Improving infection control at Atoifi Adventist Hospital, Solomon Islands: A participatory action research approach

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Declaration

I declare that this thesis is my own work and has not been submitted in any form for another degree or diploma at any university; and to the best of my knowledge and belief this thesis does not contain any material previously published or written by another person except where due reference is made in the text.

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I acknowledge that an electronic copy of my thesis must be lodged with the university library and, subject to the General Award Rules of James Cook University, immediately made available for research and study in accordance with the *Copyright Act 1968* (Cth).

Statement of the Contribution of Others

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My advisory team provided guidance and advice on study design, analysis and reporting within the remit of their roles:

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Chapter	Details of the publication	Nature and extent of the intellectual input of each author
1	**Sparke, V. L.**, MacLaren, D., Mills, J., Asugeni, R., Moutoa, K., & West, C. (2017). Improving infection control in a culturally, linguistically and spiritually diverse environment. *ANMJ*, *24*(8), 42. (Permission granted for publication)	**VS**, CW, DM and JM conceived the study and initial design. RA and KM provided the background to the infection control issue, which provided the impetus for the study. VS drafted the paper, and all authors edited and revised the draft and approved the final manuscript.
2	**Sparke, V. L.**, Diau, J., MacLaren, D., & West, C. (2020). Solutions to infection control challenges in developing countries, do they exist? An integrative review. *International Journal of Infection Control*, *16*(1). https://www.ijic.info/article/view/19332 (free open access)	**VS** undertook the database searches and drafted the integrative review. CW and DM provided guidance throughout the development of the draft. JD provided input from the perspective of a healthcare worker in a limited resource setting, and the manuscript's suitability and readability in this context. All authors edited and revised the draft paper and approved the final manuscript.
5	**Sparke, V. L.**, MacLaren, D., Esau, D., & West, C. (2021). Changing the lens through which we see others and the world: Infection prevention and control insights using Photovoice. *PLOS Global Public Health.* (submitted, under review)	VS collected the data, collated the findings, described them and drafted the manuscript. DE, as the research assistant, was present at interviews where required to interpret, and translated and transcribed the audio recordings. DE reviewed the manuscript in this context to ensure correct representation. CW and DM provided guidance throughout the draft, and all authors approved the final manuscript.

Presentations Related to This Thesis

Authors	Presentation type	Presentation title	Conference/Seminar
Sparke, V., West, C., & MacLaren, D.	Oral	The complex nexus of life, beliefs and disease: How we achieve true balance 	James Cook University 3MT (finalist)
Sparke, V., MacLaren, D., Diau, J., & West, C.	Oral	Untangling the web—Using Photovoice to understand infection prevention and control in the Solomon Islands	Pacific Island Health Research Symposium 'Health Security in the Pacific: Lessons from the Pandemic Experience' Virtual Symposium, February 2021
Sparke, V., MacLaren, D., & West, C.	Oral	Infection control challenges: from rural and remote Australia to the Western Pacific, 'same but different'	ACIPC Conference 2018, Brisbane, Australia (invited speaker)
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Sparke, V., MacLaren, D., Mills, J., West, C & Speare, R. (vale)	Poster	Using Photovoice to explore the understanding of infection prevention and control in a rural hospital in the Solomon Islands	ACIPC Conference, November 2016, Melbourne, Australia

Abstract

Modern formalised infection prevention and control (IP&C) programs have been implemented in health facilities globally since their inception 40 years ago. Designed by the Centers for Disease Control in the United States of America, these guidelines were initially adopted by health facilities in Western nations, but since have been implemented in health facilities across the world, regardless of resource availability and regardless of language, culture or religion.

IP&C has come to the fore during the COVID-19 pandemic, yet there are many health services around the world, in resource-limited settings, that are ill-equipped to tackle even the smallest number of infectious patients, regardless of disease. It would be easy to blame the commonly cited barriers for successful IP&C programs, such as geographical challenges, financial constraints, poor hospital governance and political instability; however, with 40 years since the development of modern IP&C guidelines, health services in resource-limited settings still struggle to maintain any semblance of good IP&C practice.

Atoifi Adventist Hospital (AAH) is one such health service that has struggled to implement even the most minimal IP&C requirements. Situated in a remote area of the Solomon Islands, AAH recognised the need to improve their IP&C practices in 2015, following a local measles outbreak, during which there was a 70% hospitalisation rate. To meet the requirements of a World Health Organization-funded grant, the author, an IP&C expert, was invited to AAH to audit and assist with AAH's IP&C program. Because of differences in culture, language and spiritual beliefs, which do not necessarily align with Western ways of thinking, including the germ theory of disease transmission and causation, it was clear that for AAH, meeting IP&C standards by utilising a Western-based IP&C guideline was not possible.

