if I'm going through a period where I don't have a lot on, then I wouldn't mind so much suffering through symptoms. But if I have something that I need to do like a run or something important job-wise or something [like that], then I might seek out healthcare earlier. ... I'll just say persistence of the symptoms." (CS05, female, 29 years old, line 152-156)

4.4.7 Views on risks of taking antibiotics

Past experience with using antibiotics: Non-event vs. Negative event

Consumers who had negative experiences with taking antibiotics reported side effects such as: (a) adverse impact to digestive system for a prolonged period, (b) feeling physically tired, and (c) vaginal thrush. These consumers were more reluctant to use antibiotics, unless absolutely necessary. The following quote was from a consumer who estimated that it took between 6 months to a year for the recovery of his digestive system following a prolonged course of antibiotics for tonsillitis:

> "Yes, from the roxithromycin [antibiotic] I got stomach discomfort. Just don't feel very comfortable. Digestion was not very good and I was so

> worried ... after taking two months of antibiotics, the whole body [was] ... very weak at that time; my digestion system. And I got diarrhoea very easily. So I think it might be related to the long term antibiotics ..."
> (CS08, male, 28 years old, line 513-517)

Consumers who had neutral experiences with taking antibiotics e.g. those with no troublesome side effects and recovered with the treatment, were open to using antibiotics. Although, many were mindful of not using antibiotics unless clinically warranted as advised by the GP.

Those who had either life-saving experiences with antibiotics or close brushes with antibiotic resistance — of either themselves or close family members — were very attuned to the benefits of these medications and also very aware of the need to protect the remaining armamentarium of antibiotics. For example, one participant had the traumatic experience of being told by hospital doctors that there was no antibiotic they could give her then 10-month old daughter for a post-surgical infection. The child survived with supportive treatment.

Safe to use vs. Concerned

Many consumers generally perceive that antibiotics are a safe medication to take. For example, some consumers knowing that there was uncertainty as to whether their infection was viral or bacterial, would choose to use their delayed antibiotic prescription immediately. The rationale given seems to be a win-win for the consumer, in that — they are aware that the antibiotic would not work if the infection was viral, but they believe that antibiotics would not do any harm to their body; on the other hand, the antibiotic would be effective if the infection turned out to be bacterial.

However, many consumers expressed their preference to avoid antibiotics where possible. Their reasons ranged from being unsure as to how the antibiotics actually worked and the effects it could have on the body, to being concerned about becoming "resistant". Many of these consumers also considered themselves low users of medications overall.

> "I'm pretty hesitant to take them [antibiotics], only because of the lack of information that I have received about what they actually do. And I prefer to find an alternative method to fixing what ails me ((chuckles))." (CS09, female, 31 years old, line 390-392)

> "...no, not going to take them because I don't want to get resistant." (CS02, female, 27 years old, line 366-367)

Cultivating a healthy immune system was another reason cited by consumers who were mindful of using antibiotics only when required:

> "... from a while ago I got the idea in my head that in order to build up your immune system well, you need to give it a chance to fight things on its own. It's only if it's clearly going to lose the battle that you should really help it with medication." (CS10, female, 23 years old, line 374-377)

4.4.8 Views on antibiotic resistance

Meaning of antibiotic resistance

Consumer understanding of antibiotic resistance was conceptualised in four ways: (a) as a property of the body — body becomes resistant to antibiotics, (b) as a property of the medication — antibiotic is no longer effective, (c) as a property of the bacteria — bacteria is resistant to the antibiotic, and (d) as a property of a collective — society is immune to antibiotics. The quotes below illustrate the different ways consumers described antibiotic resistance.

> "... it's [the antibiotic] just not effective for the body anymore. That's obviously, you know, it's like the body's built up this immunity to it [the antibiotic] actually working." (CS03, female, 27 years old, line 327-329 — expressing antibiotic resistance as both a property of the body and of the antibiotic)

> "... bacteria ... is getting stronger. ... People don't finish the doses ... so ... the first part of the treatment there are more <u>weak</u> bacteria [that] died, and then the stronger ones live and as you don't finish [the course of antibiotics], only the stronger ones [survive] and genetically would be the best bacteria, and that's what's happened." (CS12, male, 25 years old,

line 508-515 — expressing antibiotic resistance as a property of the bacteria)

"... if it's [antibiotics] prescribed for reasons which aren't very serious, then as a society we get immune to the effects of those drugs [antibiotics]." (CS10, female, 23 years old, line 199-201 — expressing antibiotic resistance as a property of a collective)

Some consumers use battle metaphors in describing antibiotic resistance. The following quote is an example:

"... it's like fighting an enemy with weapons that are not good enough." (CS15, female, 28 years old, line 331-332)

Pessimism vs. Optimism

Consumers were not necessarily pessimistic, but were concerned as to whether antibiotic resistance could be adequately addressed in a timely manner. Many commented that "prevention is better than cure" — finding ways to prevent or minimise antibiotic resistance is preferable to having to find ways to resolve it. A few consumers interviewed were very concerned about the issue (Box 19). Perhaps, these consumers are more aware than most of the significant lag time between discovery and marketable product or technology. Even promising new solutions take about 5 to 10 years to get to human trials.

Box 19.

"I'm actually quite worried. 'Coz even healthy people, when you travel around, one of the main reasons for spread of all these drug resistant strains has been human movement. ... people can carry them [resistant strains of bacteria] with them, and not- [be sick], just be a carrier. And then, you know, you go to a region that's endemic for ... these drug resistant bacteria, pick them up and you come back, and you disseminate it. And that's how it spreads. So, yeah, I'm, I'm quite worried. And I hope if I do get a bacterial infection, it's not drug resistant." (CS15, female, 28 years old, line 437-443)

On the other hand, some consumers were optimistic and confident that medical technologies to address or overcome resistant bacteria would be found in the not too distant future.

> "I guess medicine and technology is advancing so quickly that they may be able to stamp them [resistant bacteria] all out ..." (CS09, female, 31 years old, line 303-304)
>
> "Scientists out there will come up with something and they're really clever, so I don't worry too much because I think somebody's solving the problem." (CS23, female, 28 years old)

Optimism was also found in consumers who had lived and/or worked overseas — due to their country of origin, furthering their studies, work opportunities or for extended travel — who felt that Australia had been managing the issue of antibiotic resistance rather well. They note that antibiotics are regulated medicines in Australia and can only be accessed via a prescription. These consumers surmised and were optimistic that GPs acted as good gatekeepers for antibiotic use in the community. There was also a sense of complacency and/or a feeling of safety of being in a "first-world" country, conferring a false sense of impermeability to issues such as antibiotic resistance.

> "But here [Australia], you need to have a prescription. So I would be less concerned here, because it's regulated by the GP." (CS12, male, 25 years old, line 599-600)

Impact of antibiotic resistance: Personal and Societal

Consumers were aware that antibiotic resistance is currently an issue in hospitals. Hence, the association was made that avoidance of hospitalisation would mean avoidance of antibiotic resistance for the individual.

Consumers largely did not think antibiotic resistance would affect their health or their family's health. Although a few mentioned the more vulnerable in society may be affected adversely e.g. people suffering from cystic fibrosis who usually need antibiotics as part of their management plan. Many consumers commented that their health was good and saw this as insurance against being adversely affected by antibiotic resistance.

Most consumers, even those who were aware of antibiotic resistance and its consequences, were of the opinion that antibiotic resistance would only have societal impacts in a generation's time — citing a timeline between 5 to 40 years into the future.

> "Probably a generation. So about 40 years or so, I imagine." (CS02, female, 27 years old, line 340)

A few consumers who had personal or close family with health issues, were more concerned about the possibility that they could be adversely impacted. For example, someone with allergies to some antibiotics now, would have a faster rate of diminishing options for treatment. One consumer who seemed to rely considerably on antibiotics for minor ailments expressed their concerns about being able to continue to access antibiotics easily, should there be strong action by the government to address antibiotic resistance.

It was interesting to find that despite the high education level of the consumers interviewed, many were not aware that antibiotic resistance could occur at both an individual and societal level. These consumers had assumed it was one or the other. A few were also not aware that using antibiotics inappropriately for the common cold and/or coughs can contribute to antibiotic resistance, and in time cause these antibiotics to be ineffective for other more serious infections. Similarly, most consumers were not aware that resistant bacteria could be transferred from person to person or from food-producing animals to people.

4.4.9 Mitigating antibiotic resistance

Individual initiatives

Consumers were thoughtful as to what they can do as individuals to help mitigate antibiotic resistance. Although many felt that health professionals such as GPs should play a more proactive role — prescribe less antibiotics, educating patients when antibiotics are not required, and not succumbing to patient demands for antibiotics — they acknowledged that consumers need to be part of the solution.

Consumers reflected on their role in two ways: (a) what they can do personally as individuals, and (b) what consumers should/can do collectively. At the personal/individual level, consumers felt that their general approach of avoiding unnecessary antibiotics meant that they were not worsening the problem of antibiotic resistance. On occasions when antibiotics were prescribed, consumers recognised that socially responsible behaviour on their part would constitute completing the course of antibiotics, so as not to encourage the growth of resistant bacteria. At the societal level, consumers reported attempts at influencing their social and familial circle — albeit with mixed results.

Consumers also maintained a realistic view of having to tackle antibiotic resistance from multiple angles, highlighting the need for conservation of antibiotics now through individual efforts, while at the same time pursuing innovative approaches:

> "I certainly think we make a lot of medical breakthroughs. But I think it's often better to prevent than cure. So … if we've got this thing [antibiotics], yes we should continue to develop medical technologies and continue to try and find new antibiotics and we should continue all of that, but we shouldn't just forget about [the] potential looming problem. So I think we need to do both, does that make sense? … So we need to look after what we have [antibiotics], and not just hope that the next breakthrough is just around the corner. I certainly hope that it is. But … where does it stop? You might find a new antibiotic, well that one becomes resistant … so I think it's a continual thing." (CS19, female, 31 years old, line 546-557)

4.4.10 Patient education vs. Information needs

Consumer information needs

Consumers may or may not ask their GP or the community pharmacist for information about the antibiotics prescribed, as they expect to either see an information leaflet included in the medication pack or that the information could be easily found online. When asked, only a few consumers reported being given a leaflet with information about the prescribed antibiotics or that a leaflet had been included in the medication pack. This could be due to the shift by pharmaceutical companies from paper leaflets to providing Consumer Medicines Information online and/or via the Therapeutic Goods Administration website (Therapeutic Goods Administration, 2014).

Consumers interviewed wanted the following types of information, even though more often than not, they did not ask — or perhaps did not have the presence of mind to ask — the GP during the consultation or at the point of prescribing: (a) how the antibiotic worked, (b) the rationale for selection of a particular antibiotic, (c) the duration of treatment, including when or whether the repeat antibiotic prescription (if issued) should be used, (d) whether they can have alcohol while on antibiotics, and (e) the rationale for finishing the course of antibiotics (or the consequences of not doing so), so as to encourage adherence to the treatment.

The quote below was from a consumer who would have liked either their GP or the community pharmacist to have discussed the possible interaction between alcohol and the prescribed antibiotics more thoroughly:

> "So the doctor just said, don't drink alcohol when you take this antibiotic, which I've been told for most antibiotics I think. And then ... 'coz I was going out for my friend's 30th [birthday] while I was taking that [antibiotics]. And she said, 'Oh, no, you can drink alcohol while you're taking antibiotics, I've done it loads of times.' And so I looked it up because I have heard competing information. ... and all of the information that I could find said, <u>most</u> antibiotics, doesn't really do anything when you drink alcohol [not necessary to avoid alcohol], <u>but</u> these particular like, maybe two strains or something ... stop you from processing alcohol properly ... So ... you only need to have one drink or less, and you can start vomiting and fainting and be really sick ((chuckles)). So the doctor didn't tell me <u>that</u> much detail. He just said, don't drink alcohol." (CS18 female, 29 years old, line 162-174)

Consumers noted that the types of information listed above were not voluntarily given by GPs or community pharmacists. The quote below was from a consumer who wondered about the rationale for the selection of antibiotics, which seemed to be the same one given for another type of infection previously.

"But it seems to be the same one that's prescribed. So it would just be good if they [the GP] could provide the information of how that actually helps an ear infection and chest infection. You know ... because they're completely different. To me they're completely different areas [the infections]." CS09, female, 31 years old, line 402-406)

In the case of a delayed prescription for antibiotics, consumers wanted definitive information about when to start the antibiotics, as discussed in Section 4.4.2 Delayed antibiotic prescriptions.

Consumer awareness

Consumers interviewed were largely not aware of the public campaigns run by Government or Commonwealth funded agencies. When asked, no consumer remembered having seen any of the recent campaign materials, whether current or from the past year — in the form of print media (posters in clinics or pharmacies, at bus stops, in buses), television advertisements, or social media. This was an unexpected finding as the consumer interviews were conducted when the Winter is Coming 2015 public health campaign was active[26] (see Section 3.4.4 for details of the campaign), coupled with the fact that the annual Antibiotic Awareness Week 2014 national campaign had occurred just six months prior. A few consumers reported noticing articles related to antibiotic awareness in professional journals and online news, such as The Conversation.[27] Interestingly, some consumers were generally

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[26] Incidentally, the bus stops outside the university where many of these consumer participants were based, did have the Winter is Coming posters. Selected buses plying the university route also carried these poster advertisements, both inside the bus and on the external façade.

[27] The Conversation is a free online news site produced as a collaboration between editors and academics, which provides informed analyses and commentaries on important national and global events.

sceptical about news reported in the media, and would have assumed that the issue of antibiotic resistance had been sensationalised or that it was hyperbole.

Some consumers interviewed offered ideas or perspectives for future public campaigns. Perspectives include: (a) avoiding visually shocking and/or overtly graphic television advertisements about the consequences of antibiotic resistance, which would be detrimental to the public health message, (b) using short video clips of 5 to 10-minute talks about the topic of antibiotic resistance delivered in an engaging and entertaining manner, which could be easily shared on social media, (c) using infographics instead of text-heavy messages, and (d) using cartoon animation to tell the story of how resistant bacteria are caused and what can be done about it.

There was a general consensus that antibiotic resistance is a difficult topic with which to engage consumers, as it is "invisible" (Box 20) and inconsequential for most people currently. A few were concerned about the misinformation on social media or online about health-related topics, for example the use of alcohol while taking antibiotics.

Box 20. Antibiotic resistance is an invisible problem

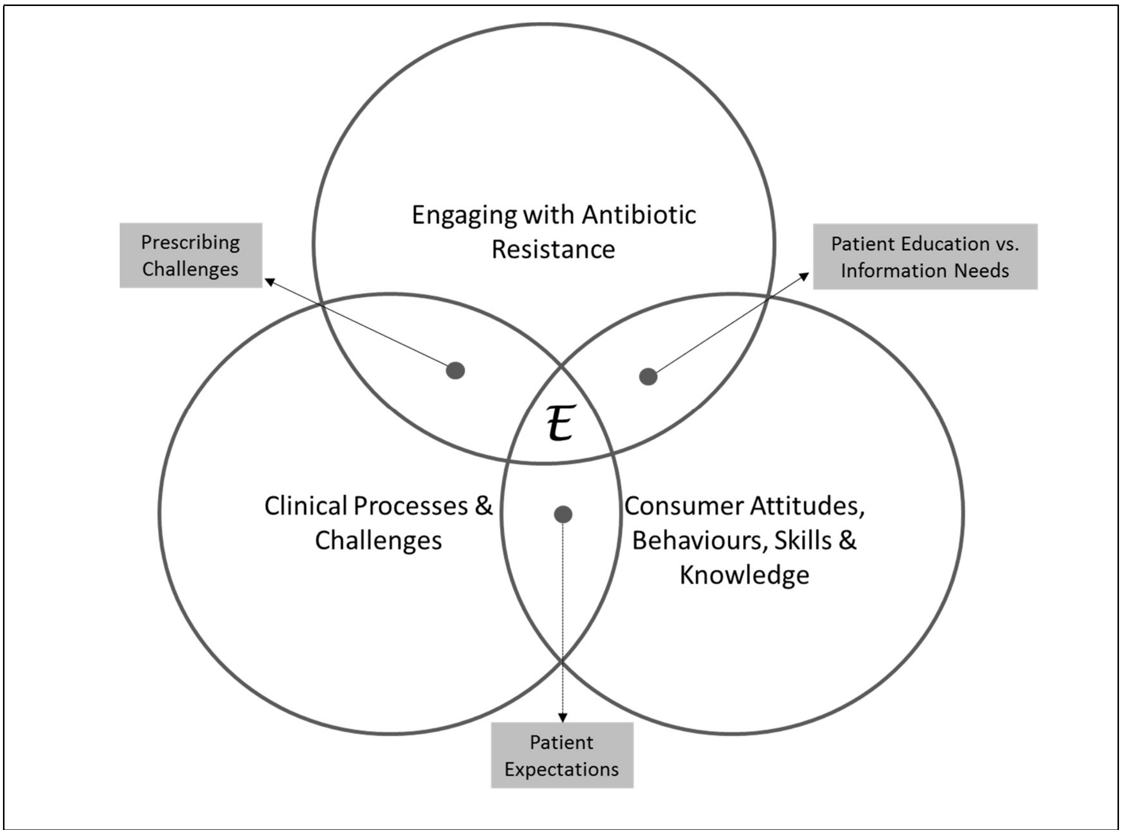
"Because it’s not something that you can see, antibiotic resistance. ... I don’t know if you can measure it. ... You can’t even see it — look at you and then say like [you have it]. ... it’s tough to convince people about that [the importance of addressing antibiotic resistance]. It’s invisible ... And it is real, but it’s invisible. So it’s very difficult to push the message across, people don’t see it you know. They think like, it doesn’t matter, I’m better today, that’s all that matters to me." (CS16, male, 26 years old, line 710-720)

4.4.11 Other findings

Other related findings from the consumer interviews are the use of more than one GP. Some consumers consult multiple GPs due to not having a regular GP. This is especially so for consumers who have relocated to Brisbane — from another country, interstate, rural or regional Queensland town — or a change of residence locally (e.g. moving to another suburb which can be a considerable distance from the previous GP). Even those who reported having a regular GP acknowledged that they may see another GP for other types of issues — usually specialty issues e.g. skin checks, or minor issues.

For example, consumers who are managing long-term conditions tend to consult their regular GP for review and follow-up regarding these conditions, but may use another GP's service for minor conditions, in part due to difficulty in booking an unplanned appointment.

4.5 THE ENABLING ANTIBIOTIC EUPRAXIS (EABE) MODEL



The Enabling Antibiotic Eupraxis (EABE) Model shown above, emerged from the third iteration of code mapping through studying the meta-categories of the coded semi-structured interviews of all three participant groups (Section 4.1.2). The model comprises of three intersecting circles — each one representing a meta-category: (a) clinical processes and challenges, (b) consumer attitudes, behaviours, skills and knowledge, and (c) engaging with antibiotic resistance.

The intersections between two circles represent shared or common subcategories between the two meta-categories concerned, and relevant to the third. For example, the subcategory of Patient Expectations is shared between the meta-categories of

Clinical Processes & Challenges and Consumer Attitudes, Behaviours, Skills & Knowledge, while being relevant to Engaging with Antibiotic Resistance. The same interpretation of the diagram applies to the sub-categories of Patient Education vs. Information Needs and Prescribing Challenges.

The area where all three meta-categories intersect is represented by the letter "E" — eupraxis, defined here to mean good/right theoretically-informed practice. This model can be used in two ways: (a) to explain the phenomenon of what influences antibiotic use from the perspectives of GPs, community pharmacists and consumers (Section 4.5.1), and (b) to inform individual and collective action on how to enable wise use of antibiotics (Section 4.5.2). In other words, antibiotic eupraxis is possible when prescribing challenges and patient expectations are made transparent between GPs and consumers, through skilful communication embedded in patient education that meets consumers' information needs.

4.5.1 Explaining the phenomenon

From the perspective of GPs, clinical processes which inform decision-making (TDF D10 Memory, Attention and Decision processes) are relatively straightforward, relying mainly on cognition and clinical examination (TDF D1 Knowledge, TDF D2 Skills), and experience and intuition, as reported in Section 4.2.2. The challenges to prudent antibiotic prescribing for GPs lie predominantly in the undercurrents of covert pressure to acquiesce to (a) prescribing practices of other medical colleagues i.e. other GPs and specialists — perhaps to a lesser extent, and (b) patient expectations — perhaps to a larger extent due to immediacy of the encounter. Referring to the EABE model to explain the doctor-patient encounter, when patient expectations for antibiotics coupled with prescribing challenges such as uncertainty of diagnosis or the prescribing practices of other medical colleagues (for example, when the patient claims that their usual GP "always" prescribes antibiotics for the same presentation), this exerts pressure on the GP to prescribe antibiotics. If the situation is not diffused by the GP through actions that show they are the patient's wise advocate (detailed in Section 4.2.2) and by clearly explaining the rationale for the decision (patient education that meets consumer information needs), the dynamic is one of "pulling" away from eupraxis (Figure 11).

Figure 11. Distortion A: Illustration of the tension between patient expectations and prescribing challenges resulting in "pulling" away from eupraxis

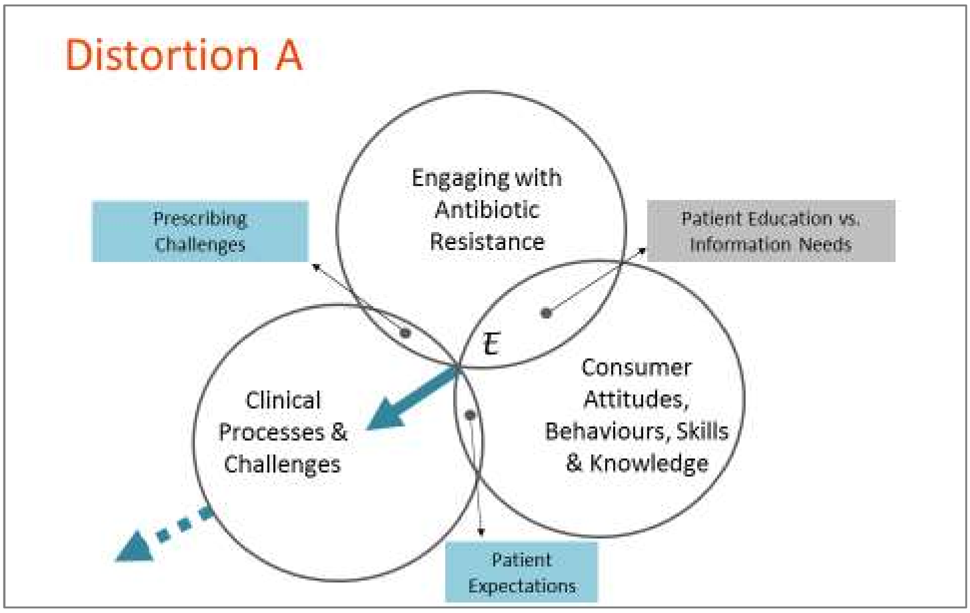
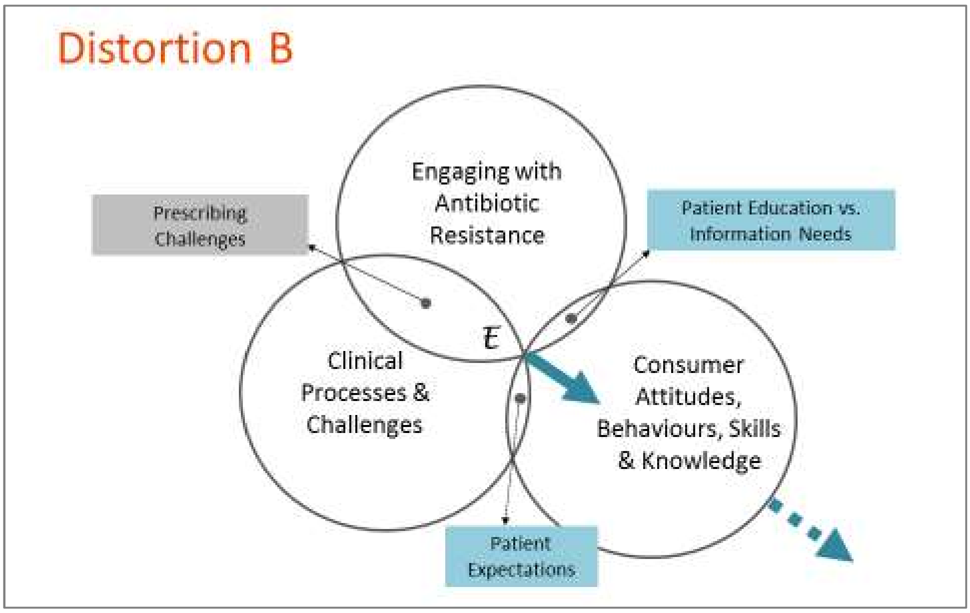


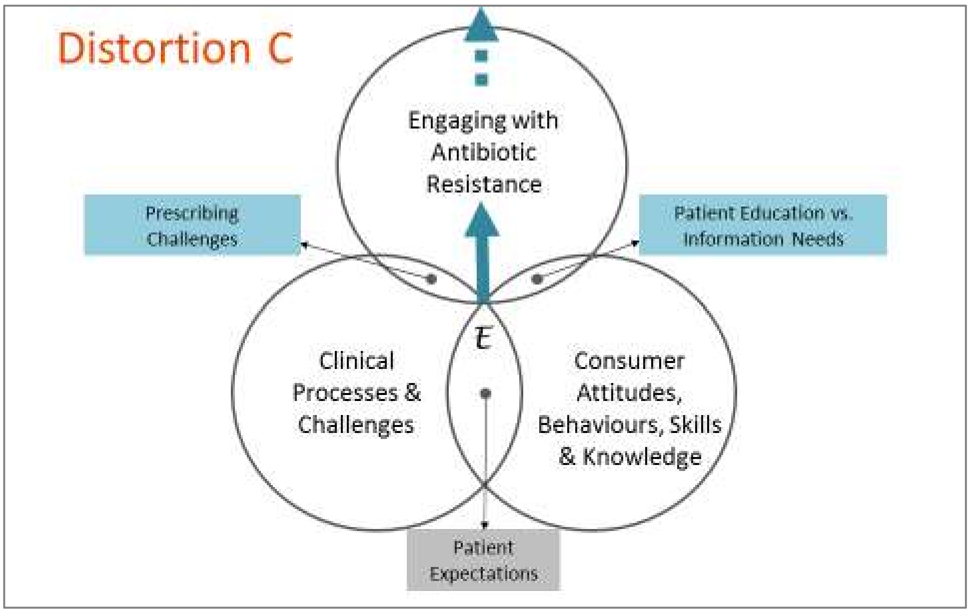
Figure 12 illustrates the situation where patient expectations for antibiotics are not properly addressed by GPs through skilful patient education that meets patient information needs, resulting in eupraxis being lost.

Figure 12. Distortion B: Illustration of the tension between patient expectations and patient education vs. information needs resulting in "pulling" away from eupraxis



Finally, Figure 13 shows eupraxis being lost when GPs capitulate by prescribing delayed antibiotics and consumer information needs are not met when given this type of script. As a result, consumers may inadvertently engage in inappropriate antibiotic use behaviours.

Figure 13. Distortion C: Illustration of the tension between prescribing challenges and patient education vs. information needs resulting in "pulling" away from eupraxis



In other words, antibiotic eupraxis is possible when prescribing challenges and patient expectations are aligned between GPs and consumers, through skilful communication embedded in patient education that meets consumer information needs.

4.5.2 Enabling theory-informed practice

The EABE model assumes an interdependence between the three meta-categories. Behaviour (e.g. how we use antibiotics) is influenced and cannot be separated from contextual influences, temporal factors, and physical and psychological characteristics. Hence, a person's context is continually shifting. As context changes, the behaviour necessary to accomplish a goal also changes. Understanding how these meta-categories lie in tension and what actions can defuse these tensions, bring or restore harmony, assists in creating or trouble-shooting individual and collective action to mitigate antibiotic resistance.

4.6 THE BRIDGE: FROM SEMI-STRUCTURED INTERVIEWS TO DISCRETE CHOICE EXPERIMENTS

This section represents the first point of interface between methods (Mixing 1), as it bridges selective aspects of the qualitative phase with the quantitative phase of the research — from semi-structured interviews to discrete choice experiments.

To recapitulate, the second research question aimed to investigate which factors are dominant in influencing the use of antibiotics in the primary healthcare sector, so that we can better understand which factors to target in order to reduce inappropriate antibiotic use. To address this research question, the DCE was selected as the method of choice — justified in Chapter 3, Section 3.5. In order to be useful for informing policy or practice, DCEs must present relevant scenarios for which the participant is the actual or potential decision maker in real life. This section describes how selected findings from the semi-structured interviews were used to develop the DCE research instrument — DCE scenarios, attributes and levels.

4.6.1 Selection of concepts/themes for DCEs

Findings from the semi-structured interviews highlighted that there were several antibiotic "reservoirs" in the community — unused antibiotics, unused antibiotic prescriptions, delayed prescriptions[28], and repeat prescriptions[29], which provide consumers with opportunities for decision-making on whether, when and how they use antibiotics (previously mentioned in Section 3.5.2 Identification of attributes and levels, and further explained in Sections 4.4.2, 4.4.3 and 4.4.5). Scrutiny of research interviews revealed that GPs, community pharmacists and consumers placed less

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[28] Delayed antibiotic prescription – a prescription given to a patient with instructions to use it only if their symptoms worsen or do not improve in a few days. The delayed prescription is usually given to the patient during the initial consultation, although some GPs prefer to leave the prescription with clinic reception for the patient to collect at a later date.

[29] Repeat prescriptions enable a regular re-supply of the prescribed medicine without the patient having to see the GP each time. The number of repeats is authorised by the GP on the original prescription. The Pharmaceutical Benefits Scheme (PBS) Schedule lists medicines and the maximum number of repeats subsidised under the scheme. Time intervals between supplies must meet PBS criteria.

emphasis on unused antibiotics, unused antibiotic prescriptions and repeat antibiotic prescriptions being sources of frustration as compared to delayed antibiotic prescriptions. This discovery led to delayed antibiotic prescription being the focus of the DCE scenario for consumers, and to a lesser extent, for GPs.

With the research question, the purpose of the DCEs, and the focus of the DCE scenarios in mind, the salient decision points which would have an impact on antibiotic consumption are: (a) for the GPs — at the point of considering whether to prescribe an antibiotic (including a delayed antibiotic prescription), and (b) for the consumers — at the point of considering whether to fill a delayed antibiotic prescription.

Given these two decision points, the relevant codes from the interview transcripts which signify events (e.g. seek GP's expertise), examples, topical markers (e.g. delayed prescription), concepts and/or themes from the research interviews, were examined for the development of the DCE scenarios and possible attributes and levels. These codes — a mix of deductive and inductive codes — are listed in Figure 14.