The overall objective of this study was to help AAH improve their IP&C practice, but to do this, it was necessary to understand what the staff who work within AAH, and the community that AAH serves, know and believe about sickness transmission within the hospital. It was also necessary to gain an understanding of what their current IP&C practices are, and why they practice them the way they do. Recognising these two underlying facets helps build an IP&C platform at AAH that is doable and sustainable.

This qualitative study employed a participatory action research methodology and used Photovoice followed by semi-structured interviews as the primary data collection method. This decolonising methodology was consistent with the Solomon Island context in which the research was conducted. Recruitment of participants occurred via purposive sampling

through word of mouth and recommendations from co-researchers. Participants included staff who were educated in biomedical principles, such as nurses and pathology workers, as well as staff who had little or no formal education, such as cleaners, cooks and maintenance staff.

The study was undertaken in two phases. Phase 1 employed the Photovoice process and asked participants to take photos that depicted the statement ‘How does sickness pass from one person to another in the hospital?’ Participants were interviewed about their photos using a recognised Photovoice interview format, and the data were collated using qualitative analysis software. Phase 2 was completed 1 year later and utilised ‘Photo-elicitation’, where participants chose photos taken by other participants during phase 1. The use of Photo-elicitation allowed for different perspectives of the same photo. Results from phase 2 interviews were collated into phase 1 data, and the overall results were analysed.

This study shows that the barriers to improving IP&C practice are not as straightforward as what the literature says. Cultural, spiritual and societal practices and beliefs influence how people view disease causation and transmission, and, for healthcare workers, affect their IP&C practice. The ‘germ theory’ does not necessarily inform people’s beliefs about disease causation and transmission, even for staff educated via the biomedical model; therefore, to educate staff and communities on IP&C based on germ theory principles, and expect them to practise accordingly, is not a plausible solution.

The results of this study add an important consideration for governments and hospital leaders when attempting to implement IP&C programs into their hospitals. IP&C programs will only work if they are transformed into a context that is understood by staff and community—one that complements the biomedical model of disease transmission.

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Index of Acronyms

AAH	Atoifi Adventist Hospital
ABHR	alcohol-based hand rub
ACIPC	Australian College for Infection Prevention and Control
CBPR	community-based participatory research
CEO	chief executive officer
COVID-19	coronavirus disease 2019
DON	director of nursing
EVD	Ebola virus disease
HAI(s)	Healthcare-associated infection(s)
HCW(s)	healthcare worker(s)
IP&C	infection prevention and control
LMIC(s)	low- and middle-income country(ies)
MLT	medical laboratory technician
NGO	non-governmental organisation
OPD	Outpatients Department
PA	pharmacy assistant
PAR	participatory action research
PAU	Pacific Adventist University
PIC(s)	Pacific Island country(ies)
PNG	Papua New Guinea
PPE	personal protective equipment
RA	research assistant
SDA	Seventh-day Adventist
SENIC	Study on the Efficacy of Nosocomial Infection Control
TB	tuberculosis
ToC	theory of change
US	United States

WHO	World Health Organization

Prologue

A Very Personal Philosophy

My parents once told me that I was always bringing friends home who were a little 'different'. There was the girl who was living with foster parents (not that I knew what that meant) who was covered in sores, and there was the 'sickly' girl we hosted from country Victoria who visited my youth group to get a 'city' experience. There was the boy who never seemed to be clean, who came from a house that looked like the local tip, and there was the brother and sister who only had a mum (through divorce), something not so normal back in 1978. The friendships I had with these kids all seemed to be short-lived as more often than not they would move to another school.

At the time, I didn't see this pattern of playing with 'different' kids as unusual. I had a very middle-class upbringing with a comfortable home and a secure relationship with my parents, and it wasn't until my parents mentioned it that I thought more about why I befriended kids from a very different social class. When I think back, there were two main reasons. First was curiosity. I wanted to know why these kids looked and sometimes behaved differently. Second, I realised that other children had chastised every one of them. I was bewildered as to why they should be treated differently just because they looked different or had a different home life. Little did I know it at the time, but I was developing not only a sense of empathy, but also the foundations of social justice.

Social justice is a concept hard to define and is quite possibly a word only used by the 'well to do' class when referring to marginalised or under-represented populations. Broadly, social justice is an ethical concept based on human rights and equity. Social justice denotes that the rights of all people be considered in a fair and equitable manner and is underpinned by the four principles of equity, access, participation and rights. When I think back to my childhood, I now realise that while I didn't know what these words meant or that these principles existed, I believed in them all.

Both my parents grew up in country Victoria in relative financial poverty, but managed to work their way 'up' to become 'middle class'. My mum, a budding nurse (until she met my dad, a patient), and my dad, a carpenter, both worked hard to give themselves, me and my sister a good life, and while I spent a lot of my childhood at the property of my paternal grandmother in the country, I was schooled in the city. As a family, we travelled Australia whenever school holidays (and at times outside of school holidays) allowed us. It was never in comfort—we spent hours driving to remote parts of Australia on (then) unsealed roads to experience what Australia had to offer. Our time at Uluru (then, Ayers Rock) is burned into

my memory as it was my first experience of meeting Australia's First Nations people. Dad made me sit among some women making tea around a campfire, somewhere close to the base of Uluru. Dad asked if he could film us by showing them his Standard 8 movie camera and mimicking filming. A woman nodded and reached out her hand, and Dad gave me five 20 cent coins and told me to give them to her, which I did, not having any idea what had just transpired. A woman then asked me for the sugar in her language; I eventually worked out what she wanted, and passed her the sugar while being filmed, but wondered why she just didn't ask in English.

It wasn't until 1990 when my partner (a carpenter) and I travelled and worked in Cairns and Darwin, and then moved to Borroloola in the Northern Territory, that I experienced first-hand the social 'injustices' that distance, adverse climatic conditions, high costs of food, and under-resourced schools and health services bring for the people who live in the small towns and the even smaller and more distant communities. With no available work as a registered nurse, I volunteered with an Aboriginal women's group called Boonu. Befriending the women of this group meant that after cooking and delivering the food for the group's 'meals on wheels' service, we'd spend the afternoons fishing, painting and walking around the bush looking for bush medicines. On mail days we would sit outside the post office waiting for the mail to be sorted, me, the only white person, sitting with the women and being passed their babies to play with and pacify, and being stared at by every white tourist who entered the post office. Politicians try and argue that people choose to live in regional and remote areas and therefore should expect these injustices, but to say this is just pure ignorance; I finally and fully understood.

Moving forward to 1996 and to an overseas study 'exchange', which was the turning point in my career. As a critical care nurse, I was sponsored by the local Rotary club to study critical care units in hospitals in South Africa. Hosted by a number of different families, I was shown around the intensive care and coronary care units of many public and private hospitals, and I was both in awe of their practices and technology but also humbled by the nurses' pay and conditions. However, it wasn't until I was staying in a regional area and had the opportunity to visit a primary healthcare centre and a tuberculosis (and AIDS) hospital that I fully realised that with the same amount of money spent on keeping one ICU patient alive, governments could fund primary healthcare centres and public health initiatives to keep hundreds of people alive. My interest in public health was sparked, as was my passion for infection control.

In 2008, we moved to Derby in the Kimberley region of Western Australia for 3 years. This move was pivotal in cementing my passion for both infection control and rural health, and not only being able to combine the two, but make them work together. Overcoming the

barriers that rural infection control practitioners face when trying to meet standards and guidelines made me realise that a solid foundational knowledge in infection control enabled plausible explanations for pragmatic solutions—solutions that overcame the infection control requirements designed for large metropolitan centres, but which are not practicable for a small rural hospital.

Following my move to Cairns to commence as an academic at James Cook University in 2011, I was asked if I could 'help out' a rural hospital in the Solomon Islands. The request was to meet a key performance indicator for a grant on how to improve their hospital's infection control practices. I jumped at the chance. Not only did I love travel (and had done plenty of it), but I had also been to PNG as a third-year nursing student for 3 weeks and loved the Pacific Island experience, particularly when it came to the provision of healthcare. I had audited plenty of rural hospitals and health clinics in the Kimberley and managed to improve their standards markedly. Naively (and somewhat arrogantly), I thought, 'How hard can this be?'

It was clear to me from when I first arrived that from the outset I couldn't help in the way that I had in the past. It was very apparent that there was very little I could suggest that was going to be practicable and doable using the 'tools' that I had. I had a few suggestions here and there, which related to the decaying hospital infrastructure; the unreliable water supply; the lack of (or out of date) consumable supplies; and the absence of surveillance, audit and other infection control governance activities. However, there were so many impediments to achieving any sort of recognised infection control standards. I was at a loss. It was at that point I admitted to my fellow travellers and colleagues, the same people who asked me 'to help', that the only way I could help was if the staff at Atoifi Adventist Hospital told me what was possible in their context. I could think about alternative strategies so they would still meet recognised infection control standards, but not the same way in which it is done in my world—affluent, Western and founded in science. It was at this point that I knew this was worthy of becoming a research project and, if possible, writing a blueprint for health facilities across culturally and spiritually diverse, resource-limited settings.

Here is my story.