Figure 14. Codes which were examined for DCE development

Abdicating responsibility	Better safe than sorry
Affecting work	Clinical approach and DM
Approach to AB use	Decision-making cognition and intuition
Bad experiences of delaying GP consult	Doctor-Patient relationship
Barriers to GP consult	It doesn’t look like you’re trying to scam them
Constrained by travel	Negotiating clinical uncertainty
Definitive instructions	No definitive trigger
Delayed AB	Patient expectations
Delegation of decision	Permissible circumstances
GP's advice	Prefer reassessment
Important life event	Reassurance
Just in case	Respecting patient’s time
Past experience with AB	Trust
Perspective CC complications	
Referral to GP	
Seek GP's expertise	
Self-assessment of severity	
Self-management strategies CC	
Time lag seeking GP consult	

A single hypothetical scenario was developed for both the GP and consumer DCEs, which could incorporate the relevant decision points each would have to make. A scenario used by Hardy-Holbrook et al. (Hardy-Holbrook et al., 2013) featuring an adult patient presenting with symptoms of a respiratory tract infection, served as the starting point. Figure 15 shows the original scenario from Hardy-Holbrook et al. (Hardy-Holbrook et al., 2013).

Figure 15. Base scenario

> A 27-year-old male with no significant past medical history who attends with a 3-day history of dry cough and sore throat. He has stayed home for 3 days and requires a medical certificate for any further time off work. On examination, his temperature (tympanic) is 37.8°C, his throat appears slightly red and there is no exudate or cervical lymphadenopathy. His chest is clear.

The base scenario was further developed with information gleaned from the following codes: approach to AB use, constrained by travel, referral to GP, seek GP's expertise, permissible circumstances, self-assessment of severity, and self-management strategies CC. Figure 16 shows the final versions of the hypothetical scenarios for both the consumer and GP DCEs. The scenario for GPs retained the clinical information found in the base scenario, to more closely mimic reality.

Figure 16. Final versions of scenarios for consumer and GP DCEs

Consumer DCE scenario
Imagine you have a runny nose, sneezing, a sore throat and a dry cough. You have managed these symptoms in your usual way, which may include a combination of rest, home remedies, vitamin supplements, commercial immune boosters, and cold/flu/cough products. As you are still feeling unwell, you decide to consult a doctor. After examining you, the doctor gives you a prescription for antibiotics because you can't come back for a reassessment in 2 days.
GP DCE scenario
An adult patient presents with a runny nose, sneezing, a sore throat and dry cough. They have managed these symptoms in their usual way, which may include a combination of rest, home remedies, vitamin supplements, commercial immune boosters, and cold/flu/cough products. As they are still feeling unwell, they decided to consult a doctor (you). The patient has no significant past medical history. On examination, their temperature (tympanic) is 37.8°C, throat appears slightly red and there is no exudate or cervical lymphadenopathy. Chest is clear.

The framing of the DCE questions was discussed in Chapter 3, Section 3.5.2. For the consumer DCE, the question was: "Based on the scenario, as you leave the doctor's clinic, in which situation (A or B) would you be **more likely to fill the antibiotic prescription** (go to the pharmacy to get the antibiotics)?" For the GP DCE, the question was: "Based on the scenario, in which situation (A or B) would you be **more likely to prescribe an antibiotic** for the patient?", followed by "And this antibiotic prescription would be?" (two choices are then presented — one for immediate treatment, the other as a delayed prescription).

The attributes and levels for the consumer and GP DCEs were presented in Chapter 3, Section 3.5.2. These were gleaned from the codes in Figure 14.

4.6.2 Rationale for not conducting a DCE for community pharmacists

As alluded to in Chapter 3, a DCE for community pharmacists was not conducted as from the literature and the interviews, there was no real decision point where community pharmacists were able to exercise a decision which would contribute directly to the reduction of antibiotic use. The Australian primary healthcare sector as it is currently structured, leaves community pharmacists out of the prescribing loop. This may change as more non-dispensing pharmacists work within a GP clinic as part of the healthcare team.

The three most relevant points where community pharmacists interact with a consumer regarding the possible use of antibiotics are: (a) consumer seeking a solution to resolve symptoms of respiratory tract infection prior to consulting a GP, (b) consumer seeking to fill an original antibiotic prescription, (c) consumer seeking to fill a repeat antibiotic prescription. For point (a), community pharmacists would exercise clinical judgment whether to recommend self-care products and provide advice for the self-management of symptoms, or to recommend a referral to the GP. Hence, possibly averting potential antibiotic-seeking behaviour of consumers. However, it can be argued that consumers who seek pharmacist advice first, have decided not to (or are less likely to) seek antibiotics in the first place. For point (b), it is highly likely that the community pharmacist would fill the original antibiotic prescription, as long as the prescription is valid (legal), the dose was appropriate for the consumer and the indication as disclosed by the consumer seemed reasonable. If the prescription was dated more than a month ago or if a repeat prescription was presented more than a month after the original was dispensed (point (c)), the pharmacist may question the consumer further to determine if they could clinically justify dispensing the antibiotic. As most community pharmacists currently do not have access to the medical records of the consumer — an issue which a robust and well-used national electronic health record would solve — they rely on the information provided by the consumer. In practice, it is deemed impractical to ring the GP clinic for every occasion an antibiotic prescription was presented, unless there was an obvious patient safety issue, such as a contraindication e.g. consumer is allergic to the antibiotic, an interaction with another medicine the consumer is taking, or a dosage issue e.g. inappropriate dose. For both points (b) and (c), the current remuneration model for pharmacies acts as a disincentive to refuse dispensing. Currently, pharmacies are largely remunerated based on prescriptions dispensed, although cognitive services are included in the Sixth Community Pharmacy Agreement (Australian Government & Department of Health, 2015). Some community pharmacists (particularly those who are practitioner-owners or in managerial roles) and a few consumers who participated in the semi-structured interviews, noted that there are currently no incentives for pharmacies or community pharmacists to be stewards of antibiotics.

4.6.3 Summary

In this chapter, results from the semi-structured interviews for GPs, community pharmacists and consumers were reported and then used to develop the Enabling Antibiotic Eupraxis (EABE) Model in answer to Research Question 1. The EABE model comprise of three intersecting circles — each one representing a meta-category: (a) clinical processes and challenges, (b) consumer attitudes, behaviours, skills and knowledge, and (c) engaging with antibiotic resistance. This model can be used in two ways: (a) to explain the phenomenon of what influences antibiotic use from the perspectives of GPs, community pharmacists and consumers (Section 4.5.1), and (b) to inform individual and collective action on how to enable wise use of antibiotics (Section 4.5.2). Plainly stated, antibiotic eupraxis is possible when prescribing challenges and patient expectations are made transparent between GPs and consumers, through skilful communication embedded in patient education that meets consumers' information needs.

Together with the literature, these results sharpened the focus of decision points constructed for the discrete choice experiments (discussed in Section 4.6.1). Selected concepts from the semi-structured interviews were used to develop the attributes and levels of DCEs for GPs and consumers. The results from these DCEs are reported next in Chapter 5.

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Chapter 5: How do GPs and consumers trade-off on factors influencing antibiotic use? — Data analysis and results of DCEs

In Chapter 5, data analysis and results of the quantitative component — discrete choice experiments, are presented in answer to Research Question 2: How do GPs and consumers trade-off on factors influencing antibiotic use?[30] The chapter begins with a description of the Mixed Logit Model (MXL) in Section 5.1. Next, results from the two DCEs — one each for GPs and consumers — are reported in Sections 5.2 and 5.3, respectively. These sections conclude with comparisons of the relative importance of coefficients estimated for each attribute level within a DCE, and a relative order of attribute importance which influenced decision-making for each of the hypothetical scenarios.

Development of the DCEs were dealt with in Chapter 3, Sections 3.5.1 to 3.5.4, with additional information provided in Chapter 4, Section 4.6 (The Bridge: From Semi-Structured Interviews to Discrete Choice Experiments). Sampling and recruitment were addressed in Chapter 3 in Sections 3.5.5 and 3.5.6, respectively.

5.1 THE MIXED LOGIT MODEL (MXL)

The Mixed Logit Model (MXL), also known as the Random-Parameters Logit (RPL), was used as it allows for potential preference heterogeneity amongst respondents and does not assume equal competition between choices unlike other multinomial logit model variants (M Ryan et al., 2008). The MXL is a model that is highly flexible and compatible to the random utility model, outlined in Chapter 3, Section 3.5. It is

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[30] The rationale for not conducting a discrete choice experiment for community pharmacists was provided in Chapter 4, Section 4.6.2.

essentially the multinomial logit (MNL) mixed with the multivariate distribution of the random parameters (M Ryan et al., 2008). The MXL is represented by the following equation:

$$\text{Prob}(choice_{ns} = j|x_{nsj}, z_n, v_n) = \frac{\exp(V_{nsj})}{\sum_{j=1}^{J_{ns}} \exp(V_{nsj})}$$

where,

$(V_{nsj}) = \beta_n' x_{nsj}$

and $\beta_n = \beta + \Delta z_n + \Gamma v_n$

x_{nsj} is the *K* attributes of alternatives *j* in choice situation *s* faced by individual *n*;

z_n is a set of *M* characteristics of individuals *n* that influence the mean of the taste parameters; and v_n is a vector of *K* random variables with zero means, known variances and zero covariances. Δz_n is the observed heterogeneity, while Γv_n represents the unobserved heterogeneity (Hensher, Rose, & Greene, 2015).

5.1.1 Data analysis

Completed surveys which contained unmatched duplicated choice sets were excluded from data analysis[31], as explained in Chapter 3, Section 3.5.7. Responses to the

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[31] However, for completeness, model estimates for the full dataset from the consumer DCE — matched and unmatched duplicated choice sets — are presented in Appendix N. The model estimates for the full dataset (n = 205) were fundamentally similar to that presented in this chapter, Section 5.3.4 (n = 186) apart from the attribute level coefficient for "Time off – No" in the full dataset which did not reach statistical significance indicating that the "Time off" attribute was not observed to be important in influencing decision-making. All completed GP DCE surveys passed the consistency checks. Hence, model estimates for the full dataset are presented in this chapter in Section 5.2.4.

duplicate choice sets were excluded from model estimates presented in Sections 5.2.4 and 5.3.4, as these were simply for respondent consistency checks to ensure data quality (i.e. in each DCE survey that passed the consistency check, only responses to choice set #3 and not #18 were included, as #18 is a repeat of #3).

Model estimation was done using NLOGIT® (Version 6; (2016)). All attribute levels were effects coded — allowing the estimation of effect size for each attribute level (Bridges et al., 2011). All coefficients of attribute levels were specified as random parameters with a normal distribution. For the estimation of these random parameters, 1 000 Halton (Standard Halton Sequence) draws were used.

Results of both DCEs were assessed for significance of statistical tests used. Statistical tests were accepted as significant if $p < 0.05$ as per convention. Seven coefficients were estimated for each DCE using NLOGIT® (Version 6; (2016)). The coefficients for the attribute levels which acted as reference levels — the omitted categories — were calculated from the estimated coefficients as their negative sum (Bech & Gyrd-Hansen, 2005).

5.2 GENERAL PRACTITIONERS: DCE RESULTS

5.2.1 Completion rate

Despite the comprehensive recruitment strategy detailed in Chapter 3, Section 3.5.6 at both a state/territory and national level, and the extension of survey closure date for an additional 4 weeks, the recruitment of GPs proved to be difficult. Participation was extremely low. Forty-three GPs entered the online DCE survey and of these, 23 completed the survey — yielding a completion rate of 53.5%, over a 3-month period.

As explained in Chapter 3, Section 3.5.4, respondents were randomly presented by Key Survey® with choice sets from either Block 1 or Block 2 in the DCE survey. Nine GPs completed a DCE Block 1 survey, while the remaining 14 completed a DCE Block 2 survey.

The targeted sample size of 42 completed surveys per block for a total of 84 completed surveys, was not reached (see Chapter 3, Section 3.5.5, for sample size calculation). However, given that there were 414 choice observations generated from these responses (see Section 5.2.3) data analysis proceeded as described in Section 5.1.1.

5.2.2 Respondent characteristics

Table 11 provides a summary of respondent demographics and characteristics (n = 23). Nineteen GPs (82.6%) and 4 GP Registrars (17.4%) completed the DCE survey. Women comprised two-thirds (65.2%) of the respondents. Most respondents had trained as a GP in Australia, with 5 who received their training elsewhere — UK, New Zealand, Iran, South Africa and Pakistan. Of these, 1 was an early career GP (≤ 5 years in practice), 3 were mid-career (6 to 15 years) and 1 had been in practice for over 30 years. Four of the overseas trained GPs had practiced in Australia for 3 years or less, with the exception of 1 GP (23 years). The respondent sample showed GPs in various stages of their careers — early, mid- and late-career — with most being in the time-bands for 6 to 15 and 16 to 25 years of experience.

More than half the respondents (56.5%) were GPs practicing in Queensland, with the other 10 practicing in either Victoria, Western Australia or South Australia. There were no respondents from New South Wales, Tasmania, the Australian Capital Territory, and the Northern Territory. Most of these GPs were located in metropolitan areas (73.9%), followed by Provincial/Regional (17.4%) and Rural/Remote (8.7%) areas. Over forty percent (43.5%) of GPs worked in a multi-GP owned clinic, usually as a contractor or a staff GP, 26.1% worked in a government or health service owned clinic, 17.4% in a corporate practice, and 4.3% in a sole GP practice. The remainder (2, 8.7%) either worked in more than one type of practice or in a superclinic. The majority of the multi-GP owned clinics (i.e. 6 of the 10) offered mixed billing. The other 3 were bulk-billing clinics and 1 offered private billing only.

Self-reporting from respondents showed that a little more than half the sample (56.5%) claimed that they prescribed about the same amount of antibiotics as their peers, while 43.5% claimed that they prescribed less antibiotics than other GPs. No respondent felt that they prescribed more antibiotics than their peers.

Respondent characteristics were generally comparable to Australian GPs[32] in terms of place of practice: 67.4% of Australian GPs practiced in metropolitan areas, 28.4% in Provincial/Regional, and 4.2% in Rural/Remote areas (Department of Health, 2015).

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[32] Australian GPs: GPs registered to practise in Australia.

However, the proportion of female respondents (65.2%) was higher than the proportion of female GPs in Australia (44.2%) (Department of Health, 2015). There were also more GPs who had trained in Australia amongst respondents (78.3%) compared to Australian GPs (60.3%) (Department of Health, 2015).

Table 11. Respondent characteristics — GPs

Characteristics	Number (Percent)* (n = 23)
Female	15 (65.2)
Male	8 (34.8)
General Practitioner	19 (82.6)
GP Registrar	4 (17.4)
Country of GP training:	
Australia	18 (78.3)
Elsewhere	5 (21.7)
Years of practice as a GP (including as a GP Registrar):	
≤5 years	5 (21.7)
6 – 15 years	9 (39.1)
16 – 25 years	5 (21.7)
26 – 35 years	3 (13.0)
>35 years	1 (4.3)
Years of practice as a GP in Australia (including as a GP Registrar):	
≤5 years	8 (34.8)
6 – 15 years	6 (26.1)
16 – 25 years	6 (26.1)
26 – 35 years	2 (8.7)
>35 years	1 (4.3)
State/Territory in which currently practising:	
Victoria	6 (26.1)
Queensland	13 (56.5)
Western Australia	1 (4.3)
South Australia	3 (13.0)
There were no respondents from New South Wales, Tasmania, Australian Capital Territory, and Northern Territory.	
Location of practice:	
Inner city/Suburban	17 (73.9)
Provincial/Regional	4 (17.4)
Rural/Remote	2 (8.7)

Professional working arrangements:	
Contractor GP	13 (56.5)
Employed GP	9 (39.1)
Partner	1 (4.3)
Sole owner	0 (0.0)
Clinic structure:	
Sole GP owned clinic	1 (4.3)
Multi-GP owned clinic	10 (43.5)
Corporate	4 (17.4)
Government/Health Service owned clinic	6 (26.1)
Other	2 (8.7)
Clinic billing:	
Bulk-billing clinic	8 (34.8)
Bulk-billing available for selected patients (mixed billing)	14 (60.9)
Private billing	1 (4.3)
Antibiotic prescribing patterns — self declared:	
Prescribe more than other GPs	0 (0.0)
About the same as other GPs	13 (56.5)
Prescribe less than other GPs	10 (43.5)
*Rounding to one decimal point means that some cells approach, but do not yield, a total of 100%.	

5.2.3 Responses to choice sets

A total of 414 choice observations were possible from the completed surveys — 162 from DCE Block 1 surveys (i.e. 9 x 18 choice sets) and 252 from DCE Block 2 surveys (i.e. 14 x 18 choice sets). Of these, none were removed from the analysis as the duplicated choice sets inserted as an intra-participant consistency check — choice sets #3 and #18 in each block — matched in all returned surveys. This meant that there were a total of 414 valid choice observations.

5.2.4 MXL estimates

The computation for MXL estimates converged after 32 iterations, with a normal exit. Results of the MXL estimates are presented in Table 12. The Log Likelihood (LL) was -161.61 and the Akaike Information Criteria (AIC) was 0.85. McFadden's pseudo R-squared which provides a relative measure of model fit was 0.44. A value between 0.2 and 0.4 indicates a good model fit (Hauber et al., 2016).

Statistical significance was reached for all but two — 2 weeks and new patient — of the estimated coefficients of the attribute levels, confirming the importance of all attributes in influencing GP preferences, apart from the "Familiarity with patient" attribute. Standard deviations were statistically significant for 6 of the 7 estimated coefficients, confirming the presence of preference heterogeneity for these attribute levels amongst respondents.

Table 12. Mixed Logit estimates for GP DCE survey with effects coding (n = 23)

Attribute	Level	Coefficient	SE	Prob. |z|>Z	SD	SE	Prob. |z|>Z
Duration of symptoms	1 week	-3.09**	0.93	0.0009	2.63**	0.85	0.0019
	2 weeks	0.16	0.21	0.4424	0.54	0.38	0.1548
	3 weeks^	2.93#			-3.17#		
Life event	No	-0.94**	0.32	0.0038	0.94**	0.28	0.0010
	Yes^	0.94#			-0.94#		
Reassessment: Patient can return for reassessment	No	0.85**	0.25	0.0006	0.86**	0.27	0.0012
	Yes^	-0.85#			-0.86#		
Familiarity with patient	New patient	-0.23	0.16	0.1444	0.53*	0.21	0.0123
	Regular patient^	0.23#			-0.53#		
Patient's expectations	Says they want antibiotics	2.35**	0.74	0.0014	2.58**	0.93	0.0057
	Says they don't want antibiotics unless necessary	-0.61*	0.29	0.0356	1.17*	0.55	0.0325
	Says they want reassurance^	-1.74#			-3.75#		

**p < 0.01 and *p < 0.05

^ Omitted category/ reference level

Calculated as the negative sum of the estimated coefficients or SDs

SE: Standard error

SD: Standard deviation for estimated coefficients

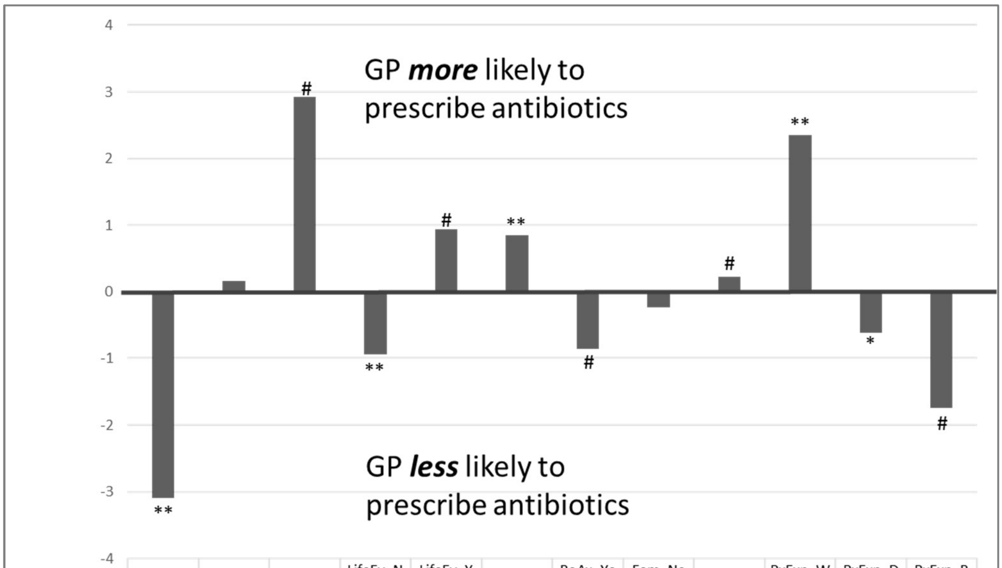
Prob. |z|>Z : p-value for the Wald test

The attribute level coefficients both estimated and calculated, proved that *a priori* assumptions were correct for all attributes but one (see Section 3.5.2, Table 7) i.e. “Familiarity with patient”. Figure 17 illustrates the interpretation of the estimated and calculated attribute level coefficients from Table 12. In other words, GPs were ***more*** likely to prescribe antibiotics in the DCE scenario if: (a) the patient's duration of symptoms was 3 weeks, (b) if the patient demanded antibiotics, (c) the patient had an important life event coming up, and (d) they could not return for a reassessment should their health deteriorate.

In contrast, GPs were ***less*** likely to prescribe antibiotics if: (a) the patient’s duration of symptoms was 1 week, (b) the patient said they did not want antibiotics unless necessary or that they want reassurance, (c) the patient did not have an important life event coming up, and (d) the patient could return for reassessment.

Trending against *a priori* assumptions for the “Familiarity with patient” attribute, GPs may be more likely to prescribe antibiotics for a regular patient (with whom they are familiar in terms of medical history and an established rapport), compared to a new patient — this coefficient did not reach statistical significance.

Figure 17. GP DCE: Estimated and calculated coefficients for attribute levels (effects coded)



	Dur_1w	Dur_2w	Dur_3w	LifeEv_No	LifeEv_Yes	ReAx_No	ReAx_Yes	Fam_New	Fam_Reg	PxExp_WantAB	PxExp_DWantAB	PxExp_Reassure
■ Coefficient	-3.09	0.16	2.93	-0.94	0.94	0.85	-0.85	-0.23	0.23	2.35	-0.61	-1.74

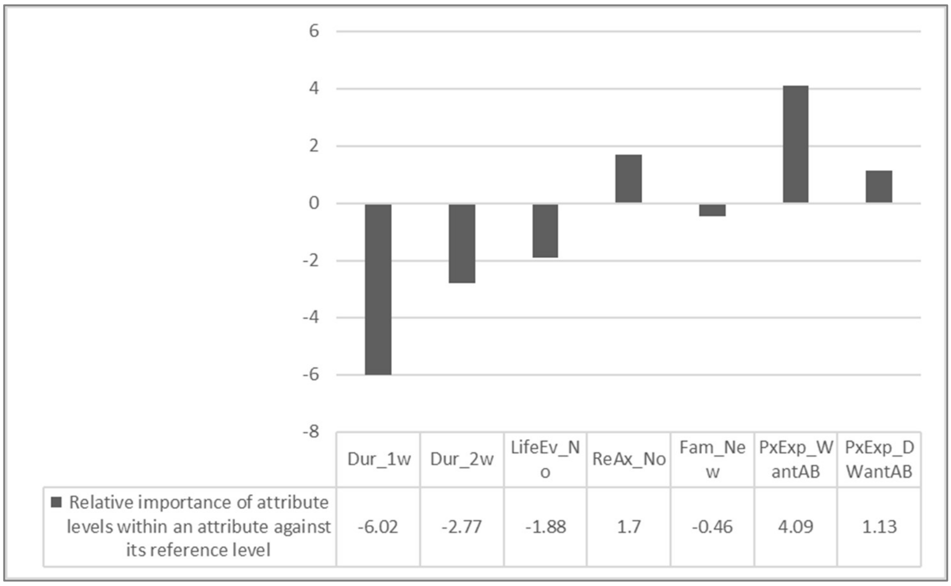
** p < 0.01, * p < 0.05
# Calculated as the negative sum of the estimated coefficients

Figure 18 shows the relative importance of attribute levels (when compared against the respective reference level for each attribute) in influencing GP decision-making. GP preferences for whether or not to prescribe antibiotics were more strongly influenced by:

- "Duration of symptoms – 1 week" (followed by "Duration of symptoms – 2 weeks") when compared against the reference level for that attribute "Duration of symptoms – 3 weeks";
- "Patient expectations – Says they want antibiotics" (followed by "Patient expectations – Says they don't want antibiotics unless necessary") when compared against the reference level "Patient expectations – Says they want reassurance";
- "Life event – No" (the patient did not have an important event or deadline coming up) when compared against "Life event – Yes"; and
- "Reassessment – No" (the patient is unable to return for reassessment) when compared against the reference level "Reassessment – Yes"

The attribute "Familiarity with patient" did not reach statistical significance, which means that this attribute was not important in influencing GP decision-making.

Figure 18. GP DCE: Relative importance of attribute levels compared against its reference level



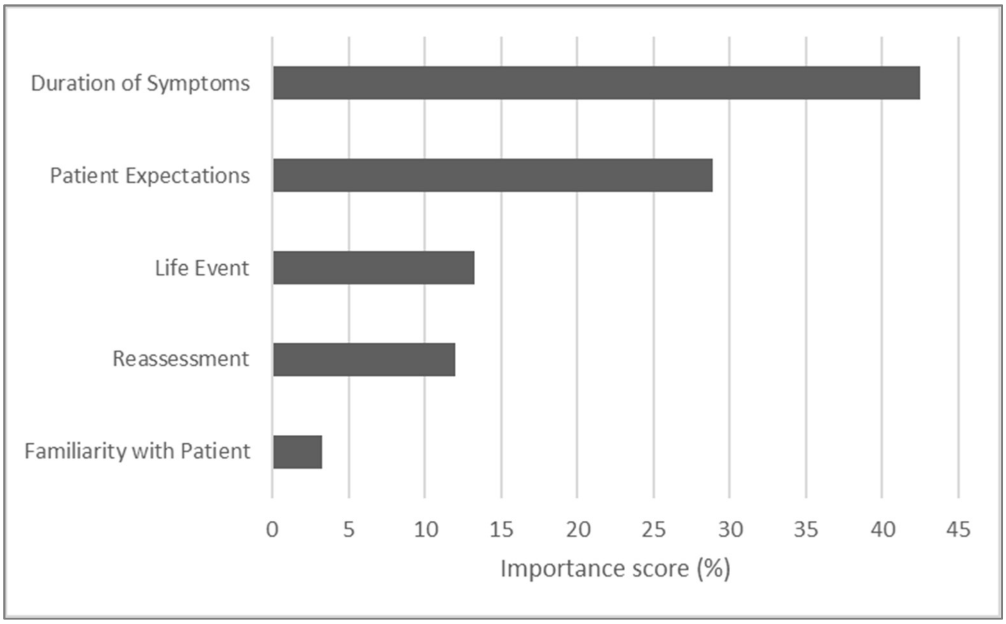
In order to quantify the relative importance of each attribute in influencing decision-making, two steps were taken. First, preference weights for each attribute were calculated as the difference between the highest and lowest attribute level coefficients from the MXL model within that attribute. Second, an importance score expressed as a percentage (%) for each attribute was generated using its preference weight as the numerator and the total preference weight as the denominator, as shown in Table 13.

Preference weights are not absolute numbers and can only be interpreted relative to each other i.e. not interpreted against a standard or benchmark. For example, a preference weight of 6.02 for "Duration of symptoms" signifies that this attribute is more important than "Patient expectations" which has a lower preference weight. Preference weights are unbounded values with no set minimum or maximum scores.

Table 13. GP DCE — Preference weights and importance scores for attributes

Attribute	Preference weight	Importance score (%)
Duration of symptoms	6.02	42.5
Patient expectations	4.09	28.9
Life event	1.88	13.3
Reassessment	1.7	12.0
Familiarity with patient	0.46	3.3
Total	14.15	100

Figure 19. Relative importance of attributes influencing GP antibiotic prescribing



The importance scores indicate the relative importance of each attribute in influencing GP preferences — illustrated in Figure 19. Beginning with the attribute which exerted the most influence on GPs' likelihood of prescribing antibiotics, these are:

1. Duration of symptoms
2. Patient expectations
3. Life event
4. Reassessment

The “Familiarity with patient” attribute did not reach statistical significance, indicating that it was not important in influencing GP decision-making.

The "Duration of symptoms" and "Patient expectations" attributes were by far the two most influential factors for the prescribing of antibiotics by GPs (Figure 19). “Life event” — whether the patient has an important life event or a deadline coming up — and “Reassessment” — whether the patient is able to return for reassessment should their symptoms worsen, exerted less influence on the propensity of GPs to prescribe antibiotics. “Familiarity with the patient” i.e. whether the presenting patient was new to the GP or a regular patient seemed to be of negligible importance.

Of the 414 valid observations, GPs indicated in 308 observations (74.4%) that the prescription given would have been a delayed antibiotic prescription. In the final section of the survey (Section C) GPs were asked about which they considered the most important and the least important attribute when weighing up between the two alternatives (Situation A and Situation B) presented in each choice set. Most GPs reported that the “Duration of symptoms” was the most important attribute, while others chose (from most votes to least votes): “Patient expectations”, “Reassessment”, “Life event” and “Familiarity with patient”, which closely align with that of the DCE component. Conversely, GPs found "Familiarity with patient" to be the least important attribute, which supports their preference elicited from the DCE component.

When asked to choose a course of action for the same DCE scenario without a forced choice to prescribe (Box 21, attribute levels in bold), 10 GPs would not prescribe antibiotics, 8 would prescribe a delayed course of antibiotics, 4 would prescribe antibiotics for immediate use, and 1 would seek more information such as co-morbidities and smoking status.

Box 21.

A **new patient** (adult) presents with a runny nose, sneezing, a sore throat and dry cough, which they've had for **2 weeks**. They have managed these symptoms in their usual way, which may include a combination of rest, home remedies, vitamin supplements, commercial immune boosters, and cold/flu/cough products. As they are still feeling unwell and **they have an important event coming up**, they decided to consult a doctor (you). The patient **says they want antibiotics**.

The patient has no significant past medical history. On examination, their temperature (tympanic) is 37.8c, throat appears slightly red and there is no exudate or cervical lymphadenopathy. Chest is clear. The patient **can't come back for a reassessment** if they are not better or feel worse.

C3. Which response best describes what you would do?

☐Prescribe an antibiotic for immediate treatment

☐Prescribe a delayed course of antibiotics

☐Not prescribe an antibiotic

☐Other response (please tell us) ______________________________

The complexity of the DCE seemed acceptable as more respondents found it to be easy/very easy (43.5%) or neutral (34.8%), compared to difficult/very difficult (21.7%).

5.3 CONSUMERS: DCE RESULTS

5.3.1 Completion rate

The state and national recruitment strategy for consumer DCE surveys was detailed in Chapter 3, Section 3.5.6. Two hundred and ninety-six consumers entered the online DCE survey and of these, 205 completed the survey — yielding a completion rate of 69.3%, over a 3-month period.

As explained in Chapter 3, Section 3.5.4 (Developing the DCE survey) the online survey platform — Key Survey® — randomly assigned a DCE survey containing choice sets from either Block 1 or Block 2 to each participant. As such, 94 consumers completed a DCE Block 1 survey, while 111 completed a DCE Block 2 survey. The targeted sample size of 42 completed surveys per block, or a total of 84 completed surveys was exceeded (see Chapter 3, Section 3.5.5, for sample size calculation).

5.3.2 Respondent characteristics

Respondent demographics and characteristics are reported for the 186 respondents (after 19 DCE surveys with unmatched consistency checks were removed from the 205 surveys submitted). A summary of respondent demographics and characteristics is shown in Table 13.

Respondent demographics and characteristics for the full dataset (n = 205) were not significantly different to that of the dataset which passed consistency checks (n = 186).

The majority of respondents were women, who comprised 83.3% of the sample. Ages ranged from 18 to 66 years old, with the majority in the 18 to 44 age bands i.e. 18 – 24 age band (39.8%), 25 – 34 age band (25.3%) and 35 – 44 age band (19.4%). The mean age was 30.5 years old while the median age was 27 years old. Just under two-thirds of the respondents (60.2%) had achieved at least a Bachelor's degree, and 66 (35.5%) finished Year 12. The majority of the respondents lived in Queensland, comprising 97.3% of the sample. The rest lived in New South Wales, Victoria, Western Australia and South Australia. There were no respondents from Tasmania, the Australian Capital Territory or the Northern Territory. Over 90% of respondents were located in metropolitan areas, with a small percentage located in Provincial/Regional (7%) or Rural/Remote areas (2.7%). The majority of respondents were in good health, selecting either excellent, very good or good health in the survey. The sample comprised mainly of low users of antibiotics, with only 18 (9.7%) respondents using antibiotics three or four times in the past year, while 4 (2.2%) had antibiotics five or more times in the same period. Forty-nine (26.3%) respondents currently held a healthcare or concession card, allowing access to subsidised medicines and to bulk-billing clinics.

Respondent characteristics were generally not comparable with the Australian population, in the following ways:

- A higher proportion of respondents were female (83.3%) compared to that found in the general population (50.6%) (Australian Bureau of Statistics, 2016a);
- The median age of the respondents was younger (27 years old) compared to the median age of 37 years old in the general population (Australian Bureau of Statistics, 2016a);
- A higher proportion of respondents had achieved at least a bachelor's degree (60.2%) compared to the Australian population (44% of those aged 15 to 74 years old) (Australian Bureau of Statistics, 2016b); and
- A higher proportion of respondents lived in metropolitan areas (90.3%) compared to the Australian population (69%), while a lower proportion of respondents lived in regional areas (7.0%) compared to the Australian population (29%) (Baxter, Hayes, & Gray, 2011)

Table 14. Respondent Characteristics — Consumers

Characteristics	Number (Percent)* (n = 186)
Female	155 (83.3)
Male	31 (16.7)
Age (years):	
18 – 24	74 (39.8)
25 – 34	47 (25.3)
35 – 44	36 (19.4)
45 – 54	24 (12.9)
≥ 55	5 (2.7)
Highest level of education achieved:	
Postgraduate degree	57 (30.6)
Graduate certificate or graduate diploma	22 (11.8)
Bachelor degree	33 (17.7)
Year 12	66 (35.5)
Other	8 (4.3)
Place of residence, State/Territory:	
Queensland	181 (97.3)
New South Wales, Victoria, Western Australia, South Australia	5 (2.7)
Area:	
Inner city/Suburban	168 (90.3)
Provincial/Regional	13 (7.0)
Rural/Remote	5 (2.7)
General health:	
Excellent	32 (17.2)
Very good	90 (48.4)
Good	51 (27.4)
Fair	13 (7.0)
Poor	0 (0.0)
Number of antibiotic courses in past 12 months:	
None	78 (41.9)
One or two	86 (46.2)
Three or four	18 (9.7)
Five or more	4 (2.2)
Concession card holder	49 (26.3)
Non-concession card holder	137 (73.7)

*Rounding to one decimal point means that some cells approach, but do not yield, a total of 100%.

5.3.3 Responses to choice sets

A total of 3690 choice observations were possible from the 205 completed surveys — 1692 from DCE Block 1 surveys (i.e. 94 x 18 choice sets) and 1998 from DCE Block 2 surveys (i.e. 111 x 18 choice sets). Of these, 19 surveys (or 342 choice observations) were removed from the analysis as the duplicated choice sets inserted as an intra-participant consistency check — choice sets #3 and #18 in each block — did not match in these surveys. This meant that there were a total of 186 valid surveys for analysis — 3348 valid choice observations — comprising 1566 choice observations from DCE Block 1 surveys (i.e. 87 x 18 choice sets) and 1782 from DCE Block 2 surveys (i.e. 99 x 18).

5.3.4 MXL estimates

The computation for MXL estimates converged after 25 iterations, with a normal exit. Results of the MXL estimates are presented in Table 14. The Log Likelihood (LL) was -1212.33 and the Akaike Information Criteria (AIC) was 0.733. McFadden's pseudo R-squared which provides a relative measure of model fit was 0.48. A value between 0.2 and 0.4 indicates a good model fit (Hauber et al., 2016).

Statistical significance was reached for all but duration of symptoms of 2 weeks, of the estimated coefficients of the attribute levels, confirming the importance of all attributes in influencing consumer preferences. Standard deviations were statistically significant for 6 of the 7 estimated coefficients, confirming the presence of preference heterogeneity for these attribute levels amongst respondents.

Table 15. Mixed Logit estimates for Consumer DCE survey with effects coding (n = 186)

Attribute	Level	Coefficient	SE	Prob. |z|>Z	SD	SE	Prob. |z|>Z
Duration of symptoms	1 week	-0.72**	0.93	0.0000	0.81**	0.10	0.0000
	2 weeks	0.01	0.06	0.83	0.15	0.10	0.1377
	3 weeks^	0.71#			-0.96#		
Life event	No	-0.49**	0.06	0.0000	0.50**	0.07	0.0000
	Yes^	0.49#			-0.50#		
Time off	No	0.16**	0.05	0.0005	0.39**	0.06	0.0000
	Yes^	-0.16#			-0.39#		
Doctor's advice	Says it's probably a viral infection and antibiotics won't help	-2.78**	0.19	0.0000	1.62**	0.16	0.0000
	Says you decide whether to take the antibiotics or not	0.57**	0.08	0.0000	0.69**	0.09	0.0000
	Says to start antibiotic treatment if you feel worse or no better in 2 days^	2.21#			-2.31#		
Past experience	No	-0.17**	0.04	0.0001	0.31**	0.06	0.0000
	Yes^	0.17#			-0.31#		

**p < 0.01 and *p < 0.05

^ Omitted category/ reference level

Calculated as the negative sum of the estimated coefficients or SDs

SE: Standard error

SD: Standard deviation for estimated coefficients

Prob. |z|>Z : p-value for the Wald test

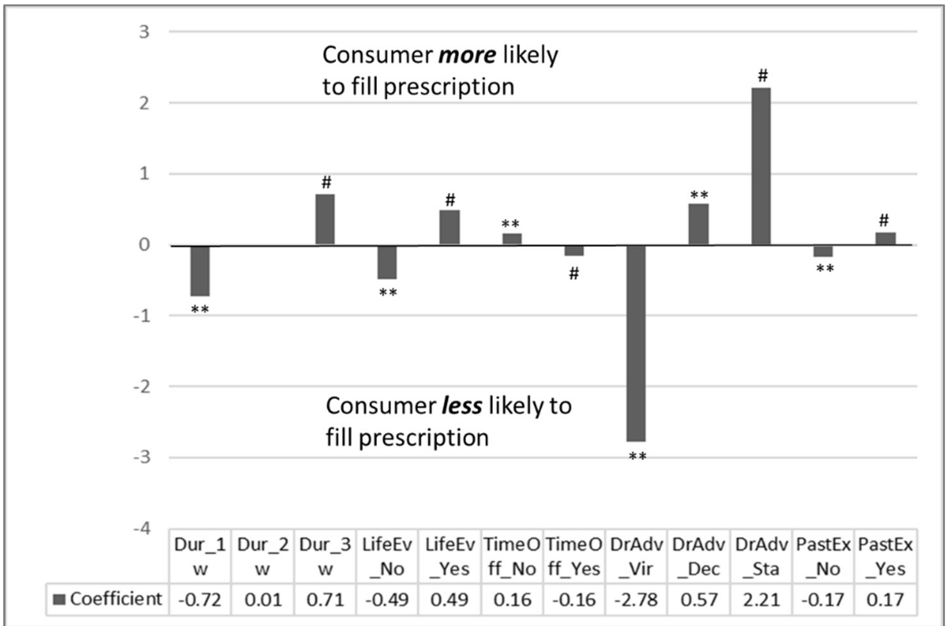
The attribute level coefficients both estimated and calculated, proved that *a priori* assumptions were correct for all attributes (see Section 3.5.2, Table 6). Figure 20 illustrates the interpretation of the estimated and calculated attribute level coefficients from Table 14. In other words, consumers were ***more*** likely to fill the antibiotic prescription in the DCE scenario if: (a) the doctor's advice was either "... you decide whether to take the antibiotics or not" or "... start antibiotic treatment if you feel worse or no better in 2 days", (b) the duration of symptoms was 3 weeks, (c) they had an important event or deadline coming up (life event), (d) they had taken antibiotics for similar symptoms in the past, and (e) they were not able to take time off to recover.

In contrast, consumers were ***less*** likely to fill the antibiotic prescription if: (a) the duration of symptoms was 1 week, (b) the doctor's advice was "…it's probably a viral infection and antibiotics won't help", (c) they had no important life events coming up, (d) they had not taken antibiotics for similar symptoms in the past, and (e) they could take time off to recover.

The attribute level "Duration of symptoms – 2 weeks" did not reach statistical significance (0.01, p=0.83), although it trended towards the consumer being more likely to fill the antibiotic prescription.

For completeness, model estimates for (a) the full dataset (n = 205) including surveys that did not pass the consistency check, and (b) the dataset (n = 181) comprising surveys that passed the consistency check for respondents 18 – 54 years old, are presented in Appendix N. The attribute level coefficient for "Time off – No" did not reach statistical significance in the parameter estimates for the full dataset (n = 205) indicating that the 'Time off" attribute was not observed to be important in influencing consumer decision-making. The importance of all other attributes as well as the relative importance of the attribute levels in influencing preferences, did not change.

Figure 20. Consumer DCE: Estimated and calculated coefficients for attribute levels (effects coded)

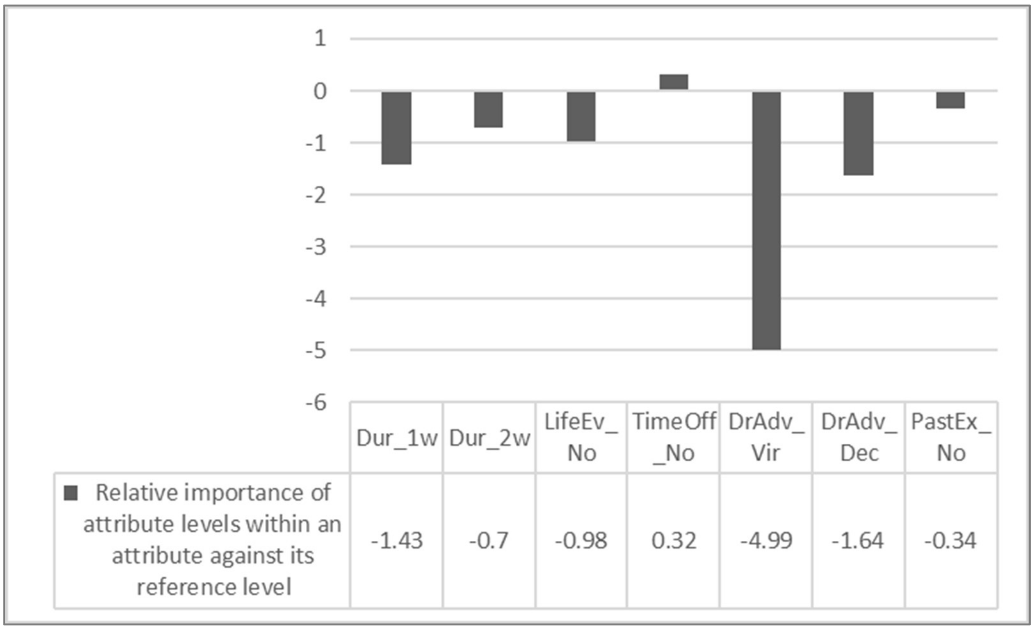


** p < 0.01, * p < 0.05
# Calculated as the negative sum of the estimated coefficients

Figure 21 shows the relative importance of attribute levels (when compared against the respective reference level for each attribute) in influencing consumer decision-making. Consumer preferences in whether to fill a delayed antibiotic prescription were more strongly influenced by:

- “Doctor’s advice – Says it’s probably a viral infection and antibiotics won’t help” (followed by “Doctor’s advice – Says you decide whether to take the antibiotics or not”);
- “Duration of symptoms – 1 week” (followed by “Duration of symptoms – 2 weeks”) when compared against the reference level for that attribute “Duration of symptoms – 3 weeks”;
- “Life event – No” (the consumer did not have an important event or a deadline coming up) when compared against “Life event – Yes”;
- “Past experience – No” (the consumer had not taken antibiotics for similar symptoms in the past) when compared against “Past experience – Yes”; and
- “Time off – No” (the consumer is unable to take time off from work/study to recover) when compared against “Time off – Yes”

Figure 21. Consumer DCE: Relative importance of attribute levels compared against its reference level



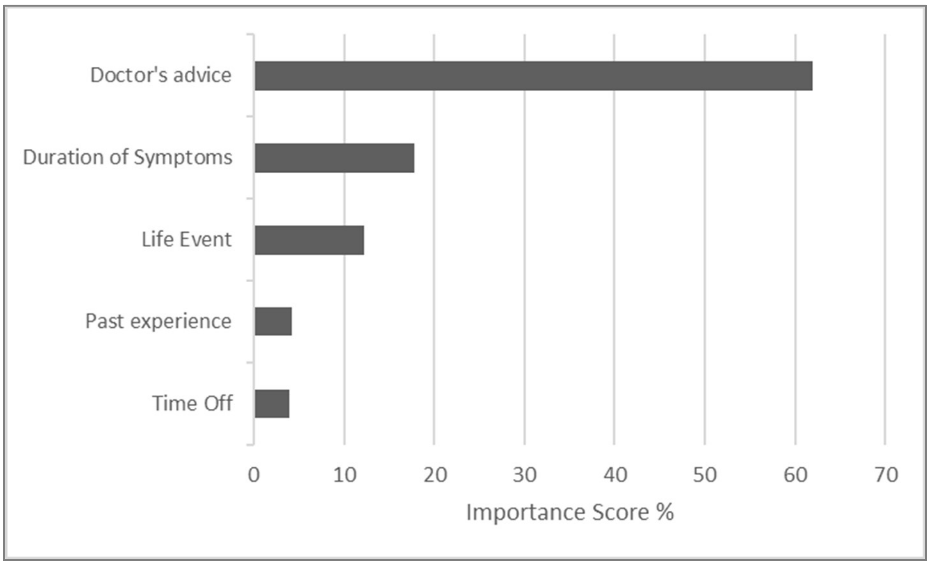
The intent of the DCE for consumers was also to investigate the relative dominance of factors that had the most bearing on consumer decision-making i.e. in deciding whether to fill a delayed prescription for antibiotics. Preference weights for each attribute were calculated as the difference between the highest and lowest attribute level coefficients within that attribute. An importance score (%) for each attribute was generated using its preference weight as the numerator and the total preference weight as the denominator, as shown in the following table.

Table 16. Consumer DCE — Preference weights and importance scores for attributes

Attribute	Preference weight	Importance score (%)
Doctor's advice	4.99	61.9
Duration of symptoms	1.43	17.7
Life event	0.98	12.2
Past experience	0.34	4.2
Time off	0.32	4.0
Total	8.06	100.0

The importance scores indicate the relative importance of each attribute in influencing consumer preferences. Figure 22 presents the relative importance of attributes in this regard and shows not surprisingly, that GP advice regarding the use of the delayed antibiotic prescription clearly exerted the most influence on consumer decision-making.

Figure 22. Relative importance of attributes influencing consumer decision to fill a delayed antibiotic prescription



In the final section of the survey (Section C), consumers were asked what they considered to be the most important and the least important attribute when weighing up between the two alternatives (Situation A and Situation B) presented in each choice set. In agreement with results from the DCE component, consumers reported that the most important attribute was the doctor's advice (124/186; 66.7%), with duration of symptoms a distant second (32/186; 17.2%). The least important attribute was "Past experience" — whether they had taken antibiotics for similar symptoms previously, although in the DCE the least important attribute seemed to be whether they could take time off to recover. However, the differences between the relative importance of the "Past experience" attribute and the "Time off" attribute are not great.

When asked to choose a course of action for the same DCE without a forced choice to fill the antibiotic prescription (Box 22, attribute levels in bold), 36 (19.4%) consumers would fill the prescription immediately, 41 (22.0%) would obtain the antibiotics but only take it if no better in 2 days, 95 (51.1%) would take a wait-and-see approach and would only use the prescription if no better in 2 days, and 8 (4.3%) would not fill the prescription at all. The remaining 6 (3.2%) offered other responses ranging from asking the doctor for more explanation to waiting up to a week before deciding what to do.

Box 22.

You have had a runny nose, sneezing, a sore throat and a dry cough for **2 weeks**. You have managed these symptoms in your usual way, which may include a combination of rest, home remedies, vitamin supplements, commercial immune boosters, and cold/flu/cough products. As you are still feeling unwell, you decide to consult a doctor, as **you have an important event coming up** and **can't take time off to recover**. After examining you, the doctor gives you a prescription for antibiotics because you can't come back for a reassessment in 2 days. **Doctor says to start the antibiotic treatment if you feel worse or no better in 2 days. In the past, you have taken antibiotics for similar symptoms before.**

C3. Which response best describes what you would do?

☐Fill the antibiotic prescription right away and take it.

☐Fill the antibiotic prescription right away and only take it if you are worse or no better in 2 days.

☐Wait 2 days. If no better, you would fill the antibiotic prescription and take it.

☐Not fill the antibiotic prescription at all.

☐Other response (please tell us) ________________________________

Consumers were also asked what they would usually do with an unused antibiotic prescription. Many would keep the prescription until it expired (75/186; 40.3%), 41 (22.0%) would keep the prescription for another time they became unwell, 51 (27.4%) would discard the prescription right away. The remaining 19 (10.2%) responses ranged from tending to forget about the prescription to keeping it for a few weeks before discarding it.

The complexity of the DCE seemed acceptable as most respondents found it to be easy (46.2%) or very easy (19.4%), and only 8.1% (15 respondents) found it difficult.

5.4 SUMMARY

In the GP DCE, all attributes were important in influencing GP preferences apart from the "Familiarity with patient" attribute. The attribute levels which exerted the strongest influence on GP decision-making when compared against the reference levels were: "Duration of symptoms – 1 week", "Patient expectations – Says they want antibiotics", "Life event – No" (the patient had no important events or deadlines coming up), and "Reassessment – No" (the patient is unable to return for reassessment).

In the consumer DCE, all attributes were important in influencing consumer preferences. The attribute levels which exerted the strongest influence on consumer decision-making when compared against the reference levels were: "Doctor's advice – Says it's probably a viral infection and antibiotics won't help", "Duration of symptoms – 1 week", "Life event – No" (the consumer did not have an important event or deadline coming up), "Past experience – No" (the consumer had not taken antibiotics for similar symptoms in the past), and "Time off – No" (the consumer is unable to take time off from work/study to recover).

In answer to Research Question 2, the GP DCE results point to the following factors having a dominant influence in driving decisions to prescribe an antibiotic: (a) duration of symptoms and (b) patient expectations for antibiotics. For consumers, GP advice regarding the use of the delayed antibiotic prescription was of primary importance in their decision on whether to fill the prescription. Dominant factors in both DCEs corroborated what GPs and consumers reported in Section C of the survey to be the most important attribute in their decision-making for the DCE scenarios presented.

In line with mixed methods research and as outlined in Chapter 3, Section 3.3.1, the next chapter — Chapter 6 — contains the discussion and synthesis of these results (Mixing 2).

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Chapter 6: **Discussion, Synthesis and Research Contributions**

This chapter is in three parts. It begins with a discussion and synthesis of results previously reported in Chapter 4 — semi-structured interviews, and Chapter 5 — discrete choice experiments (presented in Section 6.1), in line with a mixed methods approach (Tashakkori & Teddlie, 2010) and culminates in a hypothesis. The discussion and synthesis of results is juxtaposed against the literature where appropriate. Intentional application of the research paradigm — pragmatism, is woven into the section. The chapter then moves on to discuss research strengths and limitations of the study overall, strengths and limitations in the application of the selected methods, as well as reflections on how the research has shaped the researcher in Section 6.2. The chapter concludes with a section on research contributions — both theoretical and methodological, implications for policy and practice, and recommendations arising from this research pertinent to Australia's National Antimicrobial Resistance Strategy 2015 – 2019 (Section 6.3).

6.1 DISCUSSION AND SYNTHESIS OF QUALITATIVE AND QUANTITATIVE RESULTS

Consistent with pragmatism, the insights from investigating what influences antibiotic use from the multiple perspectives of GPs, community pharmacists and consumers (Research Question 1) were richer due to the various worldviews — whether implicit or acknowledged — held by the interview participants. In this section, discussion and synthesis focusses in turn on GPs, community pharmacists and consumers.

6.1.1 Focus on GPs

Patient expectations — an important barrier which is surmountable

The challenges and barriers to desirable antibiotic prescribing practices had been identified in the literature and established in Section 2.1.1. Consistent with the barriers established in the literature, patient expectations for antibiotics remained one of the significant challenges for the GP cohort interviewed. Underscoring these qualitative findings, the results of the GP DCE survey showed that amongst the attributes available for trade-off in the DCE scenario, the patient's agenda for antibiotics exerted a relatively dominant influence on GPs to prescribe antibiotics (second only to the duration of symptoms experienced by the patient). GP respondents for the DCE survey all identified as either prescribing about the same amount of antibiotics as other GPs (56.5%) or prescribe less than other GPs (43.5%). Hence, patient expectation is likely to exert an even greater influence on other GPs.

The finding that patient expectations drive GP prescribing decisions corroborates that of another recent study where more than 50% of Australian GPs surveyed reported that they would prescribe antibiotics for an upper respiratory tract infection to meet patient expectations (Fletcher-Lartey et al., 2016).

From the GP interviews, it is clear that knowledge-practice dissonance ensues when GPs capitulate to patient demands for antibiotics, either against evidence-based practice (where evidence is available) or against the GP's best clinical judgment. Despite the GP's intentions to practice evidence-based medicine, this resolve can break down when faced with the uncomfortable and awkward situation of managing patient expectations when these expectations diverge from best practice, particularly for early career GPs.

Early career GPs seemed to be less successful in convincing patients that it was in their best interest to refrain from using antibiotics, similar to a recent study involving GP Registrars (Dallas et al., 2014). Experienced GPs tended to be able to successfully steer patients away from antibiotics where they are unwarranted. They do this in a way that maintains good doctor-patient rapport, using an approach developed over many years of practice in dealing with patient demands and/or expectations for antibiotics. An interesting point brought up by some GPs was that perhaps the patients who present at the clinic with an agenda for antibiotics were a biased sample of the general population as those who were prudent with antibiotics may not seek a GP consult in the first place. As explained in the EABE model (Chapter 4, Section 4.5) GPs who are skilful in communicating their decision not to prescribe antibiotics as part of the patient education process (coupled with a thorough clinical consultation) are more likely to be able to defuse what could be an emotionally and professionally awkward situation.

Although only one of the GPs interviewed explicitly mentioned shared decision-making (SDM), elements of the successful strategies used during clinic consultation are common to SDM i.e. information sharing, intentional engagement and involvement of the patient in considering treatment options and risks, taking into account patient values (Hoffman, Montori, & Del Mar, 2014) — which when conducted well can enhance patient satisfaction and confidence in the decision (Edwards & Elwyn, 2006). A basic framework for incorporating SDM into consultations are provided by Hoffman et al. (2014). Given the complexity of managing patient expectations while maintaining (or even increasing) patient trust and good doctor-patient relationship, well-honed strategies and advanced communication skills which may include SDM are needed.

The findings of the consumer DCE show that GPs are influential in consumer decision-making. So much so, that pre-emptive strategies such as the use of posters that "nudge" in the consultation room can be successful in reducing prescribed antibiotics (Meeker et al., 2014). These posters consist of a commitment letter which included the GP's photograph and signature, declaring the GP's commitment to guidelines for appropriate antibiotic prescribing, a commitment to act in the patient's best interest, as well as a short explanation of why antibiotics may not be appropriate in many cases. The results suggested that these posters introduced a virtuous meme cycle, positively influencing GP prescribing behaviour (19.7% reduction in inappropriate antibiotic prescribing) as well as shaping patient expectations (Meeker et al., 2014).

Prescribing practices of medical colleagues — cultural meme and etiquette

An unexpected finding was that the other overarching challenge mentioned by GPs were the prescribing practices of other medical colleagues. Although prescribing etiquette had been cited in literature as one of the reasons that shape prescribing culture (A. Broom, Broom, & Kirby, 2014; Charani et al., 2013), the clinical context was that of a hospital where a medical hierarchy is often imposed and where social capital is accrued through conforming with perceived norms and practices of specialities, peers and senior colleagues (A. Broom et al., 2014). Hence, junior doctors tend to shy away from critiquing the prescribing patterns of other more senior colleagues, and their prescribing practices are in turn shaped by these colleagues.

In contrast, GPs have relative autonomy in their clinics with little or no medical hierarchy, with the exception perhaps of being a GP Registrar under supervision (Dallas et al., 2014). Even so, as discussed in Chapter 4, Section 4.2.3, GPs are somewhat affected by the aftermath of other GPs who may prescribe antibiotics more freely, whether in having to deal with: (a) patient confusion regarding the different treatment decisions, (b) subsequent patient demands/expectations for antibiotics, (c) a more resistant bacterial infection non-responsive to first-line antibiotics, and/or (d) troublesome side effects from antibiotics. In the fight against antibiotic resistance, it would be desirable to have solidarity and consistency amongst GPs in judicious use of antibiotics.

Clinical practice and prescribing patterns are often shaped early in a GP's career; and as pointed out by GPs interviewed for this study, some GPs' prescribing practices had been shaped at a time when antibiotic resistance was not high on the agenda. In a bid to "grow a prudent prescriber of antibiotics" rather than change one (which is more difficult to do), a prospective study — the ChAP study —involving GP Registrars is underway in Australia (van Driel et al., 2016). The investigators reasonably posit that appropriate antibiotic prescribing can be achieved by actively shaping the way GP Registrars practice. Educational interventions used in the ChAP study include three online modules, one of which is on advanced communication training, and face-to-face workshops for both the Registrar and their GP supervisor (van Driel et al., 2016). It would be interesting to note whether such intentional training would yield a group of early career GPs who would not only be better equipped than those not involved in the study, but also demonstrate solidarity and consistency in the way they approach antibiotic prescribing. The outcomes of the study would be useful for informing future GP training programs.

Uncertainty of diagnosis coupled with patient expectations exerts prescribing pressure

As discussed in Chapter 4, Section 4.2.2, procedurally, the medical decision-making process for respiratory tract infections is not dissimilar to GPs weighing up treatment or management options for other types of illnesses — perhaps differing only in the details of diagnostic tests used, criteria for diagnosis, methods of assessment and monitoring, and frequency of review, taking into account the need for involvement of other medical (e.g. specialists) or allied health colleagues. However, the uncertainty of diagnosis for respiratory tract infections (whether the pathogen is viral or bacterial) compounded with patient expectations for antibiotics — whether actual or perceived by the GP — exerts a measure of prescribing pressure on GPs. Some GPs interviewed acknowledged that patient expectations sometimes affected their antibiotic prescribing patterns negatively — causing knowledge-practice dissonance, and a delayed antibiotic prescription is sometimes given as a "soft option".

These findings add a new angle to and complement that of Henriksen and Hansen (2004) who linked GP self-perception to prescribing behaviours (discussed in Chapter 2, Section 2.2.1); and is in line with the findings of a recent literature review by Public Health England (2015). According to Henriksen and Hansen, GPs who felt pressured by both extrinsic and intrinsic factors prescribed in a way that protected their personal and professional self (in terms of clinical autonomy) (Henriksen & Hansen, 2004).

Considering the findings of this research together with that of Henriksen and Hansen (2004) and Public Health England (2015), perhaps an additional aspect that could be further explored for GP educational interventions in order to prevent or disrupt knowledge-practice dissonance is to speak of GP enlightened self-interest. For GPs, enlightened self-interest in terms of clinical practice which emerged from the semi-structured interviews were that prescribing practices which conserve antibiotics can: (a) prolong the usefulness of the dwindling armamentarium of antibiotics (i.e. GPs will have treatment options to offer patients), and (b) delay or reduce the likelihood of having to deal with antibiotic resistant infections in their patients during their clinical career.

6.1.2 Focus on community pharmacists

Community pharmacists — an underused resource

Of note, GPs interviewed did not discuss community pharmacists or their (potential) role as a healthcare partner in mitigating patient expectations or in providing/reinforcing patient education regarding wise use of antibiotics. Community pharmacists were rarely mentioned by GPs, and then only in the context of whether their annotations on the antibiotic prescription regarding dispensing would be followed by pharmacists. This observation indicate that most GPs do not naturally view community pharmacists as an ally in the primary healthcare sector. This is not unexpected as the two professions have been engaged antagonistically for some time in defining and defending professional boundaries, at least at the national levels of the college and professional bodies such as the Royal Australian College of General Practitioners (RACGP), the Australian Medical Association (AMA), the Pharmacy Guild and the Pharmaceutical Society of Australia (PSA). A recent example of such tensions is the pharmacist immunisation service provided by appropriately trained community pharmacists (Australian medical Association, 2014; Pharmaceutical Society of Australia, 2014; Pharmaceutical Society of Australia & Pharmacy Guild of Australia, 2016) (a more complete treatment of the professional tensions between GPs and community pharmacists is beyond the scope of this research). Nevertheless, progressive initiatives such as the recent proposal by the AMA to incentivise the integration of clinical pharmacists into GP clinics may prove to be synergistic in improving patient outcomes and reducing healthcare costs (Australian Medical Association, 2015).