Chapter 1 Introduction

This thesis uses a participatory action research (PAR) approach to explore the understanding of sickness causation and transmission, and to identify infection prevention and control (IP&C) practices, in a remote hospital in the Solomon Islands. This study documents the scientific, cultural and spiritual underpinnings that guide sickness transmission beliefs and IP&C practices, and uses this knowledge to guide the staff in recognising pragmatic, plausible and contextually specific improvements.

1.1 Chapter Outline

Infectious diseases remain prevalent globally, and reducing these diseases in the community and within healthcare settings is paramount for community and staff safety. IP&C planning and practice is the prime governance activity undertaken in healthcare settings to reduce healthcare-associated infections (HAIs). While well-resourced governments and health systems in Western nations rank IP&C highly in their governance structures, it is very different for those countries with limited resources.

This chapter illustrates to the reader the importance of a ‘working’ IP&C program for a remote hospital in the Solomon Islands. With changing political and social landscapes, the study site helps the reader understand why health challenges remain for low- and middle-income countries (LMICs) in the Western Pacific despite global improvements in health technologies. The chapter incorporates a short journal article to provide the motive for the research and why finding contextually relevant solutions to IP&C issues is fundamental for the staff and community of Atoifi Adventist Hospital (AAH).

1.2 Health in the Solomon Islands

Many Pacific Island populations are among the poorest people in the world (Zin, Myint, Htay, & Shamsul, 2014) and the most geographically isolated, and receive only basic provision of goods and services. Approximately 400,000 people in the Western Pacific are infected by preventable diseases every year, with many more unreported and/or undiagnosed. In addition, a 'double burden' is created when countries struggle to manage increasing non-communicable diseases alongside the continued burden from communicable diseases (Australian Government Department of Foreign Affairs and Trade, n.d.). The Solomon Islands is one Pacific Island country (PIC) required to manage this health-related ‘double burden’. Limited burden of disease analysis has been documented in the Solomon Islands; however, 2008 data show that ‘51% of years of life lost’ could be attributed to communicable diseases and the remainder to non-communicable diseases

(41%) and injuries (8%) (Hodge, Slayter, & Skiller, 2015). Of the communicable diseases common presentations include acute respiratory infections, skin diseases, diarrhoeal disease, malaria and tuberculosis (TB) (World Health Organization [WHO], 2015).

1.3 A Change in the Political and Social Landscape

The elite class of Solomon Islanders, which includes politicians, public servants and entrepreneurs, has benefited from colonialisation and westernisation, and has caused the once classless Melanesian society to become class-stratified. The infiltration of multi-national and trans-national corporations has produced a westernised and consumerist culture that has cut across cultural, linguistic and provincial boundaries (Keesing & Kahn, 2014). The integration of national markets has been termed 'globalisation', reflecting the notion that we now live in a 'global village', promising that an 'open market' will result in economic efficiency where everyone gains by having a comparative advantage in something, and that our access to and knowledge about people in different parts of the world is the same as if they were our neighbours in the village (Hillman, 2008). It could be argued that the loser in this phenomenon is social justice. Globalisation in poorer countries advantages leaders who advance their positions for their own gain, leaving those that live outside the realms of the global village, such as those in their own local village at the end of the muddy, unpassable dirt road who are not afforded the principles of social justice (Hillman, 2008).

Many villages in the Solomon Islands have comparatively low levels of schooling (with 27% of females and 32% of males receiving no schooling) and are experiencing population increases (Solomon Islands National Statistics Office, 2015). Local village life involves practising traditional political norms informed by differing cultural, religious and spiritual customs. Traditional gender roles and lower levels of education commonly equate to poorer health outcomes and lower health literacy (Cheer, 2019). Expecting hospitals in remote villages to provide access to quality, equitable, Western-based health services without equal resources is not only unrealistic (Hodge et al., 2015); it could be argued that it is not culturally sensitive and does not afford the principles of social justice.

1.4 Infection Prevention and Control in Resource-Limited Settings

Implementing successful IP&C programs in healthcare facilities in LMICs faces many well-known challenges. As evidenced by the recent measles outbreak in Samoa (Craig, Heywood, & Worth, 2020) the impact that HAI has on a patient, the patient's family, the community, the healthcare staff and the healthcare facility in a developing country is monumental. A high burden of disease, lack of physical and financial resources, poor

hospital infrastructure, poor staff salaries, geographical isolation, and extremes of climate mean that Western IP&C policy and procedure will ultimately fail and will continue to fail unless the influences that local culture, religion and beliefs have on disease transmission are considered.

Current infection control programs are based on the germ theory of disease. A comprehensive infection control program is resource intensive and includes data collection and analysis techniques, infection prevention bundles, treatment using third and fourth generation antibiotics, performance improvement methodologies, highly technical sterilisation and disinfection practices, environmental controls, and hand hygiene agents (P. W. Smith, Watkins, & Hewlett, 2012). Despite the advances in IP&C over the centuries, HAIs still pose a threat to hospitalised patients. At least 10 patients out of every 100 patients in developing countries acquire an HAI, with HAIs being the most common complication of a person's hospital stay (Haque, Sartelli, McKimm, & Abu Bakar, 2018), but—with inadequately functioning IP&C programs—the reality is probably much higher.

While governments in rich countries can afford the resources required to implement an effective IP&C program, what happens in those countries that cannot? The Solomon Islands Ministry of Health and Medical Services expects all health facilities and services to deliver quality of care, much of which is based on Western-based policy and procedure. When countries struggle with the corruption associated with the rising elite class borne out of westernisation and globalisation (Hillman, 2008), and a widely geographically dispersed population, many of which are at the end of a muddy dirt road, the question has to be asked, 'How can they afford to provide a socially just health care system?' Funding quality health service provision to the increasingly wealthy urban population as well as the dispersed rural and remote populations leads to an unequal distribution of resources. However, with an increasingly mobile population, increasing antibiotic resistance and re-emergence of vaccine-preventable diseases in pandemic proportions, the urgency for health systems in developing countries to develop, implement and sustain robust, socially just IP&C programs is critical.

With poor financial resources and weak government infrastructure and control, implementing resource-intensive, internationally accepted Western-based IP&C programs into health services such as AAH only adds to existing social injustices. For IP&C program implementation to be successful, governments, health facilities, and well-meaning Western-based IP&C practitioners need to transform the current approach to IP&C.

Infection control at AAH is almost non-existent, a phenomena that occurs in LMICs across the world despite growing efforts for improvement (Ider, Adams, Morton, Whitby, &

Clements, 2012). The complex mixing of traditional Melanesian spiritual worship with the introduced rituals and practices of Christianity means that the scientific basis of the germ theory, even among the most well-educated Solomon Islanders, is not necessarily believed or understood (Caprara, 1998). The role that culture, religion and spiritual beliefs play in the understanding of disease transmission is poorly articulated in the literature. If epistemological perspectives of the staff, patients and patients' families are at odds with the Western stance (and vice versa) then HAIs will continue to contribute to the burden of morbidity and mortality in non-Western facilities.

1.5 Why Is This Study Important?

It was clear from my own expertise in IP&C program management, my experiences of auditing AAH and the existing academic literature that improving IP&C at AAH through the standard channels was an unachievable goal. What was required for any modicum of success, and for AAH to meet essential international IP&C standards, was input by staff and community on how practices can be improved, thus doing it 'their way', not the 'Western' way. The following published article briefs the reader on the outbreak that provided the driving force behind my initial visit to AAH, and the motivation for this study. It provides an outline of the 'bottom-up' approach used to facilitate the voices of the staff and community so their knowledge and experiences could be shared, ultimately leading to a participatory approach to finding solutions.

1.5.1 Declaration and Contribution for Thesis Chapter 1—Journal Article

This article has been published for *ANMJ* and is not available through Open Access. The article has been written as part of this study and after commencement of PhD candidature.

Details of the publication	**Nature and extent of the intellectual input of each author**
Sparke, V. L., MacLaren, D., Mills, J., Asugeni, R., Moutoa, K., & West, C. (2017). Improving infection control in a culturally, linguistically and spiritually diverse environment. *ANMJ*, *24*(8), 42. (permission granted for publication as part of this thesis)	VS, CW, DM and JM conceived the study and initial design. RA and KM provided the background to the infection control issue, which provided the impetus for the study. VS drafted the paper, and all authors edited and revised the draft and approved the final manuscript.

IMPROVING INFECTION PREVENTION AND CONTROL PRACTICES IN A CULTURALLY, LINGUISTICALLY AND SPIRITUALLY DIVERSE ENVIRONMENT

By Vanessa L Sparke, David MacLaren, Jane Mills, Rowena Asugeni, Kenny Moutoa and Caryn West

Atoifi Adventist Hospital (AAH) in the Solomon Islands serves a population of 80,000 people, many living in small remote villages. Atoifi is situated on the east side of the island of Malaita in the East Kwaio region. Kwaio is one of 12 language groups on Malaita and most people engage in the subsistence economy.

Oral language is the dominant form of communication and most traditional (and contemporary) knowledge is handed down this way. Ninety-five percent of Solomon Islanders identify as belonging to a Christian denomination however the mountain residents of Kwaio retain many traditional practices and ancestral religious beliefs (MacLaren 2009). This includes interacting with spirits of the Kwaio ancestors who are integral to everyday life and who watch their descendants to ensure they keep to a complex set of rules. Following these rules brings prosperity while violation of these rules brings punishment in the form of sickness, death, social and economic misfortune (MacLaren 2009).