Some community pharmacists interviewed were involved in the Queensland Government Pharmacists Immunisation Pilot (QPIP) which ran over two years. The QPIP was successful with over 35 000 vaccinations for influenza, pertussis and measles being administered to adults during the trial. Thirteen percent of consumers in the pilot were first-time recipients of the influenza vaccine (The Pharmacy Guild of Australia & Pharmaceutical Society of Australia, 2016). Following the success of the QPIP, the State of Queensland legislated the administration of these vaccines by appropriately trained pharmacists from 24 March 2016 via an amendment to Section 171 of the Health (Drugs and Poisons) Regulation 1996 (State of Queensland, 2016, p. 163). Other states and territories in Australia have legislated or are about to legislate this practice (Pharmaceutical Society of Australia, 2017). Continued support for the pharmacist immunisation program is essential as a public health and infection prevention measure.

Disempowered to act as stewards of antibiotics

As expected, community pharmacists largely played an advisory role, advising consumers in the context of self-care and/or self-management of minor illnesses and alleviation of bothersome symptoms e.g. upper respiratory tract symptoms. Community pharmacists felt disempowered in their ability to act as stewards of antibiotic use, as they are: (a) not prescribers, and (b) not involved at the point of care where the decision is made to use antibiotics. Currently, pharmacists are left out of the information-decision loop with regards to prescribers' decision-making due in part to the structure and infrastructure of Australian primary healthcare. The integration of clinical pharmacists into GP clinics which has been demonstrated to improve clinical and non-clinical outcomes including significant cost savings (Freeman, Rigby, Aloizos, & Williams, 2016), and a robust (and well-used) personal e-healthcare record may help pave the way for breaking down these information silos and increase appropriate involvement of community pharmacists in the future.

Community pharmacists do not see themselves as gatekeepers of antibiotic use in the primary healthcare setting unlike their colleagues in the hospital sector, where clinical pharmacists play a successful and key role in antimicrobial stewardship programs (Dresser & Nelson, 2010; Magedanz, Silliprandi, & dos Santos, 2012; Wickens et al., 2013). Even so, hospital pharmacists experience individual and role-based constraints, as well as inter-professional and organisational challenges such as the medical hierarchy, jurisdictional ambiguity and insufficient staffing (A Broom, Broom, Kirby, Plage, & Adams, 2015; A Broom, Broom, Kirby, & Scambler, 2015). Hence, the challenge to involve and embed community pharmacists in antibiotic stewardship in the primary healthcare sector is even greater given the lack of clinical governance that effectively straddles both general practice and community pharmacy. It is clear that the model for antibiotic stewardship currently used in hospitals would need to be re-worked to suit the primary healthcare sector.

The current funding model for community pharmacy imposes a perverse barrier to prudent use of antibiotics, in that there is no clear financial incentive to refuse the dispensing of late presentations of antibiotic prescriptions beyond the index infection. Currently, under the 6th Community Pharmacy Agreement there is provision for financial claims under the Medication Adherence Programs: Clinical Interventions (Australian Government & Department of Health, 2015). However, the refusal to dispense late presentations of antibiotic prescriptions does not fit neatly into the categories set out in the guidance document for such a claim (Pharmaceutical Society of Australia, 2011).

6.1.3 Focus on consumers

Patient education must address information needs

GPs and community pharmacists interviewed reported that they provide consumers with necessary information about the antibiotics prescribed such as dosage, frequency of dose administration, side effects and its management, and checking on allergies. In contrast, consumers interviewed acknowledged that while basic information was often provided (not always), they were frustrated with the lack of specific information about the antibiotics prescribed. Regardless of whether they asked their healthcare professional, consumers wanted unambiguous instructions from GPs when prescribed antibiotics, particularly when a delayed antibiotic prescription was given so that inappropriate medicine-taking behaviours could be avoided. Consumers were also curious about the rationale for antibiotic selection and confused about the same antibiotic being prescribed for seemingly different infections (see Chapter 4, Section 4.4.10).

An information gap was found in the duration of treatment for antibiotics. When questioned by the community pharmacist, consumers often did not know the duration of treatment intended by the GP. This was more obvious in the case of repeat antibiotic prescriptions where consumers were unsure about the duration of treatment, and hence whether the repeat was required. Consumer interviews corroborated this finding from the community pharmacists interviewed. Australian data showed that for ten of the commonly used oral antibiotics 10 - 20% of first repeats were being dispensed more than 2 months after the original prescription — potentially signalling inappropriate use by consumers (Drug Utilisation Sub Committee, 2015).

Public health campaigns — getting seen

It was somewhat surprising and disappointing that consumers were largely oblivious to the public health campaigns on awareness of antibiotic resistance (and prudent use of antibiotics) despite these being stepped up in recent years by NPS MedicineWise and the Australian Commission on Safety and Quality for Health Care, and using increasingly innovative approaches comparable with that of the USA, UK and Europe (Centers for Disease Control and Prevention, 2016a; European Centre for Disease Prevention and Control, 2016; Public Health England, 2016). The challenge remains for getting campaign materials and resources noticed by consumers amid other marketing collateral (commercial or otherwise) vying for consumer attention.

Similarly, it was also disappointing that most community pharmacists did not mention being involved in these campaigns either for Antibiotic Awareness Week (a global and national event usually held in mid-November, a concession that Australia and other southerly countries have to make in deference to the northern hemisphere's winter season) or seasonal campaigns leading up to the winter months for Australia. Despite being a targeted audience for healthcare educational interventions by NPS MedicineWise, less than half the GPs interviewed mentioned the resources, educational information and tools on the topic of antibiotic resistance or antibiotic use, or the antibiotic prescribing report personalised for each GP.

Public health campaigns — getting through?

Evaluations of Australian public health campaigns i.e. the impact of the annual Antibiotic Awareness Week in improving consumer knowledge and changing behaviours have not been formally conducted[33]. As such, the cost effectiveness and success (or otherwise) of these initiatives are not known. However, consumer research by NPS MedicineWise show that only 1 in 3 people know that colds and most coughs are caused by viruses, and less than half of those surveyed realise that antibiotics are ineffective against viruses, while 76% of those with an ear, nose, throat or chest infection expect to receive antibiotics from their GP (NPS MedicineWise, 2013b). As a result of the mid-year Winter is Coming campaign which ran in 2015, Australian

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[33] A search of published and grey literature did not yield any reports as at 30 January 2017.

consumers who were exposed to the two TV commercials had improved understanding of antibiotic resistance (NPS MedicineWise, 2015). More people reported positive behaviours, with the proportion of consumers who would ask their GP for antibiotics for a cold/flu decreasing from 17% in 2014 to 13% in 2015 (NPS MedicineWise, 2015).

Recent evaluations of the UK Antibiotic Guardian campaign showed mixed results. Although there was an enhancement of knowledge overall post-campaign, positive behaviour change was more likely in consumers with prior awareness of antibiotic resistance than those without prior awareness (Chaintarli et al., 2015).

The meaning of antibiotic resistance — language and message

As detailed in Chapter 4, Section 4.4.8, The phrase "antibiotic resistance" was understood and interpreted in various ways by consumers. Antibiotic resistance was conceptualised in four ways, some of which overlapped, while others were incorrect. These were: (a) as a property of the body — body becomes resistant to antibiotics, (b) as a property of the medication — antibiotic is no longer effective, (c) as a property of the bacteria — the bacterium is resistant to the antibiotic, and (d) as a property of a collective — society is immune to antibiotics. The first three ways of conceptualising antibiotic resistance corroborates that of previous research (Brookes-Howell et al., 2012; Wellcome Trust, 2015) which found that when the term is understood, it is impactful.

Interviews with GPs and community pharmacists revealed that these health professionals tend to explain the concept of antibiotic resistance in ways which consumers interpret as alluding to the notions of (a), (b) and (c) outlined above. Hence, health professionals should use alternate phrases such as “antibiotic resistant bacteria” and/or “antibiotic resistant infections” which were found to be clearer to consumers (Wellcome Trust, 2015). This applies equally to all public-facing materials — media, campaigns, consumer/patient education, online and hardcopy resources.

Decision-making — an exercise in enlightened self interest

The bottom line for consumer decision-making regarding the use of antibiotics or the avoidance of antibiotics for minor illnesses came down to enlightened self-interest for either the current self or the future self. While many recognised that responsible behaviour in antibiotic use mitigated antibiotic resistance, societal good remained an impersonal abstraction. Apart from their own judicious behaviour with antibiotics when prescribed, consumers largely seemed overwhelmed by the issue of antibiotic resistance — too large an issue for any one sector/professional or interest group, but one that should and must be tackled collectively by all stakeholders. This sentiment was echoed by the community pharmacists and GPs interviewed, although it could be argued that GPs are in one of the pivotal roles which could directly affect antibiotic consumption, and hence antibiotic resistance. The One Health movement gaining momentum worldwide is addressing antibiotic resistance synergistically, tackling the issue from all angles — human consumption, antibiotic use in agribusiness, in veterinary science and the environment. The Longitude Prize's Antibiotic Challenge which ends in September 2019 is another initiative aimed at catalysing innovations in rapid diagnostics which would help reduce clinical uncertainty, and hence, inform the use of antibiotics (Longitude Prize, 2016). Apart from enlightened self-interest mentioned previously, the findings from the consumer DCE survey underscores the dominant influence of GPs' advice on consumer behaviour regarding the use of antibiotics. This finding demonstrated that consumer desire for specific information regarding antibiotics prescribed, should it be clearly provided by the GP, will most likely lead to compliance by the consumer.

6.1.4 The EABE model as program theory

A new model — the EABE model (Section 4.5) was derived from the semi-structured interviews to explain the phenomenon of what influences antibiotic use from the perspectives of GPs, community pharmacists and consumers, and to inform individual and collective action on how to enable wise use of antibiotics.

The EABE model was supported by the findings from the GP and consumer DCE surveys, both of which underscored not only the influence that GPs have on consumer behaviours on antibiotic use, but also the influence that consumers have on GP antibiotic prescribing behaviours. Hence, in the EABE model the meta-categories of "Clinical Processes and Challenges" (subcategory "Patient expectations") and "Consumer Attitudes, Behaviours, Skills & Knowledge" (subcategory "Patient education vs. Information needs") mutually influence and reinforce one another. Antibiotic eupraxis is possible when these two meta-categories align, which in turn opens the way to effective engagement with antibiotic resistance (meta-category; subcategory "Mitigating antibiotic resistance").

This model can be further developed into "small theory" or program theory as it has the potential to: (a) guide specification of the components of a program or intervention, and (b) articulate the assumptions and rationale about mechanisms that link a program's processes and inputs to outcomes (Davidoff, Dixon-Woods, Leviton, & Michie, 2015).

6.1.5 Hypothesis

Taken as a whole, the results from both the qualitative and quantitative phases of the research converged into the following hypothesis: that equipping GPs with clear strategies and communication skills to confidently convey their decision-making on the one hand; as well as equipping consumers with accurate information and communication skills to confidently convey their preference to avoid antibiotics where possible on the other hand; would lead to antibiotic eupraxis and the mitigation of antibiotic resistance. This hypothesis has been visually encapsulated in the EABE model.

Returning to the research aim — which was to establish the dominant factors influencing decisions to use antibiotics by GPs, community pharmacists and consumers in the Australian primary healthcare sector — it is clear from the findings of this research that modifiable factors[34] i.e. patient expectations for antibiotics and GP's advice on the use of prescribed antibiotics are not only the two dominant factors, but are also mutually influencing factors for antibiotic decision-making on the part of GPs and consumers.

6.2 RESEARCH STRENGTHS AND LIMITATIONS

The strengths and limitations of each research method has been dealt with previously in Chapter 3, Sections 3.4.8 and 3.5.8, and is not recapitulated here. Instead, this section outlines the strengths and limitations of the research overall and the application of the methods vis-à-vis the researcher. The section ends with reflections on how the research has impacted the researcher.

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[34] Although dominant, "Duration of symptoms" is what the patient presents with and hence, not a modifiable factor.

6.2.1 Strengths and limitations: Overall research

The strengths of this research lie in its use of mixed methods and the research design, which provided a more comprehensive picture of the dominant factors influencing decision-making in antibiotic use in the Australian primary healthcare sector (established in Chapter 3, Sections 3.2 and 3.3). The complementarity of the mixed methods approach used in this research served not only to corroborate the findings from both the qualitative and the quantitative components, but also to mutually underscore the recurrent shared meanings. This is possible due to the disruption of complete objectivity and complete subjectivity — what is often thought of as quantitative and qualitative, respectively — offered by pragmatism (Shannon-Baker, 2016). In this research, the dichotomies of positivist and interpretivist ways of knowing was successfully bridged via the transformation of selected interview data to further explore decision-making regarding delayed antibiotic prescriptions, which importantly, was problematised through the qualitative phase (see Section 4.6 The Bridge: From Semi-Structured Interviews to Discrete Choice Experiments). The resultant DCEs subsequently produced findings that gave quantifiable weight to the factors influencing prescriber and consumer decision-making in the context of antibiotic prescribing and consumption.

There were several limitations to the study which is outlined in turn as follows:

The use of convenience sampling for both the semi-structured interviews and the DCEs meant that only respondents with interest in the topic volunteered to participate. In the case of the semi-structured interviews, GPs who participated could be those already practising prudent prescribing of antibiotics and hence, likely to prescribe less antibiotics than their peers. Perhaps GPs who prescribe more antibiotics than their peers may have different views on the topic. Consumers who volunteered for the semi-structured interviews were those with high educational achievements (i.e. holding at least a bachelor's degree). However, despite the high level of education amongst consumers interviewed, there was diversity in the level of knowledge, awareness and concern held regarding antibiotic use and antibiotic resistance — some of which were erroneous. This leads to the sobering realisation that consumers with perhaps less formal education and/or less awareness of the topic would hold at least the same if not more misconceptions about antibiotic use and antibiotic resistance.

In the case of DCEs, due to convenience sampling, respondent characteristics were not perfectly reflective of the target populations. Specifically, a higher proportion of GP respondents were female and trained in Australia, when compared to GPs registered to practise in Australia. A higher proportion of consumer respondents were female, held a Bachelor's degree, lived in a metropolitan area and were younger (median age), when compared to the general population in Australia. Hence, the stated preferences for both the GP and consumer DCEs may not adequately represent those of Australian GPs or the general population aged 18 and above, respectively. However, the results of both the GP and consumer DCEs provide useful insight into decision-making on antibiotic use for these respondents.

The small sample size of the GP DCE — the small number of participants may be an indication that: (a) antibiotic resistance was not an area of interest, (b) GPs were experiencing survey-fatigue, and (c) GPs faced time constraints due to a high workload. In addition, the DCE was not part of a recognised GP continuing professional development activity which would allow accumulation of points.

Orme's sample size calculation is an accepted rule of thumb for DCEs in peer-reviewed literature, and does not estimate power (Marshall et al., 2010). A small sample size affects the study in two ways: it limits the study's power i.e. the probability to detect the importance of attribute levels in influencing choice is reduced, with the null hypothesis being the attribute level is not important in influencing choice (Type 1 error — rejecting the null hypothesis when it is true or Type 2 error — not rejecting the null hypothesis when it is false); and the representativeness of the respondents to the target population of interest.

Given that the findings of the GP DCE are consistent with the responses for the most and the least important attributes in Section C of the DCE survey as well as findings from the qualitative component, it is unlikely that a Type 1 error (saying that an attribute level is important in influencing choice when it is not) or Type 2 error (saying that an attribute level is not important in influencing choice when it is) was committed.

The small number of GP participants for the DCE survey (together with respondent characteristics which were dissimilar to Australian GPs) means that the findings cannot be applied to all GPs as these are the stated preferences of the respondent GPs only. Having said that, the results of the GP DCE provide important insight into choice preferences of respondent GPs, which can be cautiously used to inform policy and practice given the statistical significance of the estimated parameters and consistency with the qualitative findings.

The scope and size of this research was constrained by the available time frame, research budget and human resources allocated to a PhD study. As such, the EABE model was not able to be tested and verified in either a separate or a sub-study. Further development and refinement of the EABE model would be required.

6.2.2 Strengths and limitations: Application of the selected methods

The professional background, training and skills which I brought to the research were conducive to the development of research instruments and the implementation of the research (see Appendix B. About the Researcher). However, inherent personal biases and blind spots may also have impacted negatively on the application of methods — the qualitative phase of the study is particularly vulnerable to this.

The decision to use the Theoretical Domains Framework (TDF) as a lens for deductive coding in addition to the inductive codes, may have limited the richness and depth of what the data may show, had it been subject to other forms of analysis such as grounded theory or discourse analysis. With this in mind, it will be worthwhile to re-analyse the raw qualitative data using one of these alternate theories as a separate undertaking — which I intend to do, dependent on the availability of funding for post-doctoral work in this area.

The use of DCEs comes with its own constraints and limitations as detailed in Chapter 3, Section 3.5.8. Additional limitations were the hypothetical nature of the scenario offered and perhaps the over-simplifying of the clinical context, which was a comment made by one of the GP DCE survey respondents. However, despite these constraints there is useful knowledge to be gained from understanding how GPs trade-off between factors.

For the strengths and limitations inherent in each method used, the reader is referred to Chapter 3, Sections 3.4.8 and 3.5.8, for the semi-structured interviews and the DCEs, respectively.

6.2.3 Reflections on how the research impacted the researcher: Learnings

I emerged from this 3-year research journey a changed person — hopefully for the better — in more ways than one. As a researcher, apart from the necessary skills gained and/or enhanced in qualitative and quantitative methods and analyses, embarking and completing this study has taught me humility. Let me explain.

First, the overwhelming trust and generosity of research participants, particularly those who were involved in the semi-structured interviews, took me by surprise. Perspectives, thoughts, ideas, critique and self-examination (including those that were unflattering) were shared candidly — with me, a stranger. To honour their trust and generosity, I have sincerely done my best to steward this information, analysed and reported it in the most robust way I know. The research-relevant assistance of mentors, supervisors, friends and colleagues — both practical and intellectual — have helped shape and sharpen my thinking and approach to the research.

Second, the boundaries of qualitative and quantitative research are more fluid than I first thought (it is not black, or grey or white). Learning about and performing mixed methods research was indeed an eye-opener for me — not unlike learning how to dance — clumsy steps at first, then becoming more graceful (and maybe someday, less effortful) as the work progressed. While I embarked on the PhD journey in part as a surrogate capstone to my clinical, professional and academic achievements, I now know I still have much to learn.

Third, as researchers, we are constrained by the methods we use, and if we are honest, limited by the worldviews we hold and inherent biases in our backgrounds (there is no such thing as a view from nowhere). In this research, what I have investigated, discovered, and offered to readers, is but one possible interpretation of the phenomenon of antibiotic use in the primary healthcare sector, given my background (see Appendix B) and using the methods selected. The possibility of multiple and varied interpretations is true not only of qualitative data — but as I have come to appreciate — of quantitative data as well.

I am grateful for each of these learnings.

6.3 RESEARCH CONTRIBUTIONS

The theoretical and methodological innovations discussed in Sections 6.3.1 and 6.3.2 demonstrate the significance and novelty of this research. The implications for policy and practice (Section 6.3.3), together with the recommendations outlined in Section 6.3.4 show the significance and importance of this research.

6.3.1 Theoretical innovation

Two theoretical innovations are claimed. First, the Theoretical Domains Framework (TDF) was used in this research in four novel ways: (a) as the theoretical basis for establishing the dominant factors in decision-making in both an area (antibiotic use in the Australian primary healthcare sector) and in individuals (community pharmacists and consumers), naïve to the TDF, (b) as a coding framework for qualitative data gained from semi-structured interviews, (c) as a conceptual framework for the selection of attributes of interest for the DCEs, and (d) as a translation framework for recommendations to national programs targeting desired behaviour change in antibiotic use. In addition, the mapping of evidence to the TDF on antibiotic prescribing and antibiotic use in primary care had not been done before in peer-reviewed journals[35]. This research therefore built upon existing knowledge, added to implementation science/behaviour change research, and extended the application of the TDF.

Second, a new model was created to more fully explain the tensions between factors influencing antibiotic use, which was not easily surfaced using the TDF alone. The Enabling Antibiotic Eupraxis (EABE) model was developed from the qualitative findings of this research, to both explain the phenomenon of what influences antibiotic use from the perspectives of GPs, community pharmacists and consumers, and to inform individual and collective action on how to enable wise use of antibiotics. The EABE model was also supported by the findings from the quantitative phase.

6.3.2 Methodological innovation

An adaptation of the DCE method to reveal dominant drivers in decision-making on antibiotic use was necessary for the conduct of this research. DCEs have usually been used to reveal factors that drive selection of jobs, goods or services. In this research, the DCEs required situational framing with realistic decision points that would elicit: (a) dominant factors that drive GP antibiotic prescribing behaviour, and (b) dominant factors that drive consumer antibiotic prescription-filling behaviour. This required adaptation of the DCE method, in that the attributes and levels were not characteristics of a job, product/good or service/test, but rather of the relevant personal and external circumstances related to the hypothetical scenarios.

To the best of my knowledge, this research is novel in its use of DCEs in this manner and enabled better understanding of how one factor was traded against another, given the same hypothetical scenario, which has valuable and useful applications for policy and for practice.

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[35] The mapping of evidence for this thesis was completed in 2014. Since then, grey literature has been found, produced by Public Health England in 2015, which used the TDF to organise evidence in this area (Public Health England, 2015).

6.3.3 Implications for policy and practice

Regulatory changes as forcing functions

The findings of this study support the enactment of PBS changes for oral antibiotics proposed by the DUSC as much needed forcing functions for more appropriate use of these medicines. Specifically, (a) the reduction of the period of validity for oral antibiotic prescriptions, and (b) the removal of repeat prescriptions for oral antibiotics (Department of Health & Pharmaceutical Benefits Advisory Committee, 2015; Drug Utilisation Sub Committee, 2015). The majority of GP and community pharmacist interview participants supported both of these proposed actions.

The importance of introducing a regulatory strategy to reduce the period of validity for oral antibiotic prescriptions to minimise/prevent inappropriate use, is underscored by the consumer DCE finding that 40.3% would keep unused antibiotic prescriptions until it expired and 22% would keep it for another time they became unwell. Reducing the period of validity for antibiotic prescriptions would prevent potential misuse of antibiotics, in that prescriptions being filled many weeks or months later are unlikely to be for the treatment of the same index infection. GPs and community pharmacists interviewed suggested that for most patients a 1-month period of validity for antibiotic prescriptions would be sufficient, after which it can no longer be dispensed. This period of validity is reasonable as Australian data indicate that for the 10 most commonly used antibiotics, between 73 – 93% of the prescriptions had been dispensed by the third day after prescribing (Drug Utilisation Sub Committee, 2015).

Repeat antibiotic prescriptions contribute to the potential "reservoir" of antibiotics accessible to consumers, which may not be used appropriately. Australian data show that for three of the commonly used oral antibiotics, a high proportion of prescriptions contained a repeat — amoxicillin with clavulanic acid (68%), cephalexin (53%) and roxithromycin (71%) (Drug Utilisation Sub Committee, 2015). While it is difficult to ascertain the appropriateness of the prescribing of repeat prescriptions without matched data on clinical indications, it is of concern that for ten of the commonly used oral antibiotics 10 – 20% of first repeats were being dispensed more than 2 months after the original prescription — potentially signalling inappropriate use by consumers (Drug Utilisation Sub Committee, 2015). Similarly, in this research, many consumers interviewed reported that they retained unused repeat prescriptions which were subsequently used when they became ill again with (perceived) similar symptoms — which may or may not be clinically appropriate.

While GPs can currently adjust the settings in their prescribing software so as not to generate repeat prescriptions for antibiotics unintentionally, it was evident from the GP interviews that not all GPs are aware of how to do this and/or may not remember to do so. This finding corroborates that of a previous Australian study which found that almost 70% of computer-generated antibiotic prescriptions included repeats, compared to only 40% of handwritten antibiotic prescriptions (Newby & Robertson, 2010). A national educational intervention targeted at GPs which provided the rationale and the process for how to adjust prescribing software settings to avoid automatic generation of repeat antibiotic prescriptions did not alter these proportions significantly (Newby & Robertson, 2010). Hence, removing oral antibiotic repeat prescriptions from the PBS would be the surest way to dis-incentivise the dispensing of unintentional repeat prescriptions.

Enactment of these regulatory changes would need to provide for alternate means of accessing antibiotics — for example, via authority prescriptions or a longer period of prescription validity for selected indications. GPs and community pharmacists interviewed were emphatic that appropriate access to antibiotics need to be ensured for patients who require longer courses of treatment, clinically appropriate prophylaxis, repeat treatment or larger quantities/doses (e.g. patients with cystic fibrosis, chronic obstructive pulmonary disease, osteomyelitis). These views are in line with the DUSC proposal to the PBAC (Department of Health & Pharmaceutical Benefits Advisory Committee, 2015).

Education and training

The findings from this research highlight the need to further equip GPs, community pharmacists and consumers to act individually and collectively to mitigate antibiotic resistance. Intentional and tailored education and training relevant to each of these groups would be needed.

For GPs — all GPs but particularly early career GPs would benefit especially from being equipped with strategies to manage patient expectations and advanced communication skills to not only convey prescribing decisions confidently and persuasively to patients, but also to communicate unambiguously (especially in the case of how and when to use a delayed antibiotic prescription, should one be given) so as to help patients avoid inappropriate behaviours. Given that the majority of prescribing decisions made by GP respondents regarding the DCE choice sets (308/414, 74.4%) were that the antibiotic prescription issued would have been a delayed prescription, and that 19.4% of consumer respondents to the DCE survey indicated that they would fill such a prescription right away and take it, clear instructions from the GP is important.

For consumers — the knowledge that their expectations have the power to influence antibiotic prescribing behaviour means that consumers can more fully participate as involved actors in the fight against antibiotic resistance. Results of the GP DCE demonstrated that the modifiable factor of "Patient expectations" was dominant in influencing prescribing decisions. Consumers need to understand that clear communication on their part to GPs regarding their preference to avoid antibiotics unless necessary, not only benefits their own health (through the avoidance of risks and side effects of taking antibiotics), but also serves as an effective way of conserving antibiotics.

In other words, the findings of the DCEs that GPs and consumers mutually influence one another in decision-making should be leveraged in educational interventions for GPs and consumers alike.

It is of concern that community pharmacists who serve as front-line health professionals in the community feel inadequately informed about antibiotic resistance and disempowered to act, as per the findings from the semi-structured interviews in this research. Hence, for community pharmacists — education and training to upskill them with up-to-date knowledge of the extent of antibiotic resistance and its practical consequences, is a first step in removing the inertia to act. Following this, concrete suggestions of what they can realistically do to mitigate antibiotic resistance, would go a long way towards engaging and involving community pharmacists. Promoting awareness amongst community pharmacists of activities/initiatives identified by the International Pharmaceutical Federation (FIP) to reduce reliance on antibiotics would be a key step (International Pharmaceutical Federation (FIP), 2015) and signals (perhaps untapped) solidarity in the profession globally to mitigate the rise of antimicrobial resistance. Activities that are most pertinent for pharmacists working in the primary healthcare sector in Australia include: health promotion (promoting good hygiene, hand washing), promoting or providing vaccinations, advice on management of self-limiting viral infections, and appropriate referral to a GP (International Pharmaceutical Federation (FIP), 2015).

A one-stop website offering online resources to clinicians and patients to inform, guide, monitor and support antibiotic stewardship efforts in the primary healthcare sector, such as UK's TARGET antibiotics toolkit (Royal College of General Practitioners, n.d.), would be a useful addition/enhancement of what is currently spread across multiple organisational websites (e.g. Australian Commission on Safety and Quality in Health Care, the Australian Government, Department of Health, NPS MedicineWise).

6.3.4 Recommendations

The recommendations made in this section are based on the findings of this research, which are aligned with, corroborate and add to the implementation of: (a) the National AMR Strategy[36]: Objective 1 – Increase awareness and understanding of antimicrobial resistance, its implications, and actions to combat it through effective communication, education and training, (b) the AURA 2016 report[37], and (c) the recommendations of the International Pharmaceutical Federation (Australian Commission on Safety and Quality in Health Care, 2016; Australian Government, 2015; International Pharmaceutical Federation (FIP), 2015; World Health Organization, 2015).

The findings of this research are anticipated by the Federal Department of Health for inclusion in Australia's National Antimicrobial Strategy 2015 – 2019 Implementation Plan (Australian Government et al., 2016, p. 23) as part of the outputs of the Centre of Research Excellence in Reducing Healthcare Associated Infections (CRE-RHAI), following a national forum in late 2015.

Recommendation 1: Enact regulatory changes to the PBS

Government and policy makers to work with stakeholders and legislators to enact the proposed PBS changes to remove oral antibiotic repeats and to reduce the period of validity of oral antibiotic prescriptions, while ensuring accessibility of antibiotics where there is a proven clinical need (TDF D7 Reinforcement, TDF D11 Environmental context and resources, TDF D14 Behavioural regulation).

Recommendation 2: Embed community pharmacists into strategies to mitigate antibiotic resistance.

Government and policy makers to work with stakeholders and/or legislators to:

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[36] The National AMR Strategy is in turn aligned with the WHO Global Action Plan.

[37] Page 148 of the report regarding next steps to review specific aspects of antibiotic prescribing under the PBS to identify opportunities for improved appropriateness of antibiotic use in the community.

2A. Support the integration of community pharmacists into primary healthcare teams

Continue to support the Pharmacist in General Practice Incentive Program (PGPIP) and to incorporate community pharmacists as part of the team in Health Care Homes. Incorporating suitably trained community pharmacists in these ways not only ensures that consumer medication use is optimised, but also provides a resource for antibiotic stewardship in the clinic or team (TDF D1 Knowledge, TDF D2 Skills, TDF D3 Social/Professional role and identity, TDF D4 Beliefs about capabilities, TDF D6 Beliefs about consequences, TDF D7 Reinforcement, TDF D9 Goals, TDF D11 Environmental context and resources, TDF D14 Behavioural regulation).

Pharmacists who take up these clinic-based roles with responsibilities to contribute to antibiotic stewardship, need to be adequately upskilled, given clear guidance and resourced with tools by relevant national and professional bodies for antibiotic use and surveillance, clinical audit and consumer education.

2B. Support and legislate pharmacist immunisation programs as an infection prevention measure

Continue to support and legislate community pharmacist immunisation programs as a public health and an infection prevention measure (TDF D1 Knowledge, TDF D2 Skills, TDF D3 Social/Professional role and identity, TDF D4 Beliefs about capabilities, TDF D6 Beliefs about consequences, TDF D9 Goals, TDF D11 Environmental context and resources, TDF D14 Behavioural regulation).

Recommendation 3: Upskill community pharmacists regarding their role in mitigating antibiotic resistance

Community pharmacist education and training providers to incorporate/enhance the following in their training curricula and/or educational interventions: (a) upskill pharmacists on up-to-date knowledge of the extent of antibiotic resistance and its practical consequences, (b) promote awareness of activities identified by the International Pharmaceutical Federation that are pertinent to community pharmacists — health promotion (good hygiene, hand washing), promoting or providing vaccinations, advice on management of self-limiting viral infections, and appropriate referral to a GP, and (c) equipping pharmacists with the knowledge and skills for implementing these concrete actions (TDF D1 Knowledge, TDF D2 Skills, TDF D3 Social/Professional role and identity, TDF D4 Belief about capabilities, TDF D6 Beliefs about consequences, TDF D7 Reinforcement, TDF D8 Intentions, TDF D9 Goals, TDF D11 Environmental context and resources, TDF D12 Social influences, TDF D13 Emotion).

Recommendation 4: Incorporate new emphases and clearer terminology for public health campaigns

Stakeholders and organisations responsible for consumer education and/or public health campaigns to:

4A. Emphasise the power of consumers to directly reduce antibiotic prescribing

Emphasise the message in consumer education and public health campaigns that consumers have the power to directly reduce antibiotic prescribing (and hence reduce antibiotic resistance) by clearly communicating their preference to avoid antibiotics for minor illnesses to the GPs (TDF D1 Knowledge, TDF D2 Skills, TDF D3 Social/Professional role and identity, TDF D4 Beliefs about capabilities, TDF D8 Intentions, TDF D12 Social influences).

4B. Emphasise the role of a good GP

Reframe public perception as to what constitutes a good GP, contextualised for conservation of antibiotics (TDF D1 Knowledge, TDF D2 Skills, TDF D3 Social/Professional role and identity, TDF D7 Reinforcement, TDF D9 Goals, TDF D10 Memory, attention and decision processes, TDF D12 Social influences).

The principle being that a good GP: (a) understands your health concerns and acts in your best interest, (b) would conduct a thorough examination (i.e. clinical examination, medical history and appropriately order any tests) when deliberating on the best course of action, (c) would discuss their findings and potential courses of action with you in order to involve you in the decision-making process, and (d) would not prescribe antibiotics unless the benefits to your health outweighed the risks of treatment.

4C. Adopt clearer terminology — antibiotic resistant bacteria/infections

Use the phrase “antibiotic resistant bacteria” and/or “antibiotic resistant infections” rather than “antibiotic resistance”, in order to more accurately convey the issue to consumers/patients (TDF D1 Knowledge, TDF D7 Reinforcement, TDF D12 Social influences). This applies to all public-facing materials — media, campaigns, consumer/patient education, online and hardcopy resources.

Recommendation 5: Upskill GPs to manage patient expectations efficaciously

GP education and training providers to incorporate/enhance the following in their training curricula and/or educational interventions: (a) strategies for managing patient expectations (see description for “preparing the ground” in Chapter 4, Section 4.2.6), (b) advanced communication skills to not only convey prescribing decisions confidently and persuasively to patients, but also to communicate unambiguously (especially in the case of how and when to use a delayed antibiotic prescription, should one be given) so as to help patients avoid inappropriate behaviours (TDF D1 Knowledge, TDF D2 Skills, TDF D3 Social/Professional role and identity, TDF D4 Beliefs about capabilities, TDF D6 Beliefs about consequences, TDF D7 Reinforcement, TDF D8 Intentions, TDF D9 Goals, TDF D12 Social influences, TDF D13 Emotion, TDF D14 Behavioural regulation).

6.4 SUMMARY

Decision-making on antibiotic use is a complex phenomenon. In the discussion and synthesis of results (Section 6.1) this chapter showed how the use of mixed methods enabled a comprehensive investigation of the research aim and research questions, leading to a more nuanced understanding of the topic. Research strengths and limitations (apart from those inherent in the selected methods which were discussed in Chapter 3, Sections 3.4.8 and 3.5.8) were discussed in Section 6.2. The significance, novelty and importance of this research was demonstrated in Section 6.3 Research contributions, which concluded with five key recommendations towards: (a) the implementation of the National AMR Strategy 2015 – 2019: Objective 1 – Increase awareness and understanding of antimicrobial resistance, its implications, and actions to combat it through effective communication, education and training, (b) the AURA 2016 report, and (c) the recommendations of the International Pharmaceutical Federation.

The next chapter (Chapter 7) provides a succinct summary of this research and offers suggestions for future research.

Chapter 7: **Conclusion**

In this chapter which concludes the thesis, a grand summation (Section 7.1) comprising the following components is briefly provided: (a) the research problem, salient gaps in research, research aim and research questions; (b) research design and methods used; (c) main findings from both the qualitative and quantitative phase; (d) limitations and strengths of the research; and (e) research contributions. Opportunities for future research are discussed next. A concluding statement ends the chapter.

7.1 GRAND SUMMATION OF RESEARCH

The research problem

The ratification of the WHO Global Action Plan in 2015 and the landmark declaration agreeing to combat antimicrobial resistance (AMR) signed by 193 countries at the United Nations General Assembly in 2016, have further escalated the urgency and established the importance of fighting antimicrobial resistance globally (General Assembly of the United Nations, 2016; World Health Organization, 2015). The burden to health and to the economy is significant for both individuals and society. It is estimated that if left unchecked, globally by 2020, AMR will cause 10 million deaths per year and cost up to a hundred trillion US dollars in lost Gross Domestic Product. Currently in Australia, the cost of AMR is estimated to be over $250 million per year. The issue that despite much published research, it is not known which factors are dominant in influencing antibiotic use in the Australian primary healthcare sector, was problematized via the literature review in Chapter 2.

Salient gaps in research

This research focussed on addressing the following gaps in research: (a) although some barriers and enablers to appropriate use of antibiotics affecting GPs and consumers are known, it is not clear which factors are most impactful on decision-making, and (b) research on GP prescribing behaviours and attitudes found in published literature were predominantly completed on those practising in the UK, Europe or the USA. To date, limited research has been done with Australian GPs in this area. The same can be said of consumers. In the case of community pharmacists, little qualitative research has been done to understand how those practising in Australia view the issue of AMR, their professional role in mitigating the rise of AMR and their perceptions of what influences the use of antibiotics.

Research aim and research questions

This research aimed to establish the dominant factors influencing decisions to use antibiotics by GPs, community pharmacists and consumers in the Australian primary healthcare sector, so as to inform ongoing national programs to reduce antibiotic use.

Two research questions (RQ) were posed and addressed:

RQ1. What influences antibiotic use from the perspectives of GPs, community pharmacists and consumers?

RQ2. How do GPs and consumers trade-off on factors influencing antibiotic use?

Research design and methods

A mixed methods research design was used (QUAL → QUAN), comprising semi-structured interviews for the substantial qualitative component followed by DCEs for the quantitative component. Justification for the selection of these methods were provided in Chapter 3, Sections 3.4 and 3.5. A schematic representation of the research design was presented in Chapter 3, Section 3.3.1.

In alignment with mixed methods, the points of interface between the qualitative and quantitative components were made explicit. There were two instances of interface or "mixing" — the transformation from qualitative data to quantitative research instrument (see Chapter 4, Section 4.6) and the discussion and synthesis of results (Chapter 6, Section 6.1).

Research outcomes: Main findings

Detailed reporting of results was provided in Chapters 4 and 5. The main findings of the qualitative component — semi-structured interviews — yielded the EABE model, which both explains the phenomenon of what influences antibiotic use from the perspectives of GPs, community pharmacists and consumers, and to inform individual and collective action on how to enable wise use of antibiotics. Briefly, the EABE model shows how the meta-categories of Clinical Processes & Challenges, Consumer Attitudes, Behaviours, Skills & Knowledge, and

Engaging with Antibiotic Resistance, lie in tension and converge when aligned to allow antibiotic eupraxis. The model is illustrated in Chapter 4, Section 4.5. The EABE model was supported by the main findings of the GP and the consumer DCE surveys.

The main findings of the quantitative component — DCEs — were: (a) that GP's advice was the dominant factor influencing consumer behaviours on antibiotic use, and (b) that patient expectations for antibiotics was the dominant (modifiable) factor influencing GP antibiotic prescribing behaviours.

Taking together, the results of the qualitative and quantitative components gave rise to the hypothesis that: equipping GPs with clear strategies and communication skills to confidently convey their decision-making on the one hand; as well as equipping consumers with accurate information and communication skills to confidently convey their preference to avoid antibiotics where possible on the other hand; would lead to antibiotic eupraxis and the mitigation of antibiotic resistance.

Strengths and limitations of the research

The strengths and limitations of this research have been discussed at these various levels: (a) for each method used (Chapter 3, Sections 3.4.8 and 3.5.8), (b) for the research overall, (c) for the application of the methods, and (d) reflections by the researcher — (b) to (d) in Chapter 6, Section 6.2.

Research contributions

This research addressed the research aim and the two research questions posed (Chapters 4 to 6). Qualitative perspectives of Australian community pharmacists and consumers on antibiotic resistance, their roles in mitigating the rise of AMR and their perceptions of what influences antibiotic use from this research, are novel and contributes towards reducing a research gap (Chapter 2, Section 2.5). The qualitative perspective of Australian GPs on antibiotic prescribing are an addition to the current literature which is dominated by research from the UK, Europe or the USA. This research has also (for the first time, to the best of my knowledge) quantified preferences for decision-making in antibiotic prescribing and antibiotic consumption. Dominant factors that influence GP and consumer decision-making in these areas have been established.

The significance and novelty of this research is evidenced by the theoretical and methodological innovations discussed in Chapter 6 (Sections 6.3.1 and 6.3.2). The significance and importance of this research is demonstrated by the implications for policy and practice (Section 6.3.3), together with the recommendations outlined in Section 6.3.4.

7.2 FUTURE RESEARCH

Opportunities for future research are presented as those which could potentially be completed as part of post-doctoral research and those which may require a larger investment. Future research include, but are in no way limited to the following:

Post-doctoral research

- Research to investigate GPs' attitudes to personal use of antibiotics and the impact/influence on their prescribing practices;
- Conduct a multi-career-stage GP DCE survey including final year medical students, GP Registrars, early, mid- and late-career GPs to compare prescribing attitudes and practices;
- Compare GP DCE survey findings with real-time antibiotic prescribing data from *MedicineInsight* when publicly available, to refine and/or validate the DCE findings; and
- Research on the DCE method such as attribute non-attendance perhaps for clinician cohorts

Research requiring a team and/or larger investment

- Develop, implement and evaluate new public health messages regarding antibiotic use and antibiotic resistance, informed by the findings of this research. This would meet one of the objectives of the National AMR Strategy 2015 – 2019 i.e. to have an evidence base for behaviour change strategies/interventions;
- Research on the effectiveness of previous public health campaigns e.g. Antibiotic Awareness Week in influencing consumer behaviour, from a health communication and health literacy perspective; and

- Application of the research design used in this study to another country[38] or setting, either in the same or different topic area e.g. antibiotic use by dentist, nurse practitioners or in countries with similar healthcare structures

7.3 CONCLUDING STATEMENT

This thesis both confirms and adds new findings to the collective evidence base for action against antibiotic resistance. The significance, novelty and importance of this research were demonstrated in the results as well as in the research contributions. Actors such as government, policy-makers and GPs, who have the authority, responsibility and resources to mitigate the rise of antibiotic resistance must now maintain and/or step up efforts, not only for individual and societal good in Australia, but also globally. Community pharmacists need to engage and involve themselves in the fight against antibiotic resistance if they wish to retain a key role as a healthcare partner and provider. Consumers have more power to influence GPs' antibiotic prescribing patterns than they currently realise — this should be leveraged as much as possible. Antibiotic resistance knows no sovereign borders — so must our collective efforts in addressing this issue.

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[38] Interest to collaborate has been expressed by Dr Akke Vellinga, Epidemiologist from the School of Medicine at NUI Galway in the UK in August 2016. Discussions are ongoing.

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Appendices

Appendix A: Supervisors

Principal Supervisor

Dr Katie Page BA(Psych)Hons *Qld.*, PhD *Qld.*

Senior Research Associate, Faculty of Health, School of Public Health and Social Work, Institute of Health and Biomedical Innovation, Queensland University of Technology

Associate Supervisors

Prof Nicholas Graves BA(Economics/Economic History)Hons *Liv.*, MA *Leeds*, PhD *Lond.*

Academic Director, Centre of Research Excellence in Reducing Healthcare Associated Infections, School of Public Health and Social Work, Institute of Health and Biomedical Innovation, Queensland University of Technology

Prof Jenny Doust BEcons *W.Aust*, BA(Asian Studies) *Curtin*, BMBS *Flin.*, PhD *Qld.*, FRACGP

Professor of Clinical Epidemiology, Centre for Research in Evidence-Based Practice, Bond University

Prof Lisa Nissen BPharm, PhD *Qld.*, FPS, FHKAPh, FSHP

Professor and Head of School, School of Clinical Sciences, Faculty of Health, Queensland University of Technology

Prof Zee Upton PhD *Adel*.

Research Director, Institute of Medical Biology, Agency for Science, Technology and Research (A*STAR), Singapore; and Adjunct Professor, Faculty of Health, School of Biomedical Science, Queensland University of Technology.

Appendix B: About the Researcher

This PhD was undertaken as a continuation of a journey of what has been a multi-faceted career — not just in the discipline of pharmacy, but more broadly in the field of medicines management, as detailed in subsequent paragraphs below. The seed for the research aim and research questions was planted in 2013 while working as the Design Lead for NPS MedicineWise[39] — creating possible healthcare and educational interventions for a multi-year program to reduce antimicrobial resistance by 25% over 5 years. While reviewing the literature to sift through the evidence for "which messages directly impacted on behaviour", I realised that there was a paucity of research in this area. Although there was some research on factors that would have an impact on prescribing patterns and consumer behaviours, it was mostly non-Australian data. In addition, it was unclear which factors were most important, and hence, what aspect to leverage for public health campaigns. This early seed has evolved and changed a little, as is necessary, during the course of the 3-year PhD.

My professional background is in clinical pharmacy — having been conferred a Bachelor in Pharmacy (1993) and a Master in Clinical Pharmacy (2002), both by The University of Queensland, Australia. My clinical/working experience was gained in the healthcare sector serving in public and private hospitals, in both metropolitan and rural/regional areas — primarily in Australia, but also in Singapore and Malaysia. I have worked for the not-for-profit sector and in academia — focusing on various aspects of medicines management, including quality use of medicines and practitioner-training — in Australia and as a visiting lecturer in Sri Lanka.

My skills are diverse and include academic detailing/social marketing, implementation science, management of complex state-wide projects and programs, information systems implementation, relationship management of multi-disciplinary stakeholders, development

[39] NPS MedicineWise is a national not-for-profit organisation that enables quality use of medicines and medical tests. Up to date, evidence-based information about medicines, health conditions, medical tests, and practical tools/resources are designed and disseminated via various modalities to health professionals and consumers to influence better decision-making and better health outcomes.

and delivery of innovative educational interventions for clinicians, and development and delivery of education and training programs for undergraduates, postgraduates and health professionals.

Looking back at the trajectory of my career and reflecting on the achievements that have given me the most satisfaction, I recognise that my worldview leans towards that of social democracy. I worked in Australian public healthcare institutions at a time when funding was scarce (when is it not?) but was wisely invested in a way which allowed local innovation and best practice to be freely shared and piloted elsewhere (intra and interstate), refined and/or tailored, and spread — all in a relatively short span of time, which minimised the reinvention of wheels.

I work best with people and organisations whose values are aligned with equity — in the context of medicines management that would be: (a) equity of access and quality use of medicines, and (b) equity of access to competent and safe healthcare practitioners — doctors, pharmacists, nurses, allied health professionals.

My area of expertise is in enabling quality use of medicines (including safe systems) and in developing a skilled medicines management workforce (safe prescribers and safe practitioners) — for which I was awarded the Advanced Practice Pharmacist credential by the Australian Pharmacy Council in late 2015. My practice and contribution to healthcare has changed the way clinical pharmacists provide medication management services in Queensland public hospitals. I have had the pleasure and privilege of leading and working with many multi-disciplinary colleagues and team members to make this happen — doctors, pharmacists, pharmacy support staff, nurses, ICT experts, directors and executives. Together with able and inspiring colleagues and mentors, I have contributed to the national agenda on non-medical prescribing[40] including delineating prescribing competencies[41], and developed and co-delivered clinical education and training for International Medical Graduates on safe

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[40] Prescribing of medication by health practitioners other than doctors and dentists e.g. nurse practitioners, pharmacists, physiotherapists.

[41]Published paper: Lum E, Mitchell C, Coombes I. (2013). The competent prescriber: 12 core competencies for safe prescribing. *Aust Prescr*, 36, 13-16. Published report: National Health Workforce Planning and Research Collaboration. (2010). Non-medical prescribing: An exploration of likely nature of, and contingencies for, developing a nationally consistent approach to prescribing by non-medical health professionals. Final report by Nissen L, Kyle G, Stowasser D, Lum E, Jones A, McLean C, Gear C.

prescribing. I also co-created and co-delivered a prescribing training program for pharmacists and allied health practitioners — for which I was awarded the QUT Vice Chancellor's Performance Award (Team Award) in late 2014.

Reflections on how this research project has impacted me, the researcher — were offered in Chapter 6, Section 6.2.3.

Appendix C: Literature Search Strategy

Search criteria: Peer-reviewed journal articles; English language; abstract available; published between January 2000 and March 2014; human; adults.

Search 1: To identify barriers and enablers of antibiotic use for GPs, community pharmacists and consumers, respectively (contextualised for respiratory tract infections).

Search 1A: General Practitioners

S1: antibiotic* OR antimicrobial OR antibiotic resistance OR antimicrobial resistance S2: decision?making OR judg?ment OR prescrib* S3: doctor OR prescri* OR general practitioner OR gp S4: ambulatory OR primary care OR primary health?care S5: S1 AND S2 AND S3 S6: S4 AND S5
Subject headings: Anti-bacterial agents; practice patterns, physicians'; respiratory tract infections; primary health care; drug prescriptions; drug utilization; ambulatory care; family practice; physicians, family; health knowledge, attitudes, practice; drug resistance, microbial; inappropriate prescribing; general practice; physicians, primary care.
Yield: 554 articles (Medline – 389; CINAHL – 17; PsycINFO – 60; SCOPUS – 88) After screening of titles/abstracts: 281 articles (Medline – 207; CINAHL – 4; PsycINFO – 30; SCOPUS – 40) Total after duplicates removed: **253 articles**

Search 1B: Community Pharmacists

S1: antibiotic* OR antimicrobial OR antibiotic resistance OR antimicrobial resistance OR antibiotic use S2: pharmacist OR community pharmac* S3: (S1 AND S2) NOT hospital
Subject headings: Anti-bacterial agents; pharmacists; community pharmacy services; self medication; drug prescription; health knowledge, attitudes, practice; professional role; pharmacies; patient education as topic; respiratory tract infections; attitude of health personnel; practice patterns, physicians'.
Yield: 150 articles (Medline – 56; CINAHL – 2; PsycINFO – 17; SCOPUS – 75) After screening of titles/abstracts: 43 articles (Medline – 24; CINAHL – 0; PsycINFO – 12 SCOPUS – 7) Total after duplicates removed: **37 articles**

Search 1C: Consumers

S1: antibiotic* OR antimicrobial OR antibiotic resistance OR antimicrobial resistance OR antibiotic use S2: consumer OR patient or public S3: ambulatory OR primary care OR primary health?care S4: S1 AND S2 AND S3 S5: S4 AND (perceptions or attitudes or opinion or experience)
Subject headings: None used to narrow search further due to low number of articles.
Yield: 625 articles (Medline – 388; CINAHL – 9; PsycINFO – 68; SCOPUS – 160) After screening of titles/abstracts: 52 articles (Medline – 23; CINAHL – 1; PsycINFO – 12; SCOPUS – 16) Total after duplicates removed: **43 articles**

Search 2: To explore medical decision-making contextualised for prescribing

S1: decision?making OR judg?ment S2: medical OR prescrib* S3: S1 AND S2
Subject headings: Clinical competence; decision making; judgment; health knowledge, attitudes, practice; practice patterns, physicians'; decision support techniques.
Yield: 224 articles (Medline – 55; CINAHL – 5; PsycINFO – 99; SCOPUS – 65) After screening of titles/abstracts: 19 articles (Medline – 6; CINAHL – 0; PsycINFO – 7; SCOPUS – 6) Total after duplicates removed: **17 articles**

Search 3: To identify behaviour change strategies for GPs and consumers

Search 3A: General Practitioners

S1: antibiotic* OR antimicrobial OR antibiotic resistance OR antimicrobial resistance S2: (intervention or strategies) OR behavio?r S3: doctor OR prescri* OR general practitioner OR gp S4: S1 AND S2 AND S3 S5: S4 NOT hospital
Subject headings: Anti-bacterial agents; practice patterns, physicians'; respiratory tract infections; drug prescriptions; health knowledge, attitudes, practice; family practice; inappropriate prescribing; primary health care; general practice; drug resistance, microbial.
Yield: 422 articles (Medline – 198; CINAHL – 5; PsycINFO – 40; SCOPUS – 179) After screening of titles/abstracts: 123 articles (Medline – 81; CINAHL – 5; PsycINFO – 9; SCOPUS – 28) Total after duplicates removed: **118 articles**

Search 3B: Consumers

S1: antibiotic* OR antimicrobial OR antibiotic resistance OR antimicrobial resistance S2: (intervention or strategies) OR behavio?r S3: consumer OR patient OR public S4: S1 AND S2 AND S3 S5: S4 NOT hospital
Subject headings: Anti-bacterial agents; respiratory tract infections; health knowledge, attitudes, practice; drug resistance, bacterial; patient education as topic.
Yield: 412 articles (Medline – 202; CINAHL – 17; PsycINFO – 8; SCOPUS – 185) After screening of titles/abstracts: 73 articles (Medline – 35; CINAHL – 5; PsycINFO – 3; SCOPUS – 30) Total after duplicates removed: **70 articles**

Appendix D: Interview Guide — General Practitioners

Semi-structured Interview: Indicative Questions

Purpose of interview:	To capture participant views on (1) what influences antibiotic prescribing and usage, and (2) the notion of antibiotic resistance as a problem that requires individuals to play a mitigating role.
Participants:	General Practitioners

Opening the interview	Thank them for meeting with me + start to build rapport. Introduce self and the research. Confirm available time e.g. "the interview will take about 10 to 15 minutes, is that still OK with your schedule?" Ask if any questions re: participant info. Obtain signed Consent Form from participant. Frame the intent of the interview in one sentence and set the context: "Interviewing GPs to understand your views on antibiotic prescribing in the context of your clinical practice. So there are no right or wrong answers. I simply want to understand the reality of your clinical practice. But if there's a question that you'd rather not talk about, that's OK, just let me know and we can skip over it. Otherwise, if you're happy to chat, just go ahead. Does that sound OK?" Confirm re: OK with audio recording. Start audio recording.
Demographic questions	Let's start with getting to know a bit about you and your practice … Could you tell me where you've gained your training and where you've practiced? WHERE QUAL GAINED (where you gained your qualifications to practice) YEARS OF PRACTICE (and about how many years have you been a GP for?) WHERE PRACTICED (could you give me an idea of where you've practiced?) WORKING ARRANGEMENTS (how many hours of clinical time do you do per week? CLINIC STRUCTURE & PROFESSIONAL ARRANGEMENTS (What structure does this clinic run on? Corporate/ partnership? What is your professional arrangement with this clinic (owner/ partner/ contracted/ employed) Do you mentor or supervise medical students or trainees?

Set 1 To understand what GPs consider when prescribing antibiotics (adult patients)	In the context of respiratory tract infections … What factors do you consider when thinking through whether the patient needs antibiotics or not? (personal clinical approach) What would you do if the need for antibiotics is uncertain? In a situation where you don't think an antibiotic is needed, what would you do if the patient says they want/expect antibiotics? More generally, what are some challenges you've come across regarding antibiotic prescribing?
Set 2 To explore the issue of antibiotic resistance	Changing gears a little, to talk about antibiotic resistance… When you hear the words 'antibiotic resistance' what comes to mind? In your view, is antibiotic resistance an issue that GPs think about when making a prescribing decision? In your view, is antibiotic resistance an issue that would affect the community at large right now? Or how far away into the future? What do you think GPs can do to reduce antibiotic resistance? Thinking about your own practice, what strategies have you used? Taking off your hat as a GP for a moment: As a private individual, what is your personal approach to antibiotic use? To what extent do you think antibiotic resistance could affect you personally – your own health or your family's health? Is there anything else you'd like to say or add?
Set 3 (if time allows) Views on proposed PBS changes	The advisory committee to the PBS is considering a couple of strategies to reduce antibiotic usage. One is to remove oral antibiotic repeats from the PBS, essentially requiring the patient to come back for a review before another course can be written. The other is to reduce the period of validity for oral antibiotic prescriptions. What do you think of these ideas? Is there anything else you'd like to say or add?
Follow up questions + regular paraphrasing during interview to check meaning (member checking)	Questions to clarify e.g. Do you mean ….? What about …?
Probing questions	Tell me more about that …?

	Could you give me an example of that …? What if …?
Closing the interview and grounding the participant	Is it OK to contact you if I have further questions when I work through the recording? How would you like to be contacted? I'll be collating interview responses into a brief de-identified report, would you like a copy of that? Thank you for sharing your views with me and for your time today (+ handover interview incentive in envelope — movie vouchers) Do you know of other GP colleagues in Brisbane who would be interested to be interviewed? (obtain details) Retrieve recorder.

Appendix E: Interview Guide — Community Pharmacists

Semi-structured Interview: Indicative Questions

Purpose of interview:	To capture participant views on (1) what influences antibiotic seeking and usage (when would the pharmacist advise to seek antibiotics or refer on to GP), (2) dispensing repeat prescriptions of antibiotics that is beyond a reasonable period for continuation of treatment, and (3) the notion of antibiotic resistance as a problem that requires individuals to play a mitigating role.
Participants:	Community Pharmacists

Opening the interview	Thank them for meeting with me + start to build rapport. Introduce self and the research. Frame the intent of the interview in one sentence: Interviewing CPs to understand your views on antibiotic usage in the community. Confirm available time e.g. "the interview will take about half an hour, is that still OK with your schedule?" Ask if any questions re: participant info. Obtain signed Consent Form from participant. Confirm re: OK with audio recording. Start audio recording.
Demographic questions	Let's start with getting to know a bit about you and your practice … Could you tell me a bit about your pharmacy training and where you've practiced? WHERE QUAL GAINED (Where you gained your qualifications to practice?) YEARS OF PRACTICE (And about how many years have you been a community pharmacist for?) WHERE PRACTICED (Could you give me an idea of where you've practiced?) P/TIME, F/TIME (Ask about working arrangements: full time, part time, sessional?) Do you mentor or supervise Pharmacy students or interns?
Set 1	Now I'm going to ask a few questions about how you normally practice as a pharmacist. There are no right or wrong answers, I simply want to understand the reality of your clinical practice. If there's a question that you don't want to talk

	about – that's OK, just let me know. Otherwise, if you are OK to talk about it then just go ahead … In the context of managing the common cold or cough, could you tell me what self-management strategies you would normally advise a consumer to use? What would lead you to refer the consumer to a GP? In the context of a respiratory tract infection, what would be a situation where you would specifically advise the consumer to see a GP for antibiotics? Does your service include providing a medical certificate? How often does it get used, by say consumers with the common cold or cough?
Set 2	Let's talk about access to antibiotics… In your view, how do consumers decide whether to seek antibiotics? Many medicines to treat minor ailments are available over the counter. Have you ever been asked for an antibiotic over the counter? What is your view of having repeats on antibiotic prescriptions? The next few questions are again about how you normally practice as a pharmacist. There are no right or wrong answers, I simply want to understand the reality of your clinical practice. As before, if there's a question that you'd rather not talk about – that's OK, just let me know. Otherwise, if you are OK to talk about it then just go ahead … What would you normally do, if a consumer presented a repeat prescription for an antibiotic that is legally valid but beyond what would be a reasonable period for continuation of treatment? What kinds of questions would you ask the consumer, if you thought the repeat script was presented beyond a reasonable period for continuation of treatment? What would you consider a reasonable period (between original and repeat presentation of an antibiotic script?) (Optional follow up: .. if consumer was known to the pharmacist, vs if unknown to the pharmacist) Changing gears a little… What information or advice do you normally give a patient, when dispensing antibiotics?

	Do people ever bring leftover antibiotics back to the pharmacy for destruction? What do you tell people to do with any leftover antibiotics? (prompt: if pack size is larger than course prescribed)
Set 3	I'd like to move on to talk about another aspect of antibiotic use… When you hear the words 'antibiotic resistance' what comes to mind? Can you tell me in your own words how you would explain antibiotic resistance to a consumer? In your view, is antibiotic resistance an issue that would affect the community at large? Right now? OR how far away into the future? What do you think community pharmacists can do to reduce antibiotic resistance? Thinking about your own practice as a pharmacist, what strategies have you used? Taking off your hat as a community pharmacist… To what extent do you think antibiotic resistance affects you personally – your own health or your family's health? Can you think of things that you can do as a private individual that can help reduce antibiotic resistance? Is there anything else you'd like to add?
Follow up questions + regular paraphrasing during interview to check meaning (member checking)	Questions to clarify e.g. Do you mean ….? What about …?
Probing questions	Tell me more about that …? Could you give me an example of that …? What if …?
Closing the interview and grounding the participant	Is it OK to contact you if I have further questions when I work through the recording? How would you like to be contacted? I'll be collating interview responses into a brief de-identified report, which would include other interviews in addition to this one. Would you like a copy of that? Thank you for sharing your views with me and for your time today (+ handover interview incentive in envelope — movie vouchers). Do you know of other community pharmacist colleagues in Brisbane who would be interested to be interviewed? (Obtain details) Retrieve recorder.