Since its opening in 1966, AAH has had a solid reputation for delivering high quality patient care. However due to the hospitals' layout, location of maternity ward and toilet arrangements that do not reflect Kwaio cultural beliefs, many Kwaio who worship their ancestors do not access hospital services.

Being in a tropical environment, a remote location and with limited financial resources AAH faces many IP&C challenges. A 2014 local measles outbreak and a 2015 dysentery outbreak resulted in high (56%) hospitalisation rates (Diau et al. 2014). Although there was community action in response to the outbreaks such as vaccination and hygiene awareness, there was a lack of formalised Infection Prevention and Control (IP&C) practices. AAH, in partnership with JCU is aiming to develop, implement and evaluate the introduction of an IP&C program at AAH. Developing and implementing an IP&C program at AAH requires a sustainable 'bottom-up' approach and needs to be targeted to the local context, yet at the same time meet the minimum requirements of world-wide IP&C practices. Locally appropriate approaches are therefore needed to progress this important work.

Photovoice is one such approach that can be used by a variety of people, across a variety of languages and world views. Photography is used to document people's needs, experiences and perceptions. As a result photovoice enables people to record and reflect their community's strengths and concerns, promote dialogue and share knowledge about issues (Wang & Burris 1997). With staff and patients of AAH being from multiple language groups and having differing religious and cultural beliefs, photovoice offers a powerful means of providing insight into the perceptions of IP&C as well as highlighting the IP&C deficits and opportunities. This bottom-up development allows for an appropriate IP&C plan to be collaboratively developed to heighten implementation challenges and successes in this remote Pacific island hospital.

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Professor Jane Mills is Pro Vice-Chancellor in the College of Health, Te Kura Hauora Tangata at Massey University in New Zealand

Rowena Asugeni is Director of Nursing and Kenny Moutoa is Infection Control Nurse. Both are at Atoifi Adventist Hospital in the Solomon Islands.

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1.6 Thesis Structure

This thesis contains seven chapters. Following the introductory chapter, Chapter 2 provides an in-depth discussion of IP&C challenges faced by countries with limited

resources, and their current endeavours to find solutions. Chapter 2 is presented in the form of a published literature review.

Chapter 3 is provided in two parts. Part A describes the Solomon Islands and situates the research site within the geographical locale, and describes Solomon Island society historically and the culture as it presents today. The impact of colonisation and the infusion of Christianity versus non-Christian (or ancestral) beliefs are explained, particularly in relation to the communities of East Kwaio, where AAH is situated. As a part of Christianisation, the Seventh-day Adventist (SDA) Church founded the AAH. A brief history of health services and healthcare worker (HCW) training at AAH is then described. Part A of this chapter concludes with a more detailed description of the burden of disease and the compelling events that led to this research project.

Part B of Chapter 3 leads the reader into a world where the germ theory is not the primary informer of people's sickness causation and transmission beliefs. The foundations of current IP&C practices, based on the germ theory, are explained, but this is quickly followed by alternative views to the scientific-based germ theory. These belief systems are discussed in three sections: sickness causation, sickness transmission, and subsequent treatment-seeking practices. Part B concludes by describing the role that sociocultural constructions of healthcare systems play in hygiene practices, painting an overall picture of the complexities encountered when trying to adopt a Western-based IP&C program in a culturally and spiritually diverse setting.

Chapter 4 is also presented in two parts. Part A opens with a diary note and a personal account of the journey to deciding the study methodology and data collection method. The chosen worldview, theoretical lens and methodical approach are placed in the context of the research question, and the data collection method of Photovoice is explicitly explained. Importantly in this section, personal accounts of trust-building are revealed, which is essential in PAR. Part B of Chapter 4 is more esoteric and discusses praxiologic moments or events that occurred throughout the data collection.

The findings of the study are presented in Chapter 5. A published manuscript is presented, describing what participants know and believe about sickness transmission in the hospital, followed by the participants' voices expressing what the current IP&C practices are, and their ideas for improvement.

Chapter 6 forms the discussion chapter. The findings of this study are complex and convoluted, and the discussion chapter provides a platform for their interpretation. With such complexity, the discussion may initially appear illogical from an IP&C perspective; however, the underlying factors that inform IP&C practice and beliefs around sickness

transmission at AAH are interlaced and situated in the existing literature. Solutions, as voiced by the participants, are also represented and analysed against the literature. Limitations of the study are discussed.

Chapter 7 provides a concluding discussion and importantly discusses the 'where to next?' question, and what the study means for IP&C in LMICs globally.

The thesis concludes with an epilogue.