Appendix F: Interview Guide — Consumers

Semi-structured Interview: Indicative Questions

Purpose of interview:	To capture participant views on (1) what influences antibiotic seeking and usage, and (2) the notion of antibiotic resistance as a problem that requires individuals to play a mitigating role.
Participants:	Consumers

Opening the interview	Thank them for meeting with me + start to build rapport. Introduce self and the research. Frame the intent of the interview in one sentence: Interviewing general public to understand your views on antibiotic usage in the community. Confirm available time e.g. "the interview will take between half an hour to 45 minutes, is that still OK with your schedule?" Ask if any questions re: participant info. Obtain signed Consent Form from participant. Confirm re: OK with audio recording. Start audio recording.
Demographics	Let's start with getting to know a bit about you … Could you tell me a bit about yourself? (Have you always lived in Brisbane?) (Where you're from, how long you've lived in Australia?) Do you have a regular GP that you go to? Do you have a regular pharmacy that you use?
Set 1	Now I'm going to ask a few questions about what you would normally do about a common cold or cough. There are no right or wrong answers, I simply want to understand your views. If there's a question that you don't want to talk about – that's OK, just let me know. Otherwise, if you are OK to talk about it then just go ahead … When you get a common cold or cough, could you tell me what you would normally do to manage it?

	(Would you consult your/a pharmacist?) (Could you tell me more about that? … what does the pharmacist/pharmacy staff do or advise?) (Does your pharmacist offer a medical certificate service?)
DECISION → GP	What would lead you to decide to see a GP? (OR At what point would you decide to see a GP?) (could be other people (who?) who advises them to see a GP?)
EXPECTATIONS	If you <u>did go</u> to the GP, what would be your expectations for that visit?
DURING CONSULT	Just changing our conversation a little … So, in your case … how would you feel or respond, if the GP said you didn't need an antibiotic to get over the cough or cold? (Follow up question – optional) How would you feel or respond, if the GP suggested some simple things you could do to manage the symptoms instead (without prescribing the antibiotic)? How would you feel or respond, if the GP seemed unsure of whether you needed an antibiotic, but gave you a prescription for it anyway? (Would you fill the prescription?)
RISKS	How much does the risk of <u>complications</u> from a cold or cough worry you? (prompt if needed e.g. getting sicker) How much does the risk of side effects of antibiotics worry you? (prompt if needed e.g. diarrhoea, thrush, nausea)
Set 2	Let's talk about taking antibiotics …
MEDS TAKING BEHAVIOUR	Have you taken antibiotics before for a cough or a cold (if no, ask about for other illnesses)?
INFO RECEIVED	What information or advice did the GP give you about the antibiotics? (depending on the reply - whether for a cold/cough, or other illness) (Did they tell you how long to take the antibiotics for? Whether to fill it? Whether to get the repeats?) What information or advice did the <u>pharmacist</u> give you about the antibiotics?
ADHERENCE	

PROGRESSION OF ILLNESS ABOUT REPEATS	Many people find it hard to remember to take antibiotics as prescribed. What is your own experience of this? (Optional follow up: About how often would you stop taking it when you feel better)? Thinking back to a time when you took antibiotics, say you've taken one course, and still did not feel well … what did you do then? (See another GP? See own GP again? Fill the repeat? …) GPs often prescribe antibiotics with repeats (so you can get another course of antibiotics). What is your view on repeat prescriptions? What do you normally do with these repeat prescriptions? (Do you fill them? When do you fill them?) What was your experience at the pharmacy when you'd presented a repeat prescription for an antibiotic, to be filled? (Filled, queried by pharmacist?) .. and what do you do with leftover antibiotics? About how many times a year would you say you'd be taking antibiotics? (for anything)
Set 3 ANTIBIOTIC RESISTANCE WHAT PEOPLE SEE/HEAR COMMUNITY & TIME	Now I'd like to move on to talk about another aspect of antibiotic use… Again, I'm interested in your take on things, there are no right or wrong answers. If there's a question that you don't want to talk about – that's OK, just let me know. Otherwise, if you are OK to talk about it then just go ahead … When you hear the words 'antibiotic resistance' what comes to mind? Or Can you tell me in your own words what antibiotic resistance is? (prepare script to explain ABR if they have never heard of it) (or if a GP or pharmacist has explained in the past, ask what they remember of the explanation) Antibiotics and Antibiotic resistance have sometimes been mentioned in the news, TV, magazines or social media like Facebook or Twitter. Do you remember seeing or hearing this mentioned? Can you tell me more about what you remember seeing/ hearing? (Which magazine/social media site; what was it about) [Could be campaign material, or sensational news] What did you think about it? (the article/ piece/ post)

	In your view, is antibiotic resistance an issue that would affect the community at large? Right now? OR how far away into the future? What do you think can be done to manage antibiotic resistance? To what extent do you think antibiotic resistance affects you personally – your own health or your family's health? Can you think of things that you can do as a private individual that can help reduce antibiotic resistance? Before we finish, is there anything else you'd like to say or add?
Follow up questions + regular paraphrasing during interview to check meaning (member checking)	Questions to clarify e.g. Do you mean ….? What about …?
Probing questions	Tell me more about that …? Could you give me an example of that …? What if …?
Closing the interview and grounding the participant	Just to wrap up, do you mind if I ask how old you are? … and do you have any long term or chronic illnesses? …(ask about highest level of education, if not disclosed by now) Is it OK to contact you if I have further questions when I work through the recording? How would you like to be contacted? I'll be collating interview responses into a brief de-identified report, would you like a copy of that? Thank you for sharing your views with me and for your time today (+ handover interview incentive — movie vouchers) Retrieve recorder.

Appendix G: Standard Procedure for Booking Interviews

1. Ring (preferable)/email participant who expressed interest to be interviewed: "Thank you for expressing interest in participating." [How did they hear about this study?]

2. Agree on day and time for interview:
   - "Interview will take between 15-30 minutes depending on the conversation"
   - "Interview will be audio-recorded, are you OK with that?"

3. Venue address:
   - "I can travel to your clinic/workplace, or would you like to come to QUT Kelvin Grove campus?"
   - Obtain name & address of clinic/workplace

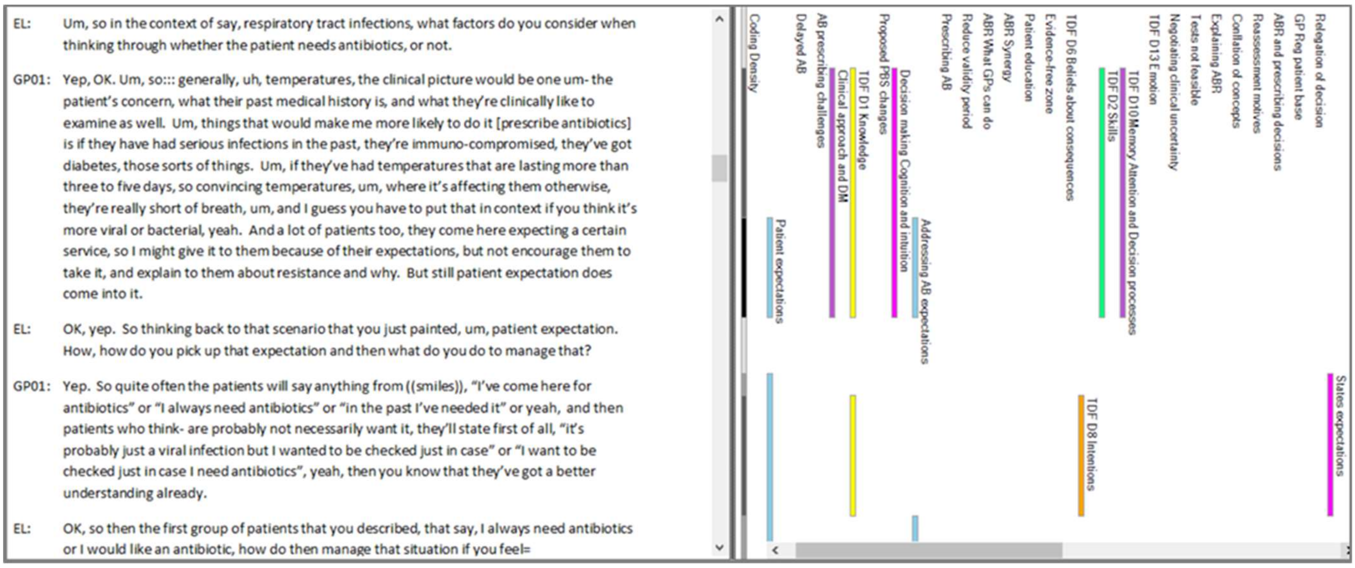
4. "I will send a confirmation email", obtain/confirm their contact details:
   - Name (check how to spell their name)
   - Email
   - Phone (just in case need to contact on the day)

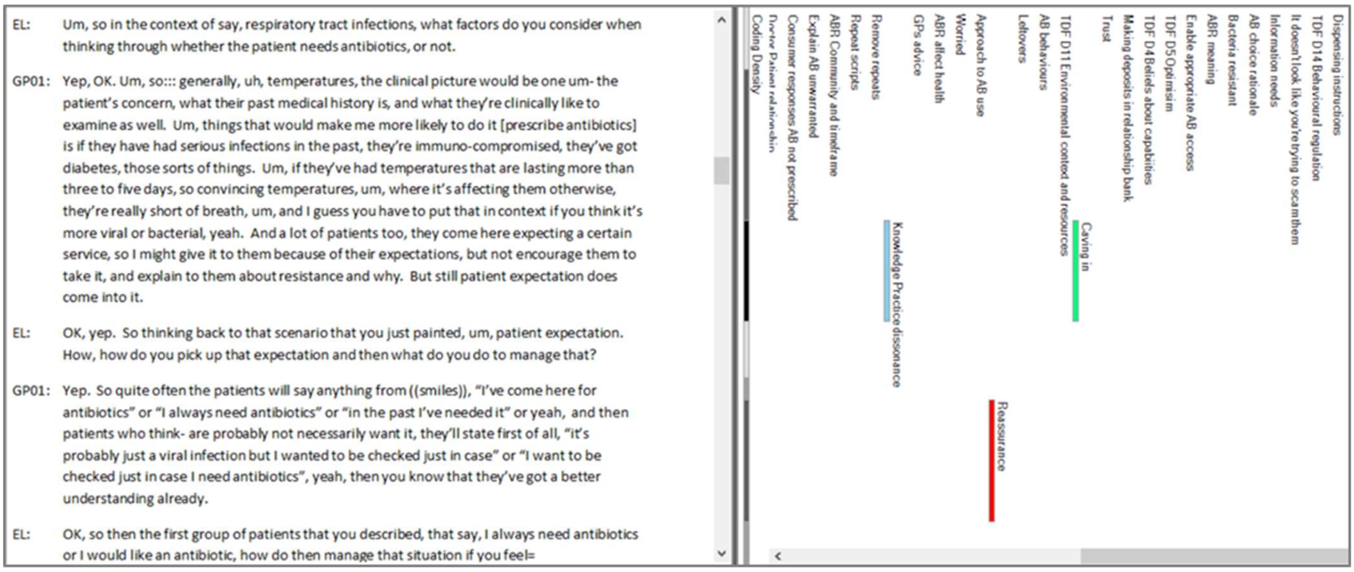
5. Email Participant Info Sheet and Consent Form: Mention in email that the interview will be audio recorded. Reminder to complete consent form and email back, or return on the day.

6. Include maps and transport options in email if participant is coming to QUT KG Campus.

Appendix H: Example of Coded Transcript Excerpt

The two screenshots below show the same excerpt from a GP interview transcript in NVIVO® (left panel) with all its corresponding coding stripes displayed (right panel) for deductive and inductive codes.





Appendix I: Interim Report for Interview Participants

Summary of findings (Interim Report) for Interview Participants

Prepared by: Elaine Lum, PhD Scholar, Queensland University of Technology, Australia

This summary has been prepared for the General Practitioners, Community Pharmacists and Consumers who have generously given their time to be interviewed between April – October 2015 as part of a PhD project entitled "Making decisions about antibiotic use in the Australian primary healthcare sector" (QUT Ethics approval number: 1500000190).

Please do not circulate further, as detailed analysis of the data and the project is still ongoing. Thank you for your consideration.

Main Findings

A total of 54 semi-structured interviews were conducted in the Brisbane and Greater Brisbane area comprising 10 General Practitioners, 12 Community Pharmacists, and 32 Consumers. Selected findings are outlined below.

General Practitioners (GPs)

GPs reported using a variety of mental algorithms when deciding whether or not to prescribe antibiotics to a patient presenting with a respiratory tract infection. Considerations include (a) clinical need, (b) likelihood of bacterial infection, (c) medical history and co-morbidities of the patient, and (d) potential risks to the patient's health (if the GP gets it wrong). These were balanced with whether the patient was able to return for a second assessment if their condition worsened. GPs were more likely to consider prescribing a delayed course of antibiotics[42], if the patient was unable to return for reassessment, in the event their condition was not better in a few days or if it worsened.

Experienced GPs tended to be able to successfully steer patients away from antibiotics where antibiotics are clinically unwarranted. They do this in a way that maintains good doctor-patient rapport, using an approach developed over many years of practice in dealing with patient demands and/or expectations for antibiotics. Some early career GPs reported that in frustration they sometimes gave in to patient demands for antibiotics as a way to end a stressful encounter. Overall, GPs noted that patients who insisted on antibiotics are in the minority and that more patients seemed to be aware of not using antibiotics unless necessary.

GPs were aware of antibiotic resistance becoming a problem in the community. They acknowledged that GPs' antibiotic prescribing patterns contributed in part to antibiotic resistance and were concerned with having to deal with antibiotic resistant infections during their lifetime of clinical practice.

Community Pharmacists

Community Pharmacists reported providing general advice and recommendations for over-the-counter products for self-management of upper respiratory tract symptoms, to patients. Most Pharmacists would fill an original antibiotic prescription, due to (a) trusting and/or deferring to the clinical judgment of the GP, (b) a lack of clinical information on which to query the need for antibiotics, (c) the current funding model for pharmacies being largely based on the dispensing of prescriptions, and (d) the lack of financial incentive to act as gatekeepers of antibiotic use in the primary healthcare setting. In contrast, when presented with a repeat prescription[43] for an antibiotic, most would question the patient if it was beyond a reasonable period of time for treatment of the initial infection.

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[42] A delayed course of antibiotics (also known as a delayed antibiotic prescription), is an antibiotic prescription given to a patient with instructions to use it only if their symptoms worsen or do not improve in a few days. The delayed prescription is usually given to the patient during the initial consultation, although some GPs prefer to leave the prescription with clinic reception for the patient to collect at a later date.

[43] Repeat prescriptions enable a regular re-supply of the prescribed medicine without having to see the GP each time. The number of repeats is authorised by the GP on the original prescription. The

Community Pharmacists working in less affluent suburbs were concerned about the following trends: (a) that patients would often seek antibiotics from GPs as these were cheaper than purchasing self-management products for the common cold or cough, (b) children were being prescribed multiple courses of antibiotics, and (c) inadequate doses were being prescribed, particularly for children.

Many Community Pharmacists felt disempowered in their ability to act to reduce inappropriate use of antibiotics, as they are not involved at the point of care where the decision is made to use antibiotics.

Consumers

Dominant themes for Consumer attitudes and behaviour regarding antibiotics were: (a) avoidance of antibiotic use unless clinically warranted, (b) antibiotics were useful but "weakened the body", and (c) the use of complementary medicines as adjuncts to antibiotics or to strengthen the immune system.

Key information needs of Consumers were: (a) unambiguous instructions from GPs when prescribed antibiotics, so that inappropriate medicine-taking behaviour can be avoided, (b) rationale for antibiotic selection, and (c) treatment duration.

Consumer understanding of antibiotic resistance was conceptualised in three ways: as a property of the body (body becomes resistant to antibiotics), the medication (antibiotic no longer effective), and the bacteria (bacteria is resistant). Antibiotic resistance was perceived as an issue that would only affect the wider community in the future, although most recognised that it is a current challenge for hospitals. Personal good health and/or avoidance of antibiotics were perceived as insurance against being adversely affected by antibiotic resistance.

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Pharmaceutical Benefits Scheme (PBS) Schedule lists medicines and the maximum number of repeats subsidised under the scheme. Time intervals between supplies must meet PBS criteria.

What's next?

A structured survey based on these findings will be developed to investigate how Consumers and GPs weigh up factors influencing antibiotic use.

Outcomes from the project overall (interviews and surveys) will be used to (a) inform Australian public health campaigns promoting conservation of antibiotics and (b) inform clinical resources for general practitioners and community pharmacists that support their roles as stewards of antibiotic use in the community.

The outcomes of this research are anticipated by the Federal Department of Health for inclusion in Australia's National Antimicrobial Strategy 2015 – 2019 Implementation Plan.

Appendix J: Template for Structured Reflections Post Interview

Participant code:

Day and date of interview:

Time taken for interview:

My impressions of how it went overall:

What I could do better or differently:

What were the main issues/themes that struck me in this interview? (Which research variables in the initial framework did the participant bear on most centrally?)

Anything else that struck me as salient, interesting, illuminating or important in this interview? (What new assertions, propositions, hypotheses, speculations or hunches about the field were suggested by the participant?)

Any questions that need following up/ clarification with this participant?

What new (or remaining) target questions do I have in considering the next interview? (Where should I focus on for the next interview and what kinds of information should be sought?)

Appendix K: Adapted Jeffersonian Transcription Notation

Symbol	Usage
[text]	Indicates text inserted by researcher.
=	Indicates the break and subsequent continuation of a single uninterrupted utterance.
(number of seconds) e.g. (2)	Indicates the time in seconds, of a pause in speech.
(.)	Indicates a micropause of less than a second in speech.
-	Indicates an abrupt halt or self-interruption in utterance.
____	Underlined text indicates the speaker is emphasizing or stressing the speech/word.
:::	Indicates prolongation of an utterance.
(text)	Speech which is unclear or in doubt in the transcript.
((text))	Annotation of non-verbal activity.

Appendix L: Discrete Choice Experiment — General Practitioners

This is the final version of the DCE survey for GPs, showing both Block 1 and Block 2 choice sets in Section B, before survey logic (described in Chapter 3, Section 3.5.4) and HTML coding for the online survey platform — Key Survey® (Version 8.7.5; (2016)). Participants were presented with the same Section A and C of the survey, and randomised by the online survey platform to either Block 1 or Block 2 choice sets for Section B. Choice sets 3 and 18 in each block are duplicates for the purpose of intra-participant consistency checks.

Screening questions (prior to entering the survey)

Are you a GP or GP Registrar practising in Australia?

☐Yes

☐No

Do you <u>primarily</u> work for an After-hours medical deputising service?

☐Yes

☐No

SECTION A: About you

To start with, we would like to know a little about you.

A1. Are you?

☐Female

☐Male

A2. Are you a?

☐GP

☐GP Registrar

A3. In which country did you train as a GP?

☐Australia

☐Elsewhere – Please tell us:

A4. How long have you practiced as a GP, including as a GP Registrar? (years)

A5. How long have you practiced <u>in Australia</u>, as a GP including as a GP Registrar? (years)

A6. Which state/territory are you currently practising in?

☐NSW

☐VIC

☐QLD

☐WA

☐SA

☐TAS

☐ACT

☐NT

A7. What best describes where you practise?

☐Inner city/ Suburban

☐Provincial/ Regional

☐Rural/ Remote

A8. What best describes your professional working arrangement with the practice?

☐Contractor GP

☐Employed GP

☐Partner

☐Sole owner

A9. What best describes the ownership structure of your place of practice?

☐Sole GP owned clinic

☐Multi-GP owned clinic

☐Corporate

☐Government/Health service owned clinic

☐Other (please tell us) ___________________________

A10. What best describes how patients are billed at your place of practice?

☐Bulk-billing clinic

☐Bulk-billing available for selected patients (mixed-billing clinic)

☐Private billing

A11. In general, how would you describe your **antibiotic prescribing patterns**?

☐Prescribe more than other GPs

☐About the same as other GPs

☐Prescribe less than other GPs

INSTRUCTIONS

Before we get into the main survey, here's a brief explanation of what to expect.

The survey questions are based on this scenario:

SCENARIO

An adult patient presents with a runny nose, sneezing, a sore throat and dry cough. They have managed these symptoms in their usual way, which may include a combination of rest, home remedies, vitamin supplements, commercial immune boosters, and cold/flu/cough products. As they are still feeling unwell, they decided to consult a doctor (you).

The patient has no significant past medical history. On examination, their temperature (tympanic) is 37.8°C, throat appears slightly red and there is no exudate or cervical lymphadenopathy. Chest is clear.

You will be presented with 19 questions. Each question contains a pair of situations, A and B. Situation A is different from Situation B in these ways:

1. **Duratio**n of symptoms – the patient has had these symptoms for different lengths of time. In the situations presented, this will be shown as **1 week, 2 weeks** or **3 weeks**.
2. **Life event** – the patient has an important event or a deadline coming up. This will be shown as either **yes**, they do or **no**, they don't.
3. **Reassessment** – the patient is able to return for reassessment. This will be shown as either **yes**, they can return for reassessment or **no**, they can't.
4. **Familiarity with patient.** One of two possibilities will be shown in each situation: (a) the patient is a **regular patient** (you have attended to them before, and you have a good doctor-patient relationship with them) or (b) this is a **new patient**.
5. **Patient's expectations** – what the patient says. One of three possibilities will be shown in each situation: the patient (a) **says they want antibiotics**, (b) **says they don't want antibiotics unless necessary**, or (c) **says they want reassurance**.

To get you familiar with the survey, this is what a typical question looks like:

Based on the scenario, in which situation (A or B) would you be **more likely** to prescribe an antibiotic for the patient?

	Situation A	Situation B
Duration: Patient has had symptoms for	2 weeks	3 weeks
Life event: Patient has an important event or a deadline coming up	Yes	No
Reassessment: Patient is able to return for reassessment	Yes	No
Familiarity with patient	New patient	Regular patient
Patient's expectations	Says they want antibiotics	Says they don't want antibiotics unless necessary
I would be **more likely** to prescribe an antibiotic in ... (Please select one)	Situation A ☐	Situation B ☐

And this antibiotic prescription would be?

☐For immediate use

☐A delayed prescription

We understand that in practice, you may or may not prescribe an antibiotic at all in any of these situations (a question at the end of the survey asks you about this). However, to tease out the complexities of prescribing decisions, we want to understand how doctors trade-off between factors contained in these situations. Hence, the questions do not offer the 'I would not prescribe' option, deliberately.

Bear in mind that often the combinations within Situation A or Situation B may not be your ideal combination. For each question, as you weigh up the combination in Situation A against those in Situation B, select as a whole the combination (i.e. Situation A or Situation B) in which you would be **more likely** to prescribe an antibiotic for the patient. Please also indicate whether the prescription is for immediate use or a delayed prescription, to be used only if the patient is worse or no better in 2 days. **There are no right or wrong answers.** We are simply interested in your choice between Situation A and Situation B, and the nature of the prescription (immediate treatment or delayed prescription).

Was that explanation clear?

☐Yes

☐No (You can go back to read the explanation again by clicking the back button)

SECTION B: Main survey

This is now the start of the main survey.

We understand that in practice, you may or may not prescribe an antibiotic at all in any of these situations (a question at the end of the survey asks you about this). However, to tease out the complexities of prescribing decisions, we want to understand how doctors trade-off between factors contained in these situations. Hence, the questions do not offer the 'I would not prescribe' option, deliberately.

Bear in mind that often the combinations within Situation A or Situation B may not be your ideal combination. For each question, as you weigh up the combination in Situation A against those in Situation B, select as a whole the combination (i.e. Situation A or Situation B) in which you would be **more likely** to prescribe an antibiotic for the patient.

Please also indicate whether the prescription is for immediate use or a delayed prescription, to be used only if the patient is worse or no better in 2 days.

There are no right or wrong answers. We are simply interested in your choice between Situation A and Situation B, and the nature of the prescription (immediate treatment or delayed prescription).

Block 1

B1Q1. Based on the <u>scenario</u>, in which situation (A or B) would you be **more likely to prescribe an antibiotic** for the patient?

	Situation A	Situation B
Duration: Patient has had symptoms for	2 weeks	3 weeks
Life event: Patient has an important event or a deadline coming up	Yes	No
Reassessment: Patient is able to return for reassessment	Yes	No
Familiarity with patient	New patient	Regular patient
Patient's expectations	Says they want antibiotics	Says they don't want antibiotics unless necessary
I would be **more likely to prescribe an antibiotic** in … (Please select one)	Situation A ☐	Situation B ☐

And this antibiotic prescription would be?

☐For immediate use

☐A delayed prescription

B1Q2. Based on the <u>scenario</u>, in which situation (A or B) would you be **more likely to prescribe an antibiotic** for the patient?

	Situation A	Situation B
Duration: Patient has had symptoms for	3 weeks	1 week
Life event: Patient has an important event or a deadline coming up	No	Yes
Reassessment: Patient is able to return for reassessment	No	Yes
Familiarity with patient	Regular patient	New patient
Patient's expectations	Says they don't want antibiotics unless necessary	Says they want reassurance
I would be **more likely to prescribe an antibiotic** in … (Please select one)	Situation A ☐	Situation B ☐

And this antibiotic prescription would be?

☐For immediate use

☐A delayed prescription

B1Q3. Based on the scenario, in which situation (A or B) would you be **more likely to prescribe an antibiotic** for the patient?

	Situation A	Situation B
Duration: Patient has had symptoms for	3 weeks	1 week
Life event: Patient has an important event or a deadline coming up	Yes	No
Reassessment: Patient is able to return for reassessment	No	Yes
Familiarity with patient	Regular patient	New patient
Patient's expectations	Says they want reassurance	Says they want antibiotics
I would be **more likely to prescribe an antibiotic** in … (Please select one)	Situation A ☐	Situation B ☐

And this antibiotic prescription would be?

☐For immediate use

☐A delayed prescription

B1Q4. Based on the scenario, in which situation (A or B) would you be **more likely to prescribe an antibiotic** for the patient?

	Situation A	Situation B
Duration: Patient has had symptoms for	2 weeks	3 weeks
Life event: Patient has an important event or a deadline coming up	No	Yes
Reassessment: Patient is able to return for reassessment	No	Yes
Familiarity with patient	New patient	Regular patient
Patient's expectations	Says they want reassurance	Says they want antibiotics
I would be **more likely to prescribe an antibiotic** in … (Please select one)	Situation A ☐	Situation B ☐

And this antibiotic prescription would be?

☐For immediate use

☐A delayed prescription

B1Q5. Based on the scenario, in which situation (A or B) would you be **more likely to prescribe an antibiotic** for the patient?

	Situation A	Situation B
Duration: Patient has had symptoms for	1 week	2 weeks
Life event: Patient has an important event or a deadline coming up	Yes	No
Reassessment: Patient is able to return for reassessment	Yes	No
Familiarity with patient	Regular patient	New patient
Patient's expectations	Says they want reassurance	Says they want antibiotics
I would be **more likely to prescribe an antibiotic** in … (Please select one)	Situation A ☐	Situation B ☐

And this antibiotic prescription would be?

☐For immediate use

☐A delayed prescription

B1Q6. Based on the scenario, in which situation (A or B) would you be **more likely to prescribe an antibiotic** for the patient?

	Situation A	Situation B
Duration: Patient has had symptoms for	1 week	2 weeks
Life event: Patient has an important event or a deadline coming up	No	Yes
Reassessment: Patient is able to return for reassessment	Yes	No
Familiarity with patient	New patient	Regular patient
Patient's expectations	Says they want antibiotics	Says they don't want antibiotics unless necessary
I would be **more likely to prescribe an antibiotic** in … (Please select one)	Situation A ☐	Situation B ☐

And this antibiotic prescription would be?

☐For immediate use

☐A delayed prescription

B1Q7. Based on the scenario, in which situation (A or B) would you be **more likely to prescribe an antibiotic** for the patient?

	Situation A	**Situation B**
Duration: Patient has had symptoms for	2 weeks	3 weeks
Life event: Patient has an important event or a deadline coming up	No	Yes
Reassessment: Patient is able to return for reassessment	No	Yes
Familiarity with patient	Regular patient	New patient
Patient's expectations	Says they want antibiotics	Says they don't want antibiotics unless necessary
I would be **more likely to prescribe an antibiotic** in … (Please select one)	Situation A ☐	Situation B ☐

And this antibiotic prescription would be?

☐For immediate use

☐A delayed prescription

B1Q8. Based on the scenario, in which situation (A or B) would you be **more likely to prescribe an antibiotic** for the patient?

	Situation A	**Situation B**
Duration: Patient has had symptoms for	3 weeks	1 week
Life event: Patient has an important event or a deadline coming up	No	Yes
Reassessment: Patient is able to return for reassessment	Yes	No
Familiarity with patient	Regular patient	New patient
Patient's expectations	Says they don't want antibiotics unless necessary	Says they want reassurance
I would be **more likely to prescribe an antibiotic** in … (Please select one)	Situation A ☐	Situation B ☐

And this antibiotic prescription would be?

☐For immediate use

☐A delayed prescription

B1Q9. Based on the scenario, in which situation (A or B) would you be **more likely to prescribe an antibiotic** for the patient?

	Situation A	Situation B
Duration: Patient has had symptoms for	3 weeks	1 week
Life event: Patient has an important event or a deadline coming up	Yes	No
Reassessment: Patient is able to return for reassessment	No	Yes
Familiarity with patient	New patient	Regular patient
Patient's expectations	Says they want reassurance	Says they want antibiotics
I would be **more likely to prescribe an antibiotic** in … (Please select one)	Situation A ☐	Situation B ☐

And this antibiotic prescription would be?

☐For immediate use

☐A delayed prescription

B1Q10. Based on the scenario, in which situation (A or B) would you be **more likely to prescribe an antibiotic** for the patient?

	Situation A	Situation B
Duration: Patient has had symptoms for	1 week	2 weeks
Life event: Patient has an important event or a deadline coming up	No	Yes
Reassessment: Patient is able to return for reassessment	No	Yes
Familiarity with patient	New patient	Regular patient
Patient's expectations	Says they don't want antibiotics unless necessary	Says they want reassurance
I would be **more likely to prescribe an antibiotic** in … (Please select one)	Situation A ☐	Situation B ☐

And this antibiotic prescription would be?

☐For immediate use

☐A delayed prescription

B1Q11. Based on the scenario, in which situation (A or B) would you be **more likely to prescribe an antibiotic** for the patient?

	Situation A	Situation B
Duration: Patient has had symptoms for	3 weeks	1 week
Life event: Patient has an important event or a deadline coming up	Yes	No
Reassessment: Patient is able to return for reassessment	Yes	No
Familiarity with patient	New patient	Regular patient
Patient's expectations	Says they don't want antibiotics unless necessary	Says they want reassurance
I would be **more likely to prescribe an antibiotic** in … (Please select one)	Situation A ☐	Situation B ☐

And this antibiotic prescription would be?

☐For immediate use

☐A delayed prescription

B1Q12. Based on the scenario, in which situation (A or B) would you be **more likely to prescribe an antibiotic** for the patient?

	Situation A	Situation B
Duration: Patient has had symptoms for	1 week	2 weeks
Life event: Patient has an important event or a deadline coming up	No	Yes
Reassessment: Patient is able to return for reassessment	Yes	No
Familiarity with patient	Regular patient	New patient
Patient's expectations	Says they want reassurance	Says they want antibiotics
I would be **more likely to prescribe an antibiotic** in … (Please select one)	Situation A ☐	Situation B ☐

And this antibiotic prescription would be?

☐For immediate use

☐A delayed prescription

B1Q13.Based on the scenario, in which situation (A or B) would you be **more likely to prescribe an antibiotic** for the patient?

	Situation A	Situation B
Duration: Patient has had symptoms for	2 weeks	3 weeks
Life event: Patient has an important event or a deadline coming up	Yes	No
Reassessment: Patient is able to return for reassessment	Yes	No
Familiarity with patient	New patient	Regular patient
Patient's expectations	Says they want reassurance	Says they want antibiotics
I would be **more likely to prescribe an antibiotic** in … (Please select one)	Situation A ☐	Situation B ☐

And this antibiotic prescription would be?

☐For immediate use

☐A delayed prescription

B1Q14. Based on the scenario, in which situation (A or B) would you be **more likely to prescribe an antibiotic** for the patient?

	Situation A	Situation B
Duration: Patient has had symptoms for	2 weeks	3 weeks
Life event: Patient has an important event or a deadline coming up	Yes	No
Reassessment: Patient is able to return for reassessment	No	Yes
Familiarity with patient	Regular patient	New patient
Patient's expectations	Says they don't want antibiotics unless necessary	Says they want reassurance
I would be **more likely to prescribe an antibiotic** in … (Please select one)	Situation A ☐	Situation B ☐

And this antibiotic prescription would be?

☐For immediate use

☐A delayed prescription

B1Q15. Based on the scenario, in which situation (A or B) would you be **more likely to prescribe an antibiotic** for the patient?

	Situation A	**Situation B**
Duration: Patient has had symptoms for	1 week	2 weeks
Life event: Patient has an important event or a deadline coming up	Yes	No
Reassessment: Patient is able to return for reassessment	No	Yes
Familiarity with patient	New patient	Regular patient
Patient's expectations	Says they want antibiotics	Says they don't want antibiotics unless necessary
I would be **more likely to prescribe an antibiotic** in … (Please select one)	Situation A ☐	Situation B ☐

And this antibiotic prescription would be?

☐For immediate use

☐A delayed prescription

B1Q16. Based on the scenario, in which situation (A or B) would you be **more likely to prescribe an antibiotic** for the patient?

	Situation A	**Situation B**
Duration: Patient has had symptoms for	2 weeks	3 weeks
Life event: Patient has an important event or a deadline coming up	No	Yes
Reassessment: Patient is able to return for reassessment	No	Yes
Familiarity with patient	Regular patient	New patient
Patient's expectations	Says they don't want antibiotics unless necessary	Says they want reassurance
I would be **more likely to prescribe an antibiotic** in … (Please select one)	Situation A ☐	Situation B ☐

And this antibiotic prescription would be?

☐For immediate use

☐A delayed prescription

B1Q17. Based on the scenario, in which situation (A or B) would you be **more likely to prescribe an antibiotic** for the patient?

	Situation A	**Situation B**
Duration: Patient has had symptoms for	1 week	2 weeks
Life event: Patient has an important event or a deadline coming up	No	Yes
Reassessment: Patient is able to return for reassessment	Yes	No
Familiarity with patient	Regular patient	New patient
Patient's expectations	Says they want antibiotics	Says they don't want antibiotics unless necessary
I would be **more likely to prescribe an antibiotic** in … (Please select one)	Situation A ☐	Situation B ☐

And this antibiotic prescription would be?

☐For immediate use

☐A delayed prescription

B1Q18. Based on the scenario, in which situation (A or B) would you be **more likely to prescribe an antibiotic** for the patient?

	Situation A	**Situation B**
Duration: Patient has had symptoms for	3 weeks	1 week
Life event: Patient has an important event or a deadline coming up	Yes	No
Reassessment: Patient is able to return for reassessment	No	Yes
Familiarity with patient	Regular patient	New patient
Patient's expectations	Says they want reassurance	Says they want antibiotics
I would be **more likely to prescribe an antibiotic** in … (Please select one)	Situation A ☐	Situation B ☐

And this antibiotic prescription would be?

☐For immediate use

☐A delayed prescription

B1Q19. Based on the scenario, in which situation (A or B) would you be **more likely to prescribe an antibiotic** for the patient?

	Situation A	**Situation B**
Duration: Patient has had symptoms for	3 weeks	1 week
Life event: Patient has an important event or a deadline coming up	Yes	No
Reassessment: Patient is able to return for reassessment	Yes	No
Familiarity with patient	New patient	Regular patient
Patient's expectations	Says they want antibiotics	Says they don't want antibiotics unless necessary
I would be **more likely to prescribe an antibiotic** in … (Please select one)	Situation A ☐	Situation B ☐

And this antibiotic prescription would be?

☐For immediate use

☐A delayed prescription

Block 2

B2Q1. Based on the scenario, in which situation (A or B) would you be **more likely to prescribe an antibiotic** for the patient?

	Situation A	Situation B
Duration: Patient has had symptoms for	1 week	2 weeks
Life event: Patient has an important event or a deadline coming up	Yes	No
Reassessment: Patient is able to return for reassessment	No	Yes
Familiarity with patient	Regular patient	New patient
Patient's expectations	Says they want reassurance	Says they want antibiotics
I would be **more likely to prescribe an antibiotic** in … (Please select one)	Situation A ☐	Situation B ☐

And this antibiotic prescription would be?

☐For immediate use

☐A delayed prescription

B2Q2. Based on the scenario, in which situation (A or B) would you be **more likely to prescribe an antibiotic** for the patient?

	Situation A	Situation B
Duration: Patient has had symptoms for	2 weeks	3 weeks
Life event: Patient has an important event or a deadline coming up	Yes	No
Reassessment: Patient is able to return for reassessment	Yes	No
Familiarity with patient	Regular patient	New patient
Patient's expectations	Says they don't want antibiotics unless necessary	Says they want reassurance
I would be **more likely to prescribe an antibiotic** in … (Please select one)	Situation A ☐	Situation B ☐

And this antibiotic prescription would be?

☐For immediate use

☐A delayed prescription

B2Q3. Based on the scenario, in which situation (A or B) would you be **more likely to prescribe an antibiotic** for the patient?

	Situation A	Situation B
Duration: Patient has had symptoms for	3 weeks	1 week
Life event: Patient has an important event or a deadline coming up	Yes	No
Reassessment: Patient is able to return for reassessment	No	Yes
Familiarity with patient	Regular patient	New patient
Patient's expectations	Says they want antibiotics	Says they don't want antibiotics unless necessary
I would be **more likely to prescribe an antibiotic** in … (Please select one)	Situation A ☐	Situation B ☐

And this antibiotic prescription would be?

☐For immediate use

☐A delayed prescription

B2Q4. Based on the scenario, in which situation (A or B) would you be **more likely to prescribe an antibiotic** for the patient?

	Situation A	Situation B
Duration: Patient has had symptoms for	1 week	2 weeks
Life event: Patient has an important event or a deadline coming up	No	Yes
Reassessment: Patient is able to return for reassessment	No	Yes
Familiarity with patient	New patient	Regular patient
Patient's expectations	Says they want antibiotics	Says they don't want antibiotics unless necessary
I would be **more likely to prescribe an antibiotic** in … (Please select one)	Situation A ☐	Situation B ☐

And this antibiotic prescription would be?

☐For immediate use

☐A delayed prescription

B2Q5. Based on the scenario, in which situation (A or B) would you be **more likely to prescribe an antibiotic** for the patient?

	Situation A	**Situation B**
Duration: Patient has had symptoms for	3 weeks	1 week
Life event: Patient has an important event or a deadline coming up	No	Yes
Reassessment: Patient is able to return for reassessment	Yes	No
Familiarity with patient	New patient	Regular patient
Patient's expectations	Says they want reassurance	Says they want antibiotics
I would be **more likely to prescribe an antibiotic** in … (Please select one)	Situation A ☐	Situation B ☐

And this antibiotic prescription would be?

☐For immediate use

☐A delayed prescription

B2Q6. Based on the scenario, in which situation (A or B) would you be **more likely to prescribe an antibiotic** for the patient?

	Situation A	**Situation B**
Duration: Patient has had symptoms for	3 weeks	1 week
Life event: Patient has an important event or a deadline coming up	No	Yes
Reassessment: Patient is able to return for reassessment	No	Yes
Familiarity with patient	New patient	Regular patient
Patient's expectations	Says they don't want antibiotics unless necessary	Says they want reassurance
I would be **more likely to prescribe an antibiotic** in … (Please select one)	Situation A ☐	Situation B ☐

And this antibiotic prescription would be?

☐For immediate use

☐A delayed prescription

B2Q7. Based on the <u>scenario</u>, in which situation (A or B) would you be **more likely to prescribe an antibiotic** for the patient?

	Situation A	Situation B
Duration: Patient has had symptoms for	1 week	2 weeks
Life event: Patient has an important event or a deadline coming up	Yes	No
Reassessment: Patient is able to return for reassessment	Yes	No
Familiarity with patient	New patient	Regular patient
Patient's expectations	Says they don't want antibiotics unless necessary	Says they want reassurance
I would be **more likely to prescribe an antibiotic** in … (Please select one)	Situation A ☐	Situation B ☐

And this antibiotic prescription would be?

☐For immediate use

☐A delayed prescription

B2Q8. Based on the <u>scenario</u>, in which situation (A or B) would you be **more likely to prescribe an antibiotic** for the patient?

	Situation A	Situation B
Duration: Patient has had symptoms for	2 weeks	3 weeks
Life event: Patient has an important event or a deadline coming up	No	Yes
Reassessment: Patient is able to return for reassessment	Yes	No
Familiarity with patient	Regular patient	New patient
Patient's expectations	Says they want antibiotics	Says they don't want antibiotics unless necessary
I would be **more likely to prescribe an antibiotic** in … (Please select one)	Situation A ☐	Situation B ☐

And this antibiotic prescription would be?

☐For immediate use

☐A delayed prescription

B2Q9. Based on the scenario, in which situation (A or B) would you be **more likely to prescribe an antibiotic** for the patient?

	Situation A	**Situation B**
Duration: Patient has had symptoms for	1 week	2 weeks
Life event: Patient has an important event or a deadline coming up	Yes	No
Reassessment: Patient is able to return for reassessment	No	Yes
Familiarity with patient	Regular patient	New patient
Patient's expectations	Says they want reassurance	Says they want antibiotics
I would be **more likely to prescribe an antibiotic** in … (Please select one)	Situation A ☐	Situation B ☐

And this antibiotic prescription would be?

☐For immediate use

☐A delayed prescription

B2Q10. Based on the scenario, in which situation (A or B) would you be **more likely to prescribe an antibiotic** for the patient?

	Situation A	**Situation B**
Duration: Patient has had symptoms for	2 weeks	3 weeks
Life event: Patient has an important event or a deadline coming up	Yes	No
Reassessment: Patient is able to return for reassessment	Yes	No
Familiarity with patient	New patient	Regular patient
Patient's expectations	Says they don't want antibiotics unless necessary	Says they want reassurance
I would be **more likely to prescribe an antibiotic** in … (Please select one)	Situation A ☐	Situation B ☐

And this antibiotic prescription would be?

☐For immediate use

☐A delayed prescription

B2Q11. Based on the scenario, in which situation (A or B) would you be **more likely to prescribe an antibiotic** for the patient?

	Situation A	**Situation B**
Duration: Patient has had symptoms for	3 weeks	1 week
Life event: Patient has an important event or a deadline coming up	Yes	No
Reassessment: Patient is able to return for reassessment	Yes	No
Familiarity with patient	Regular patient	New patient
Patient's expectations	Says they want antibiotics	Says they don't want antibiotics unless necessary
I would be **more likely to prescribe an antibiotic** in … (Please select one)	Situation A ☐	Situation B ☐

And this antibiotic prescription would be?

☐For immediate use

☐A delayed prescription

B2Q12. Based on the scenario, in which situation (A or B) would you be **more likely to prescribe an antibiotic** for the patient?

	Situation A	**Situation B**
Duration: Patient has had symptoms for	2 weeks	3 weeks
Life event: Patient has an important event or a deadline coming up	No	Yes
Reassessment: Patient is able to return for reassessment	No	Yes
Familiarity with patient	New patient	Regular patient
Patient's expectations	Says they want reassurance	Says they want antibiotics
I would be **more likely to prescribe an antibiotic** in … (Please select one)	Situation A ☐	Situation B ☐

And this antibiotic prescription would be?

☐For immediate use

☐A delayed prescription

B2Q13. Based on the scenario, in which situation (A or B) would you be **more likely to prescribe an antibiotic** for the patient?

	Situation A	Situation B
Duration: Patient has had symptoms for	2 weeks	3 weeks
Life event: Patient has an important event or a deadline coming up	Yes	No
Reassessment: Patient is able to return for reassessment	No	Yes
Familiarity with patient	Regular patient	New patient
Patient's expectations	Says they want antibiotics	Says they don't want antibiotics unless necessary
I would be **more likely to prescribe an antibiotic** in … (Please select one)	Situation A ☐	Situation B ☐

And this antibiotic prescription would be?

☐For immediate use

☐A delayed prescription

B2Q14. Based on the scenario, in which situation (A or B) would you be **more likely to prescribe an antibiotic** for the patient?

	Situation A	Situation B
Duration: Patient has had symptoms for	3 weeks	1 week
Life event: Patient has an important event or a deadline coming up	No	Yes
Reassessment: Patient is able to return for reassessment	Yes	No
Familiarity with patient	Regular patient	New patient
Patient's expectations	Says they want reassurance	Says they want antibiotics
I would be **more likely to prescribe an antibiotic** in … (Please select one)	Situation A ☐	Situation B ☐

And this antibiotic prescription would be?

☐For immediate use

☐A delayed prescription

B2Q15. Based on the scenario, in which situation (A or B) would you be **more likely to prescribe an antibiotic** for the patient?

	Situation A	Situation B
Duration: Patient has had symptoms for	3 weeks	1 week
Life event: Patient has an important event or a deadline coming up	No	Yes
Reassessment: Patient is able to return for reassessment	No	Yes
Familiarity with patient	New patient	Regular patient
Patient's expectations	Says they want antibiotics	Says they don't want antibiotics unless necessary
I would be **more likely to prescribe an antibiotic** in … (Please select one)	Situation A ☐	Situation B ☐

And this antibiotic prescription would be?

☐For immediate use

☐A delayed prescription

B2Q16. Based on the scenario, in which situation (A or B) would you be **more likely to prescribe an antibiotic** for the patient?

	Situation A	Situation B
Duration: Patient has had symptoms for	1 week	2 weeks
Life event: Patient has an important event or a deadline coming up	No	Yes
Reassessment: Patient is able to return for reassessment	Yes	No
Familiarity with patient	Regular patient	New patient
Patient's expectations	Says they don't want antibiotics unless necessary	Says they want reassurance
I would be **more likely to prescribe an antibiotic** in … (Please select one)	Situation A ☐	Situation B ☐

And this antibiotic prescription would be?

☐For immediate use

☐A delayed prescription

B2Q17. Based on the scenario, in which situation (A or B) would you be **more likely to prescribe an antibiotic** for the patient?

	Situation A	Situation B
Duration: Patient has had symptoms for	2 weeks	3 weeks
Life event: Patient has an important event or a deadline coming up	No	Yes
Reassessment: Patient is able to return for reassessment	Yes	No
Familiarity with patient	New patient	Regular patient
Patient's expectations	Says they want reassurance	Says they want antibiotics
I would be **more likely to prescribe an antibiotic** in … (Please select one)	Situation A ☐	Situation B ☐

And this antibiotic prescription would be?

☐For immediate use

☐A delayed prescription

B2Q18. Based on the scenario, in which situation (A or B) would you be **more likely to prescribe an antibiotic** for the patient?

	Situation A	Situation B
Duration: Patient has had symptoms for	3 weeks	1 week
Life event: Patient has an important event or a deadline coming up	Yes	No
Reassessment: Patient is able to return for reassessment	No	Yes
Familiarity with patient	Regular patient	New patient
Patient's expectations	Says they want antibiotics	Says they don't want antibiotics unless necessary
I would be **more likely to prescribe an antibiotic** in … (Please select one)	Situation A ☐	Situation B ☐

And this antibiotic prescription would be?

☐For immediate use

☐A delayed prescription

B2Q19. Based on the scenario, in which situation (A or B) would you be **more likely to prescribe an antibiotic** for the patient?

	Situation A	**Situation B**
Duration: Patient has had symptoms for	1 week	2 weeks
Life event: Patient has an important event or a deadline coming up	Yes	No
Reassessment: Patient is able to return for reassessment	No	Yes
Familiarity with patient	New patient	Regular patient
Patient's expectations	Says they don't want antibiotics unless necessary	Says they want reassurance
I would be **more likely to prescribe an antibiotic** in … (Please select one)	Situation A ☐	Situation B ☐

And this antibiotic prescription would be?

☐For immediate use

☐A delayed prescription

SECTION C

Thinking back to the survey you've just completed, when you were weighing up between situation A and B:

C1. Generally speaking, which was the **most important characteristic** to you?

☐Duration of symptoms: How long the patient has had the symptoms for

☐Life event: Whether the patient had an important event or a deadline coming up

☐Reassessment: Whether the patient was able to return for reassessment

☐Familiarity with patient: Whether it was a regular patient or new patient

☐Patient's expectations

Why? ____ (optional)

C2. Generally speaking, which was the **least important characteristic** to you?

☐Duration of symptoms: How long the patient has had the symptoms for

☐Life event: Whether the patient had an important event or a deadline coming up

☐Reassessment: Whether the patient was able to return for reassessment

☐Familiarity with patient: Whether it was a regular patient or new patient

☐Patient's expectations

Why? ____
(optional)

A chance to choose differently

In the main survey, we asked you to choose between situation A and situation B. We know that in some instances, you may have wanted to make a different choice. So for the next question based on the same scenario, we have presented more options for you to choose from.

A **new patient** (adult) presents with a runny nose, sneezing, a sore throat and dry cough, which they've had for **2 weeks**. They have managed these symptoms in their usual way, which may include a combination of rest, home remedies, vitamin supplements, commercial immune boosters, and cold/flu/cough products. As they are still feeling unwell and **they have an important event coming up**, they decided to consult a doctor (you). The patient **says they want antibiotics**.

The patient has no significant past medical history. On examination, their temperature (tympanic) is 37.8c, throat appears slightly red and there is no exudate or cervical lymphadenopathy. Chest is clear. The patient **can't come back for a reassessment** if they are not better or feel worse.

C3. Which response best describes what you would do?

☐Prescribe an antibiotic for immediate treatment

☐Prescribe a delayed course of antibiotics

☐Not prescribe an antibiotic

☐Other response (please tell us) ________________________________

C4. How difficult or easy did you find this survey overall?

☐Very easy

☐Easy

☐Neutral

☐Difficult

☐Very difficult

C5. Do you have any comments that you would like to make about this survey?

Thank you for participating in this survey!

Appendix M: Discrete Choice Experiment — Consumers

This is the final version of the DCE survey for consumers, showing both Block 1 and Block 2 choice sets in Section B, before survey logic (described in Chapter 3, Section 3.5.4) and HTML coding for the online survey platform — Key Survey® (Version 8.7.5; (2016)). Participants were presented with the same Section A and C of the survey, and randomised by the online survey platform to either Block 1 or Block 2 choice sets for Section B. Choice sets 3 and 18 in each block are duplicates for the purpose of intra-participant consistency checks.

Screening questions (prior to entering the survey)

Do you live in Australia and are at least 18 years old?

☐Yes

☐No

Which statement below best describes your position toward using antibiotics? (please tick one)

☐I would take antibiotics if advised to do so by the doctor.

☐I avoid taking antibiotics at all costs, even if this was against medical advice

SECTION A: About you

To start with, we would like to know a little about you.

A1. Are you?

☐Female

☐Male

A2. How old are you? (years)

[ ]

A3. What is the highest level of education you have completed?

☐Postgraduate degree (Master, Doctoral or PhD)

☐Graduate Certificate or Graduate Diploma

☐Bachelor degree

☐Year 12

☐Other – Please specify below:

[ ]

A4. How long have you lived in Australia? (years)

[ ]

A5. Which state/territory do you live in?

☐NSW

☐VIC

☐QLD

☐WA

☐SA

☐TAS

☐ACT

☐NT

A6. What best describes where you live?

☐ Inner city/ Suburban

☐ Provincial/ Regional

☐ Rural/ Remote

A7. In general, would you say your health is:

☐Excellent

☐Very good

☐Good

☐Fair

☐Poor

A8. In the past 12 months, how many courses of antibiotics have you taken? Please estimate.

☐None

☐One or two

☐Three or four

☐Five or more

A9. Has a doctor ever said to you that you are more likely to need antibiotics because of a chronic health condition that you are managing?

☐Yes

☐No

A10. In the past, have you experienced bad effects or side effects from taking antibiotics?

☐Yes

☐No

A11. Do you hold a healthcare or concession card? (With this card, you would pay $6.20 for prescription medicines covered under the Pharmaceutical Benefits Scheme)

☐Yes

☐No

INSTRUCTIONS

Before we get into the main survey, here's a brief explanation of what to expect.

The survey questions are based on this scenario:

> **SCENARIO**
>
> Imagine you have a runny nose, sneezing, a sore throat and a dry cough. You have managed these symptoms in your usual way, which may include a combination of rest, home remedies, vitamin supplements, commercial immune boosters, and cold/flu/cough products. As you are still feeling unwell, you decide to consult a doctor.
>
> After examining you, the doctor gives you a prescription for antibiotics because you can't come back for a reassessment in 2 days.

You will be presented with 19 questions. Each question contains a pair of situations, A and B. Situation A is different from situation B in these ways:

1. **Duration** of symptoms – you have had these symptoms for different lengths of time. In the situations presented this will be shown as **1 week, 2 weeks** or **3 weeks**.
2. **Life event** – you have an important event or a deadline coming up. This will be shown as either **yes**, you do have an important event or a deadline coming up or **no**, you don't.
3. **Time off** – you are able to take time off from work/study to recover. This will be shown as either **yes**, you can take time off to recover or **no**, you can't.
4. **Doctor's advice** – what the doctor said. One of three possibilities will be shown in each situation: (a) doctor says it's **probably a viral infection and antibiotics won't help**, (b) doctor says to **start antibiotic treatment if you feel worse or no better in 2 days**, or (c) doctor leaves it to **you to decide whether to take the antibiotics or not**.
5. **Past experience** – you have taken antibiotics for similar symptoms before. This will be shown as **yes**, you have or **no**, you haven't.

To get you familiar with the survey, this is what a typical question looks like:

Based on the scenario, as you leave the doctor's clinic, in which situation (A or B) would you be more likely to fill the antibiotic prescription (go to the pharmacy to get the antibiotics)?

	Situation A	**Situation B**
Duration: You've had symptoms for	1 week	3 weeks
Life event: You've an important event or a deadline coming up	No	Yes
Time off: You're able to take time off from work/study to recover	No	Yes
Doctor's advice:	Probably a viral infection and antibiotics won't help	You decide whether to take the antibiotics or not
Past experience: You've taken antibiotics for similar symptoms before	No	Yes
I would be more likely to fill the antibiotic prescription in … (Please select one)	Situation A ☐	Situation B ☐

For each question, we would like to know in which situation you would be more likely to fill the antibiotic prescription. Please choose either Situation A or Situation B.

We know that in some instances, you may want to make a different choice. However, only two situations are presented. Please choose the situation in which you are more likely to fill the antibiotic prescription.

There are no right or wrong answers. We are simply interested in your choice between Situation A and Situation B.

Was that explanation clear?

☐ Yes

☐No (You can go back to read the explanation again by clicking the back button)

SECTION B: Main survey

This is now the start of the main survey.

We know that in some instances, you may want to make a different choice. However, only two situations are presented. Please choose the situation in which you are more likely to fill the antibiotic prescription.

There are no right or wrong answers. We are simply interested in your choice between Situation A and Situation B.

Block 1

B1Q1. Based on the scenario, as you leave the doctor's clinic, in which situation (A or B) would you be more likely to fill the antibiotic prescription (go to the pharmacy to get the antibiotics)?

	Situation A	**Situation B**
Duration: You've had symptoms for	1 week	2 weeks
Life event: You've an important event or a deadline coming up	Yes	No
Time off: You're able to take time off from work/study to recover	No	Yes
Doctor's advice:	Says to start antibiotic treatment if you feel worse or no better in 2 days	Says it's probably a viral infectio and antibiotics won't help
Past experience: You've taken antibiotics for similar symptoms before	Yes	No
I would be more likely to fill the antibiotic prescription in … (Please select one)	Situation A ☐	Situation B ☐

B1Q2. Based on the scenario, as you leave the doctor's clinic, in which situation (A or B) would you be more likely to fill the antibiotic prescription (go to the pharmacy to get the antibiotics)?

	Situation A	**Situation B**
Duration: You've had symptoms for	2 weeks	3 weeks
Life event: You've an important event or a deadline coming up	Yes	No
Time off: You're able to take time off from work/study to recover	Yes	No
Doctor's advice:	Says it's probably a viral infection and antibiotics won't help	Says you decide whether to take the antibiotics or not
Past experience: You've taken antibiotics for similar symptoms before	No	Yes
I would be more likely to fill the antibiotic prescription in … (Please select one)	Situation A ☐	Situation B ☐

B1Q3. Based on the scenario, as you leave the doctor's clinic, in which situation (A or B) would you be more likely to fill the antibiotic prescription (go to the pharmacy to get the antibiotics)?

	Situation A	**Situation B**
Duration: You've had symptoms for	3 weeks	1 week
Life event: You've an important event or a deadline coming up	Yes	No
Time off: You're able to take time off from work/study to recover	No	Yes
Doctor's advice:	Says to start antibiotic treatment if you feel worse or no better in 2 days	Says it's probably a viral infection and antibiotics won't help
Past experience: You've taken antibiotics for similar symptoms before	Yes	No
I would be more likely to fill the antibiotic prescription in … (Please select one)	Situation A ☐	Situation B ☐

B1Q4. Based on the scenario, as you leave the doctor's clinic, in which situation (A or B) would you be more likely to fill the antibiotic prescription (go to the pharmacy to get the antibiotics)?

	Situation A	**Situation B**
Duration: You've had symptoms for	2 weeks	3 weeks
Life event: You've an important event or a deadline coming up	Yes	No
Time off: You're able to take time off from work/study to recover	Yes	No
Doctor's advice:	Says you decide whether to take the antibiotics or not	Says to start antibiotic treatment if you feel worse or no better in 2 days
Past experience: You've taken antibiotics for similar symptoms before	Yes	No
I would be more likely to fill the antibiotic prescription in … (Please select one)	Situation A ☐	Situation B ☐

B1Q5. Based on the scenario, as you leave the doctor's clinic, in which situation (A or B) would you be more likely to fill the antibiotic prescription (go to the pharmacy to get the antibiotics)?

	Situation A	**Situation B**
Duration: You've had symptoms for	1 week	2 weeks
Life event: You've an important event or a deadline coming up	No	Yes
Time off: You're able to take time off from work/study to recover	No	Yes
Doctor's advice:	Says it's probably a viral infection and antibiotics won't help	Says you decide whether to take the antibiotics or not
Past experience: You've taken antibiotics for similar symptoms before	No	Yes
I would be more likely to fill the antibiotic prescription in … (Please select one)	Situation A ☐	Situation B ☐

B1Q6. Based on the scenario, as you leave the doctor's clinic, in which situation (A or B) would you be more likely to fill the antibiotic prescription (go to the pharmacy to get the antibiotics)?

	Situation A	**Situation B**
Duration: You've had symptoms for	3 weeks	1 week
Life event: You've an important event or a deadline coming up	No	Yes
Time off: You're able to take time off from work/study to recover	No	Yes
Doctor's advice:	Says you decide whether to take the antibiotics or not	Says to start antibiotic treatment if you feel worse or no better in 2 days
Past experience: You've taken antibiotics for similar symptoms before	Yes	No
I would be more likely to fill the antibiotic prescription in … (Please select one)	Situation A ☐	Situation B ☐

B1Q7. Based on the scenario, as you leave the doctor's clinic, in which situation (A or B) would you be more likely to fill the antibiotic prescription (go to the pharmacy to get the antibiotics)?

	Situation A	**Situation B**
Duration: You've had symptoms for	3 weeks	1 week
Life event: You've an important event or a deadline coming up	No	Yes
Time off: You're able to take time off from work/study to recover	Yes	No
Doctor's advice:	Says to start antibiotic treatment if you feel worse or no better in 2 days	Says it's probably a viral infection and antibiotics won't help
Past experience: You've taken antibiotics for similar symptoms before	No	Yes
I would be more likely to fill the antibiotic prescription in … (Please select one)	Situation A ☐	Situation B ☐

B1Q8. Based on the scenario, as you leave the doctor's clinic, in which situation (A or B) would you be more likely to fill the antibiotic prescription (go to the pharmacy to get the antibiotics)?

	Situation A	**Situation B**
Duration: You've had symptoms for	1 week	2 weeks
Life event: You've an important event or a deadline coming up	Yes	No
Time off: You're able to take time off from work/study to recover	Yes	No
Doctor's advice:	Says you decide whether to take the antibiotics or not	Says to start antibiotic treatment if you feel worse or no better in 2 days
Past experience: You've taken antibiotics for similar symptoms before	No	Yes
I would be more likely to fill the antibiotic prescription in ... (Please select one)	Situation A ☐	Situation B ☐

B1Q9. Based on the scenario, as you leave the doctor's clinic, in which situation (A or B) would you be more likely to fill the antibiotic prescription (go to the pharmacy to get the antibiotics)?

	Situation A	**Situation B**
Duration: You've had symptoms for	2 weeks	3 weeks
Life event: You've an important event or a deadline coming up	No	Yes
Time off: You're able to take time off from work/study to recover	No	Yes
Doctor's advice:	Says to start antibiotic treatment if you feel worse or no better in 2 days	Says it's probably a viral infection and antibiotics won't help
Past experience: You've taken antibiotics for similar symptoms before	No	Yes
I would be more likely to fill the antibiotic prescription in ... (Please select one)	Situation A ☐	Situation B ☐

B1Q10. Based on the scenario, as you leave the doctor's clinic, in which situation (A or B) would you be more likely to fill the antibiotic prescription (go to the pharmacy to get the antibiotics)?