1.7 Summary

In this chapter, I have described the health disparities that occur in LMICs, specifically the Solomon Islands, and how these are influenced by the changing political and social situation. The burden of HAIs on the patient, family and community have been described in the context of challenging IP&C environments. IP&C barriers have been situated in the background of not only the changing socio-political situation, but also the cultural, spiritual and linguistically diverse setting, which comprises the Solomon Islands people. The chapter concludes with the rationale for this research.

The following chapter provides the reader with an in-depth look at the broader aspects of IP&C in LMICs and current available opportunities for improvement.

Chapter 2 Background

2.1 Introduction

The concept of disease transmission has been documented as far back as the medieval era, with the bubonic plague killing about one-third of people in Europe. Frequent epidemics of smallpox, influenza, typhus and 'English sweating disease' were also reported to have had high mortality (P. W. Smith et al., 2012). High mortality rates associated with outbreaks of dysentery and typhoid in hospitals during these times made hospitals dangerous places, and the post-operative death rate was around 80% because of lack of asepsis, with large numbers of these succumbing to hospital gangrene (P. W. Smith et al., 2012). Outbreaks during the medieval era indicated that being in close proximity and breathing the same air as those infected led to disease transmission, and this belief was reaffirmed in the 1800s, when hospitals were reportedly 'so filthy with frequent outbreaks' that when those with money became unwell, they were cared for at home (P. W. Smith et al., 2012). However, it was not until Oliver Holmes and Ignaz Semmelweis separately published their findings on the transmission of puerperal sepsis in the mid 1850s that the contribution of HCWs' hands as a mode of transmission of HAI was realised (De Costa, 2002).

Modern day infection control was borne out of the results of the Study on the Effectiveness of Nosocomial Infection Control (SENIC) conducted by the Centres for Disease Control in the 1970s, which proved that comprehensive infection control programs could improve HAI rates (P. W. Smith et al., 2012). The development of IP&C programs resulting from the study were first adopted in rich Western countries and then implemented in LMICs. Despite the advances in IP&C over the centuries, HAIs still pose a threat to hospitalised patients. Between 10 and 25 patients out of every 100 patients in LMICs acquire an HAI (Desta et al., 2018), with HAI being the most common complication of a person's hospital stay (Haque et al., 2018).

While governments in rich countries can afford the resources required to implement an effective IP&C program, countries with limited resources cannot. Many countries struggle with increasing westernisation and corruption, increasing and geographically dispersed populations, and the inherent disparities that result from globalisation, yet these countries are expected to implement resource-intensive and expensive IP&C programs developed by and for Western nations. The urgency for health systems in LMICs to develop, implement and sustain robust IP&C programs is critical. However, with limited financial resources and often weak government/governance infrastructure and systems, implementation of the

resource-intensive, internationally accepted Western-based IP&C programs is not sustainable.

Countries with limited resources are fully aware of the impediments they face in implementing and sustaining IP&C programs. The following published manuscript (Sparke, Diau, MacLaren, & West, 2020) is an integrative review of the available literature on the measures that many countries have implemented in an attempt to improve their IP&C practice.

2.2 Infection Control Challenges in Developing Countries

2.2.1 Declaration and Contribution for Thesis Chapter 2—Journal Article

This article has been published by the *International Journal of Infection Control* and is freely available through Open Access. The article was written as part of this study and after commencement of PhD candidature.

Details of the publication	**Nature and extent of the intellectual input of each author**
Sparke, V. L., Diau, J., MacLaren, D., & West, C. (2020). Solutions to infection control challenges in developing countries, do they exist? An integrative review. *International Journal of Infection Control*, *16*(1). https://www.ijic.info/article/view/19332 (free open access)	VS undertook the database searches and drafted the integrative review. CW and DM provided guidance throughout the development of the draft. JD provided input from the perspective of a healthcare worker in a limited resource setting, and the manuscript's suitability and readability in this context. All authors edited and revised the draft paper and approved the final manuscript.

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REVIEW

Solutions to infection prevention and control challenges in developing countries, do they exist? An integrative review

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Abstract

Implementing sustainable infection prevention and control (IP&C) programs in developing countries is challenging. Many developing countries experience high burdens of disease and political instability. In addition, they are affected by geographical and climatic challenges, and have unique social, cultural and spiritual beliefs, all of which contribute to a higher prevalence of infections. The aim of this integrative review is to identify existing solutions to the challenges faced by developing countries when implementing IP&C programs. An extensive literature review was conducted to explore improvements in infection control in rural hospitals in developing countries. Three electronic databases were searched for relevant articles written between 1980 and 2018, published in peer reviewed English language journals, and relating to hospitals, not community settings. The findings indicate that developing countries continue to face many challenges in implementing IP&C programs. Limited success has been described with some IP&C program components but it is clear that little original research on the topic exists. Notably scarce are studies on the influences that culture, religious and spiritual beliefs have on IP&C program implementation. This review highlights opportunities for further research into healthcare workers perceptions of disease causation and infection transmission, and the role this plays in the effective implementation of an IP&C program. By exploring these opportunities appropriate and culturally sensitive solutions may be identified, which can assist with the design and implementation of culturally relevant IP&C programs in these settings.