	Situation A	Situation B
Duration: You've had symptoms for	1 week	2 weeks
Life event: You've an important event or a deadline coming up	Yes	No
Time off: You're able to take time off from work/study to recover	Yes	No
Doctor's advice:	Says to start antibiotic treatment if you feel worse or no better in 2 days	Says it's probably a viral infection and antibiotics won't help
Past experience: You've taken antibiotics for similar symptoms before	Yes	No
I would be more likely to fill the antibiotic prescription in … (Please select one)	Situation A ☐	Situation B ☐

B1Q11. Based on the scenario, as you leave the doctor's clinic, in which situation (A or B) would you be more likely to fill the antibiotic prescription (go to the pharmacy to get the antibiotics)?

	Situation A	Situation B
Duration: You've had symptoms for	2 weeks	3 weeks
Life event: You've an important event or a deadline coming up	No	Yes
Time off: You're able to take time off from work/study to recover	Yes	No
Doctor's advice:	Says it's probably a viral infection and antibiotics won't help	Says you decide whether to take the antibiotics or not
Past experience: You've taken antibiotics for similar symptoms before	Yes	No
I would be more likely to fill the antibiotic prescription in … (Please select one)	Situation A ☐	Situation B ☐

B1Q12. Based on the scenario, as you leave the doctor's clinic, in which situation (A or B) would you be more likely to fill the antibiotic prescription (go to the pharmacy to get the antibiotics)?

	Situation A	**Situation B**
Duration: You've had symptoms for	3 weeks	1 week
Life event: You've an important event or a deadline coming up	No	Yes
Time off: You're able to take time off from work/study to recover	Yes	No
Doctor's advice:	Says you decide whether to take the antibiotics or not	Says to start antibiotic treatment if you feel worse or no better in 2 days
Past experience: You've taken antibiotics for similar symptoms before	Yes	No
I would be more likely to fill the antibiotic prescription in ... (Please select one)	Situation A ☐	Situation B ☐

B1Q13. Based on the scenario, as you leave the doctor's clinic, in which situation (A or B) would you be more likely to fill the antibiotic prescription (go to the pharmacy to get the antibiotics)?

	Situation A	**Situation B**
Duration: You've had symptoms for	2 weeks	3 weeks
Life event: You've an important event or a deadline coming up	Yes	No
Time off: You're able to take time off from work/study to recover	Yes	No
Doctor's advice:	Says you decide whether to take the antibiotics or not	Says to start antibiotic treatment if you feel worse or no better in 2 days
Past experience: You've taken antibiotics for similar symptoms before	No	Yes
I would be more likely to fill the antibiotic prescription in ... (Please select one)	Situation A ☐	Situation B ☐

B1Q14. Based on the scenario, as you leave the doctor's clinic, in which situation (A or B) would you be more likely to fill the antibiotic prescription (go to the pharmacy to get the antibiotics)?

	Situation A	**Situation B**
Duration: You've had symptoms for	1 week	2 weeks
Life event: You've an important event or a deadline coming up	No	Yes
Time off: You're able to take time off from work/study to recover	No	Yes
Doctor's advice:	Says you decide whether to take the antibiotics or not	Says to start antibiotic treatment if you feel worse or no better in 2 days
Past experience: You've taken antibiotics for similar symptoms before	No	Yes
I would be more likely to fill the antibiotic prescription in … (Please select one)	Situation A ☐	Situation B ☐

B1Q15. Based on the scenario, as you leave the doctor's clinic, in which situation (A or B) would you be more likely to fill the antibiotic prescription (go to the pharmacy to get the antibiotics)?

	Situation A	**Situation B**
Duration: You've had symptoms for	2 weeks	3 weeks
Life event: You've an important event or a deadline coming up	Yes	No
Time off: You're able to take time off from work/study to recover	No	Yes
Doctor's advice:	Says it's probably a viral infection and antibiotics won't help	Says you decide whether to take the antibiotics or not
Past experience: You've taken antibiotics for similar symptoms before	Yes	No
I would be more likely to fill the antibiotic prescription in … (Please select one)	Situation A ☐	Situation B ☐

B1Q16. Based on the scenario, as you leave the doctor's clinic, in which situation (A or B) would you be more likely to fill the antibiotic prescription (go to the pharmacy to get the antibiotics)?

	Situation A	**Situation B**
Duration: You've had symptoms for	3 weeks	1 week
Life event: You've an important event or a deadline coming up	No	Yes
Time off: You're able to take time off from work/study to recover	Yes	No
Doctor's advice:	Says to start antibiotic treatment if you feel worse or no better in 2 days	Says it's probably a viral infection and antibiotics won't help
Past experience: You've taken antibiotics for similar symptoms before	Yes	No
I would be more likely to fill the antibiotic prescription in … (Please select one)	Situation A ☐	Situation B ☐

B1Q17. Based on the scenario, as you leave the doctor's clinic, in which situation (A or B) would you be more likely to fill the antibiotic prescription (go to the pharmacy to get the antibiotics)?

	Situation A	**Situation B**
Duration: You've had symptoms for	3 weeks	1 week
Life event: You've an important event or a deadline coming up	No	Yes
Time off: You're able to take time off from work/study to recover	No	Yes
Doctor's advice:	Says it's probably a viral infection and antibiotics won't help	Says you decide whether to take the antibiotics or not
Past experience: You've taken antibiotics for similar symptoms before	No	Yes
I would be more likely to fill the antibiotic prescription in … (Please select one)	Situation A ☐	Situation B ☐

B1Q18. Based on the scenario, as you leave the doctor's clinic, in which situation (A or B) would you be more likely to fill the antibiotic prescription (go to the pharmacy to get the antibiotics)?

	Situation A	**Situation B**
Duration: You've had symptoms for	3 weeks	1 week
Life event: You've an important event or a deadline coming up	Yes	No
Time off: You're able to take time off from work/study to recover	No	Yes
Doctor's advice:	Says to start antibiotic treatment if you feel worse or no better in 2 days	Says it's probably a viral infection and antibiotics won't help
Past experience: You've taken antibiotics for similar symptoms before	Yes	No
I would be more likely to fill the antibiotic prescription in … (Please select one)	Situation A ☐	Situation B ☐

B1Q19. Based on the scenario, as you leave the doctor's clinic, in which situation (A or B) would you be more likely to fill the antibiotic prescription (go to the pharmacy to get the antibiotics)?

	Situation A	**Situation B**
Duration: You've had symptoms for	1 week	2 weeks
Life event: You've an important event or a deadline coming up	Yes	No
Time off: You're able to take time off from work/study to recover	No	Yes
Doctor's advice:	Says it's probably a viral infection and antibiotics won't help	Says you decide whether to take the antibiotics or not
Past experience: You've taken antibiotics for similar symptoms before	No	Yes
I would be more likely to fill the antibiotic prescription in … (Please select one)	Situation A ☐	Situation B ☐

Block 2

B2Q1. Based on the scenario, as you leave the doctor's clinic, in which situation (A or B) would you be more likely to fill the antibiotic prescription (go to the pharmacy to get the antibiotics)?

	Situation A	**Situation B**
Duration: You've had symptoms for	3 weeks	1 week
Life event: You've an important event or a deadline coming up	No	Yes
Time off: You're able to take time off from work/study to recover	No	Yes
Doctor's advice:	Says you decide whether to take the antibiotics or not	Says to start antibiotic treatmen you feel worse or no better in 2 days
Past experience: You've taken antibiotics for similar symptoms before	No	Yes
I would be more likely to fill the antibiotic prescription in … (Please select one)	Situation A ☐	Situation B ☐

B2Q2. Based on the scenario, as you leave the doctor's clinic, in which situation (A or B) would you be more likely to fill the antibiotic prescription (go to the pharmacy to get the antibiotics)?

	Situation A	Situation B
Duration: You've had symptoms for	3 weeks	1 week
Life event: You've an important event or a deadline coming up	Yes	No
Time off: You're able to take time off from work/study to recover	No	Yes
Doctor's advice:	Says it's probably a viral infection and antibiotics won't help	Says you decide whether to take the antibiotics or not
Past experience: You've taken antibiotics for similar symptoms before	Yes	No
I would be more likely to fill the antibiotic prescription in … (Please select one)	Situation A ☐	Situation B ☐

B2Q3. Based on the scenario, as you leave the doctor's clinic, in which situation (A or B) would you be more likely to fill the antibiotic prescription (go to the pharmacy to get the antibiotics)?

	Situation A	Situation B
Duration: You've had symptoms for	1 week	2 weeks
Life event: You've an important event or a deadline coming up	No	Yes
Time off: You're able to take time off from work/study to recover	Yes	No
Doctor's advice:	Says it's probably a viral infection and antibiotics won't help	Says you decide whether to take the antibiotics or not
Past experience: You've taken antibiotics for similar symptoms before	No	Yes
I would be more likely to fill the antibiotic prescription in … (Please select one)	Situation A ☐	Situation B ☐

B2Q4. Based on the scenario, as you leave the doctor's clinic, in which situation (A or B) would you be more likely to fill the antibiotic prescription (go to the pharmacy to get the antibiotics)?

	Situation A	**Situation B**
Duration: You've had symptoms for	2 weeks	3 weeks
Life event: You've an important event or a deadline coming up	No	Yes
Time off: You're able to take time off from work/study to recover	No	Yes
Doctor's advice:	Says it's probably a viral infection and antibiotics won't help	Says you decide whether to take the antibiotics or not
Past experience: You've taken antibiotics for similar symptoms before	Yes	No
I would be more likely to fill the antibiotic prescription in … (Please select one)	Situation A ☐	Situation B ☐

B2Q5. Based on the scenario, as you leave the doctor's clinic, in which situation (A or B) would you be more likely to fill the antibiotic prescription (go to the pharmacy to get the antibiotics)?

	Situation A	**Situation B**
Duration: You've had symptoms for	1 week	2 weeks
Life event: You've an important event or a deadline coming up	Yes	No
Time off: You're able to take time off from work/study to recover	No	Yes
Doctor's advice:	Says to start antibiotic treatment if you feel worse or no better in 2 days	Says it's probably a viral infection and antibiotics won't help
Past experience: You've taken antibiotics for similar symptoms before	Yes	No
I would be more likely to fill the antibiotic prescription in … (Please select one)	Situation A ☐	Situation B ☐

B2Q6. Based on the scenario, as you leave the doctor's clinic, in which situation (A or B) would you be more likely to fill the antibiotic prescription (go to the pharmacy to get the antibiotics)?

	Situation A	Situation B
Duration: You've had symptoms for	3 weeks	1 week
Life event: You've an important event or a deadline coming up	Yes	No
Time off: You're able to take time off from work/study to recover	No	Yes
Doctor's advice:	Says to start antibiotic treatment if you feel worse or no better in 2 days	Says it's probably a viral infectio and antibiotics won't help
Past experience: You've taken antibiotics for similar symptoms before	No	Yes
I would be more likely to fill the antibiotic prescription in … (Please select one)	Situation A ☐	Situation B ☐

B2Q7. Based on the scenario, as you leave the doctor's clinic, in which situation (A or B) would you be more likely to fill the antibiotic prescription (go to the pharmacy to get the antibiotics)?

	Situation A	Situation B
Duration: You've had symptoms for	3 weeks	1 week
Life event: You've an important event or a deadline coming up	Yes	No
Time off: You're able to take time off from work/study to recover	Yes	No
Doctor's advice:	Says it's probably a viral infection and antibiotics won't help	Says you decide whether to take the antibiotics or not
Past experience: You've taken antibiotics for similar symptoms before	Yes	No
I would be more likely to fill the antibiotic prescription in … (Please select one)	Situation A ☐	Situation B ☐

B2Q8. Based on the scenario, as you leave the doctor's clinic, in which situation (A or B) would you be more likely to fill the antibiotic prescription (go to the pharmacy to get the antibiotics)?

	Situation A	Situation B
Duration: You've had symptoms for	3 weeks	1 week
Life event: You've an important event or a deadline coming up	Yes	No
Time off: You're able to take time off from work/study to recover	Yes	No
Doctor's advice:	Says you decide whether to take the antibiotics or not	Says to start antibiotic treatmen you feel worse or no better in 2 days
Past experience: You've taken antibiotics for similar symptoms before	No	Yes
I would be more likely to fill the antibiotic prescription in … (Please select one)	Situation A ☐	Situation B ☐

B2Q9. Based on the scenario, as you leave the doctor's clinic, in which situation (A or B) would you be more likely to fill the antibiotic prescription (go to the pharmacy to get the antibiotics)?

	Situation A	Situation B
Duration: You've had symptoms for	2 weeks	3 weeks
Life event: You've an important event or a deadline coming up	No	Yes
Time off: You're able to take time off from work/study to recover	No	Yes
Doctor's advice:	Says to start antibiotic treatment if you feel worse or no better in 2 days	Says it's probably a viral infectio and antibiotics won't help
Past experience: You've taken antibiotics for similar symptoms before	No	Yes
I would be more likely to fill the antibiotic prescription in … (Please select one)	Situation A ☐	Situation B ☐

B2Q10. Based on the scenario, as you leave the doctor's clinic, in which situation (A or B) would you be more likely to fill the antibiotic prescription (go to the pharmacy to get the antibiotics)?

	Situation A	Situation B
Duration: You've had symptoms for	1 week	2 weeks
Life event: You've an important event or a deadline coming up	No	Yes
Time off: You're able to take time off from work/study to recover	Yes	No
Doctor's advice:	Says to start antibiotic treatment if you feel worse or no better in 2 days	Says it's probably a viral infectio and antibiotics won't help
Past experience: You've taken antibiotics for similar symptoms before	Yes	No
I would be more likely to fill the antibiotic prescription in … (Please select one)	Situation A ☐	Situation B ☐

B2Q11. Based on the scenario, as you leave the doctor's clinic, in which situation (A or B) would you be more likely to fill the antibiotic prescription (go to the pharmacy to get the antibiotics)?

	Situation A	Situation B
Duration: You've had symptoms for	2 weeks	3 weeks
Life event: You've an important event or a deadline coming up	Yes	No
Time off: You're able to take time off from work/study to recover	Yes	No
Doctor's advice:	Says to start antibiotic treatment if you feel worse or no better in 2 days	Says it's probably a viral infectio and antibiotics won't help
Past experience: You've taken antibiotics for similar symptoms before	No	Yes
I would be more likely to fill the antibiotic prescription in … (Please select one)	Situation A ☐	Situation B ☐

B2Q12. Based on the scenario, as you leave the doctor's clinic, in which situation (A or B) would you be more likely to fill the antibiotic prescription (go to the pharmacy to get the antibiotics)?

	Situation A	Situation B
Duration: You've had symptoms for	2 weeks	3 weeks
Life event: You've an important event or a deadline coming up	Yes	No
Time off: You're able to take time off from work/study to recover	No	Yes
Doctor's advice:	Says you decide whether to take the antibiotics or not	Says to start antibiotic treatmen you feel worse or no better in 2 days
Past experience: You've taken antibiotics for similar symptoms before	Yes	No
I would be more likely to fill the antibiotic prescription in … (Please select one)	Situation A ☐	Situation B ☐

B2Q13. Based on the scenario, as you leave the doctor's clinic, in which situation (A or B) would you be more likely to fill the antibiotic prescription (go to the pharmacy to get the antibiotics)?

	Situation A	Situation B
Duration: You've had symptoms for	1 week	2 weeks
Life event: You've an important event or a deadline coming up	No	Yes
Time off: You're able to take time off from work/study to recover	Yes	No
Doctor's advice:	Says you decide whether to take the antibiotics or not	Says to start antibiotic treatmen you feel worse or no better in 2 days
Past experience: You've taken antibiotics for similar symptoms before	Yes	No
I would be more likely to fill the antibiotic prescription in … (Please select one)	Situation A ☐	Situation B ☐

B2Q14. Based on the scenario, as you leave the doctor's clinic, in which situation (A or B) would you be more likely to fill the antibiotic prescription (go to the pharmacy to get the antibiotics)?

	Situation A	Situation B
Duration: You've had symptoms for	2 weeks	3 weeks
Life event: You've an important event or a deadline coming up	No	Yes
Time off: You're able to take time off from work/study to recover	No	Yes
Doctor's advice:	Says you decide whether to take the antibiotics or not	Says to start antibiotic treatmen you feel worse or no better in 2 days
Past experience: You've taken antibiotics for similar symptoms before	Yes	No
I would be more likely to fill the antibiotic prescription in … (Please select one)	Situation A ☐	Situation B ☐

B2Q15. Based on the scenario, as you leave the doctor's clinic, in which situation (A or B) would you be more likely to fill the antibiotic prescription (go to the pharmacy to get the antibiotics)?

	Situation A	Situation B
Duration: You've had symptoms for	1 week	2 weeks
Life event: You've an important event or a deadline coming up	No	Yes
Time off: You're able to take time off from work/study to recover	Yes	No
Doctor's advice:	Says it's probably a viral infection and antibiotics won't help	Says you decide whether to take the antibiotics or not
Past experience: You've taken antibiotics for similar symptoms before	Yes	No
I would be more likely to fill the antibiotic prescription in … (Please select one)	Situation A ☐	Situation B ☐

B2Q16. Based on the scenario, as you leave the doctor's clinic, in which situation (A or B) would you be more likely to fill the antibiotic prescription (go to the pharmacy to get the antibiotics)?

	Situation A	Situation B
Duration: You've had symptoms for	3 weeks	1 week
Life event: You've an important event or a deadline coming up	Yes	No
Time off: You're able to take time off from work/study to recover	Yes	No
Doctor's advice:	Says it's probably a viral infection and antibiotics won't help	Says you decide whether to take the antibiotics or not
Past experience: You've taken antibiotics for similar symptoms before	No	Yes
I would be more likely to fill the antibiotic prescription in … (Please select one)	Situation A ☐	Situation B ☐

B2Q17. Based on the scenario, as you leave the doctor's clinic, in which situation (A or B) would you be more likely to fill the antibiotic prescription (go to the pharmacy to get the antibiotics)?

	Situation A	Situation B
Duration: You've had symptoms for	2 weeks	3 weeks
Life event: You've an important event or a deadline coming up	No	Yes
Time off: You're able to take time off from work/study to recover	Yes	No
Doctor's advice:	Says to start antibiotic treatment if you feel worse or no better in 2 days	Says it's probably a viral infection and antibiotics won't help
Past experience: You've taken antibiotics for similar symptoms before	No	Yes
I would be more likely to fill the antibiotic prescription in … (Please select one)	Situation A ☐	Situation B ☐

B2Q18. Based on the scenario, as you leave the doctor's clinic, in which situation (A or B) would you be more likely to fill the antibiotic prescription (go to the pharmacy to get the antibiotics)?

	Situation A	**Situation B**
Duration: You've had symptoms for	1 week	2 weeks
Life event: You've an important event or a deadline coming up	No	Yes
Time off: You're able to take time off from work/study to recover	Yes	No
Doctor's advice:	Says it's probably a viral infection and antibiotics won't help	Says you decide whether to take the antibiotics or not
Past experience: You've taken antibiotics for similar symptoms before	No	Yes
I would be more likely to fill the antibiotic prescription in … (Please select one)	Situation A ☐	Situation B ☐

B2Q19. Based on the scenario, as you leave the doctor's clinic, in which situation (A or B) would you be more likely to fill the antibiotic prescription (go to the pharmacy to get the antibiotics)?

	Situation A	**Situation B**
Duration: You've had symptoms for	1 week	2 weeks
Life event: You've an important event or a deadline coming up	Yes	No
Time off: You're able to take time off from work/study to recover	No	Yes
Doctor's advice:	Says you decide whether to take the antibiotics or not	Says to start antibiotic treatmen you feel worse or no better in 2 days
Past experience: You've taken antibiotics for similar symptoms before	No	Yes
I would be more likely to fill the antibiotic prescription in … (Please select one)	Situation A ☐	Situation B ☐

SECTION C

Thinking back to the survey you've just completed, when you were weighing up between situation A and B:

C1. Generally speaking, which was the **most important characteristic** to you?

☐Duration of symptoms: How long you've had the symptoms for

☐Life event: Whether you have an important event or a deadline coming up

☐Time off: Whether you were able to take time off from work/study to recover

☐Doctor's advice

☐Past experience: Whether you had taken antibiotics for similar symptoms before

Why? ____
(optional)

C2. Generally speaking, which was the **least important characteristic** to you?

☐Duration of symptoms: How long you've had the symptoms for

☐Life event: Whether you have an important event or a deadline coming up

☐Time off: Whether you were able to take time off from work/study to recover

☐Doctor's advice

☐Past experience: Whether you had taken antibiotics for similar symptoms before

Why? ____
(optional)

A chance to choose differently

In the main survey, we asked you to choose between situation A and situation B. We know that in some instances, you may have wanted to make a different choice. So, for the next question based on the same scenario, we have presented more options for you to choose from.

You have had a runny nose, sneezing, a sore throat and a dry cough for **2 weeks**. You have managed these symptoms in your usual way, which may include a combination of rest, home remedies, vitamin supplements, commercial immune boosters, and cold/flu/cough products. As you are still feeling unwell, you decide to consult a doctor, as **you have an important event coming up** and **can't take time off to recover**. After examining you, the doctor gives you a prescription for antibiotics because you can't come back for a reassessment in 2 days. **Doctor says to start the antibiotic treatment if you feel worse or no better in 2 days. In the past, you have taken antibiotics for similar symptoms before.**

C3. Which response best describes what you would do?

☐Fill the antibiotic prescription right away and take it.

☐Fill the antibiotic prescription right away and only take it if you are worse or no better in 2 days.

☐Wait 2 days. If no better, you would fill the antibiotic prescription and take it.

☐Not fill the antibiotic prescription at all.

☐Other response (please tell us) ________________________________

C4. What do you usually do with an unused antibiotic prescription?

☐Keep prescription for another time you become unwell.

☐Keep prescription until it expires.

☐Discard prescription right away.

☐Other (please tell us) ______________________________

C5. How difficult or easy did you find this survey overall?

☐Very easy

☐Easy

☐Neutral

☐Difficult

☐Very difficult

C6. Do you have any comments that you would like to make about this survey?

Thank you for participating in this survey!

Appendix N: MXL Estimates for Consumer DCE Survey with Effects Coding — Full Dataset

MXL estimates for Consumer DCE survey with effects coding – Full dataset (n = 205)

Attribute	Level	Coefficient	SE	Prob. |z|>Z	SD	SE	Prob. |z|>Z
Duration of symptoms	1 week	-0.58**	0.08	0.0000	0.74**	0.08	0.0000
	2 weeks	0.03	0.05	0.5588	0.09	0.09	0.3672
	3 weeks^	0.55#			-0.83#		
Life event	No	-0.38**	0.05	0.0000	0.48**	0.06	0.0000
	Yes^	0.38#			-0.48#		
Time off	No	0.07	0.04	0.0682	0.36**	0.05	0.0000
	Yes^	-0.07#			-0.36#		
Doctor's advice	Says it's probably a viral infection and antibiotics won't help	-2.42**	0.16	0.0000	1.42**	0.11	0.0000
	Says you decide whether to take the antibiotics or not	0.45**	0.07	0.0000	0.63**	0.08	0.0000
	Says to start antibiotic treatment if you feel worse or no better in 2 days^	1.97#			-2.05#		
Past experience	No	-0.12**	0.04	0.0008	0.26**	0.05	0.0000
	Yes^	0.12#			-0.26#		

**p < 0.01 and *p < 0.05

^ Omitted category/ reference level

Calculated as the negative sum of the estimated coefficients or SDs

SE: Standard error

SD: Standard deviation for estimated coefficients

Prob. |z|>Z : p-value for the Wald test

The computation for MXL estimates converged after 22 iterations, with a normal exit. The Log Likelihood (LL) was -1457.41 and the Akaike Information Criteria (AIC) was 0.798. McFadden's pseudo R-squared was 0.43.

The attribute level coefficient for "Time off – No" did not reach statistical significance in the parameter estimates, indicating that the 'Time off' attribute was not important in influencing consumer decision-making.

MXL estimates for Consumer DCE survey with effects coding – Dataset with matched duplicated choice sets for respondents 18 – 54 years old (n = 181)

Attribute	Level	Coefficient	SE	Prob. |z|>Z	SD	SE	Prob. |z|>Z
Duration of symptoms	1 week	-0.75**	0.10	0.0000	0.82**	0.10	0.0000
	2 weeks	0.02	0.06	0.7278	0.17	0.11	0.1198
	3 weeks^	0.73#			-0.99#		
Life event	No	-0.51**	0.06	0.0000	0.52**	0.08	0.0000
	Yes^	0.51#			-0.52#		
Time off	No	0.18**	0.05	0.0002	0.41**	0.06	0.0000
	Yes^	-0.18#			-0.41#		
Doctor's advice	Says it's probably a viral infection and antibiotics won't help	-2.88**	0.20	0.0000	1.69**	0.17	0.0000
	Says you decide whether to take the antibiotics or not	0.61**	0.09	0.0000	0.74**	0.09	0.0000
	Says to start antibiotic treatment if you feel worse or no better in 2 days^	2.27#			-2.43#		
Past experience	No	-0.17**	0.05	0.0002	0.30**	0.06	0.0000
	Yes^	0.17#			-0.30#		

**p < 0.01 and *p < 0.05

^ Omitted category/ reference level

Calculated as the negative sum of the estimated coefficients or SDs

SE: Standard error

SD: Standard deviation for estimated coefficients

Prob. |z|>Z : p-value for the Wald test

The computation for MXL estimates converged after 30 iterations, with a normal exit. The Log Likelihood (LL) was -1159.31 and the Akaike Information Criteria (AIC) was 0.721. McFadden's pseudo R-squared was 0.49.

Appendix O: Human Research Ethics Approval

QUT

University Human Research Ethics Committee (UHREC)

HUMAN RESEARCH ETHICS APPROVAL CERTIFICATE

NHMRC Registered Committee Number EC00171

Date of Issue: 8/4/15 (supersedes all previously issued certificates)

Dear Dr Katie Page

This approval certificate serves as your written notice that the proposal has met the requirements of the *National Statement on Ethical Conduct in Human Research* and has been approved on that basis. You are therefore authorised to commence activities as outlined in your application, subject to any specific and standard conditions detailed in this document.

Project Details

Category of Approval:	Human Negligible-Low Risk
Approved From:	8/04/2015
Approved Until:	8/04/2017 (subject to annual reports)
Approval Number:	1500000190
Project Title:	Making decisions about antibiotic use in the Australian primary healthcare sector

Investigator Details

Chief Investigator: Dr Katie Page

Other Staff/Students:

Investigator Name	Type	Role
Prof Nicholas Graves	Internal	QUT Associate Supervisor
Prof Lisa Nissen	Internal	QUT Associate Supervisor
Dr Jenny Doust	External	External Associate Supervisor
Ms Elaine Lum	Student	Doctoral (Research)

Conditions of Approval

Specific Conditions of Approval:
No special conditions placed on approval by the UHREC. Standard conditions apply.

Standard Conditions of Approval:
1. Conduct the project in accordance with QUT policy, the ***National Statement on Ethical Conduct in Human Research*** (http://www.nhmrc.gov.au/guidelines/publications/e72), the ***Australian Code for the Responsible Conduct of Research*** (http://www.nhmrc.gov.au/guidelines/publications/r39), any associated legislation, guidelines or standards;
2. Gain UHREC approval for any proposed variation (http://www.orei.qut.edu.au/human/var/) to the project **prior** to implementation;
3. Respond promptly to the requests and instructions of UHREC;
4. Immediately advise the Office of Research Ethics and Integrity (http://www.orei.qut.edu.au/human/adv/) if:
   - any unforeseen development or events occur that might affect the continued ethical acceptability of the project;
   - any complaints are made, or expressions of concern are raised, in relation to the project;
   - the project needs to be suspended or modified because the risks to participants now outweigh the benefits;
   - a participant can no longer be involved because the research may harm them; and
5. Report on the progress of the approved project at least annually, or at intervals determined by UHREC. The Committee may also choose to conduct a random audit of your project.

If any details within this Approval Certificate are incorrect please advise the Research Ethics Unit within 10 days of receipt of this certificate.

End of Document

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QUT HREC stipulates that the Chief Investigator is the PhD Student's Principal Supervisor (personal communication with Janette Lamb, Research Ethics Advisory Team, February 2015).

Appendix P: Research Dissemination

Conferences

Lum E, Page K, Nissen L, Doust J, Graves N. (2015). *What consumers think, do and say about antibiotic use*. Paper presented at the 9th Health Services & Policy Research Conference, Melbourne, Australia.

Lum E, Graves N, Page K, Doust J, Nissen L, Whitty J. (2015). *Making decisions about antibiotic use in the Australian primary healthcare sector*. Poster presented at Antimicrobials 2015, the Annual Scientific Meeting of the Antimicrobial Society of Australia (ASA), Brisbane, Australia.

Lum E, Graves N, Page K, Doust J, Nissen L, Whitty J. (2014). *Making decisions about antibiotic use in the Australian primary healthcare sector*. Poster presented at IHBI Inspires, the Annual Postgraduate Conference of the Institute of Health and Biomedical Innovation (IHBI), Gold Coast, Australia.

Conference/Forum presentations of related work

Page K, Lum E, Healey L. (2016). *What do consumers do with and think about antibiotics?* Paper to be presented on 22nd November 2016 at the 5th International Conference of the Australasian College for Infection Prevention and Control (ACIPC).

Page K, Lum E. (2016). *Consumer preferences and drivers for antibiotic usage*. Paper to be presented on 14th November 2016 at the 3rd Queensland Antimicrobial Resistance Forum: One Health.

Page K, Lum E. (2015). *Questionable antibiotic practices: Obtaining reliable estimates of consumer behaviours*. Paper presented at the 4th International Conference of the Australasian College for Infection Prevention and Control (ACIPC).

Publications in progress

	Title/Working Title	Type of Article	Status
1	A mixed methods study of antibiotic prescribing in primary healthcare: Dominant factors and trade-offs in decision-making.	Data paper reporting on the results of the GP interviews and DCE.	Manuscript submitted to a Scimago Q1 journal.
2	Australian consumer views of antibiotic use: A qualitative study.	Data paper reporting on the qualitative results of the consumer interviews.	Manuscript submitted to a Scimago Q1 journal.
3	Consumer behaviours with delayed antibiotic prescriptions: A discrete choice experiment.	Data paper reporting on the results of the consumer DCE.	Manuscript in progress.
4	What community pharmacists in Australia think, say and do about antibiotic use.	Data paper reporting on the qualitative results of the community pharmacist interviews.	Manuscript in progress.
5	Choice modelling can contribute to the understanding of antibiotic prescribing and consumption behaviour	Perspective/methods paper on the novel use of DCEs in the area of antibiotic use.	Manuscript in progress.
6	The EABE Model: Visualising the tensions in antibiotic prescribing and consumption based on the Theoretical Domains Framework	Theory paper presenting the EABE model as an extension of the TDF for antibiotic eupraxis.	Manuscript on hold until publication of manuscripts 1, 2 and 4.