Keywords: Infection control, professional practice, developing countries

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Background

Infection prevention and control (IP&C) internationally is important for patient safety and quality care, but is challenging in developing countries. The prevalence of healthcare associated infections (HCAI) is higher in developing countries than developed countries;[1] however the lack of formalised surveillance and audit means the true statistics are not revealed, leading to the assumption that the reality is substantially worse than the limited documented evidence suggests. The impact an HCAI has on a patient, the patient's family, the community, the healthcare staff and the healthcare facility in a developing country is monumental and compounded by high burden of disease, lack of physical and financial resources, poor hospital infrastructure, poor staff salaries, geographical isolation, and extremes of climate.

Defined as a country with less than $1,230 (US) gross national income per capita, "developing countries" is a term often used interchangeably with lower middle income (LMI), resource poor, and least developed country (LDC).[2,3] These countries face severe structural impediments to sustainable development due largely to economic vulnerability.[3] One of the associated effects is the higher prevalence of HCAI and high rates of mortality and morbidity due to communicable diseases.[1,4,5]

In developed countries, successful implementation of evidenced-based infection control programs is driven by many factors including patient stay data, publicly reported HCAI rates, media attention, and litigation potential.[6] Generic components include hand hygiene monitoring, isolation precaution practices, cleaning, sterilisation and disinfection, investigation and management of multi-drug resistant organisms, staff immunisation, surveillance and monitoring of invasive devices, all of which require physical resources, working healthcare infrastructure, financial support and educated IP&C staff.[7] In addition, local factors such as climate, geography, sociocultural, socioeconomic, political and demographic conditions, high costs of treatment, and antibiotic prescription habits make the implementation of IP&C programs developed by highly resourced western countries almost impossible to implement in resource poor settings.[6] Despite nearly 40 years of IP&C evidence, practice and knowledge, health systems within developing countries continue to be challenged in the implementation of sustainable programs and therefore hindered by high burdens of disease and infections.

Given the influence that local factors have on the health systems ability to deliver IP&C programs in developing countries, local adaptation is essential. With limited evidence in the literature[8] that describes the social, religious, spiritual and cultural influences contributing to disease transmission in healthcare settings in developing countries, this review identifies a critical gap in the current body of knowledge.[9]

Method

A systematic search of online databases was undertaken using keywords and their synonyms, and was broadened to search keyword truncations (*). The PICO (problem, intervention, comparison, outcome) method was used to identify the following keywords: "infection control" AND improvement AND practice.[10] The terms "infection control", improvement, practice, improve*, and practic*, were entered into CINAHL, Scopus, and Ovid Medline with a further search term AND "developing count*" added to limit the search to include literature pertaining to developing countries only. For literature that may have not been captured in the initial search, the synonym "limited resource" was used instead of "developing count*", and "communicable disease control" was used instead of "infection control", however the latter search did not reveal anything further as literature tended to focus on issues around disease control in public health rather than in healthcare facilities. The search was limited to studies written in English and published later than 1979. The date was chosen as it follows the publication of the *Study on the Efficacy of Nosocomial Infection Control (SENIC)*, the pioneering study which demonstrated the efficacy of hospital infection control programs.[11]

A total of 1763 titles and abstracts were identified during the initial search. Following preliminary screening using inclusion and exclusion criteria (Table I), 71 articles were retained, printed and read. Seven articles were further identified using ancestry

searching of reference lists. After removing duplicates (n=20), 58 articles were read in-depth resulting in a further 42 articles being excluded. Of the 42 excluded articles, secondary screening revealed that while improvements in IP&C were discussed briefly, solutions were either not offered, or at best, mentioned without any further explanation. A final number of 16 articles were synthesised and included in the present review (Table II). An adapted PRISMA flow chart was used to document the selection process during the review (Figure I).[12] The Critical Appraisal Skills Programme (CASP) evaluation checklist was applied to assess the quality of research articles, however as only four of the final 16 were research articles, with all other sources being reviews, opinion pieces, discussion articles, and commentaries, the CASP evaluation tool for systematic reviews was also utilised.[13]

Table I. Literature search inclusion and exclusion criteria

Inclusion Criteria	Exclusion criteria
Published in English language	Published in languages other than English
Published after 1979	Published prior to 1980
Published in peer reviewed journals only	Focus on the Public Health domain
Based in healthcare facilities	Based in tertiary hospitals in large cities
	Disease specific focus
	Ward specific focus

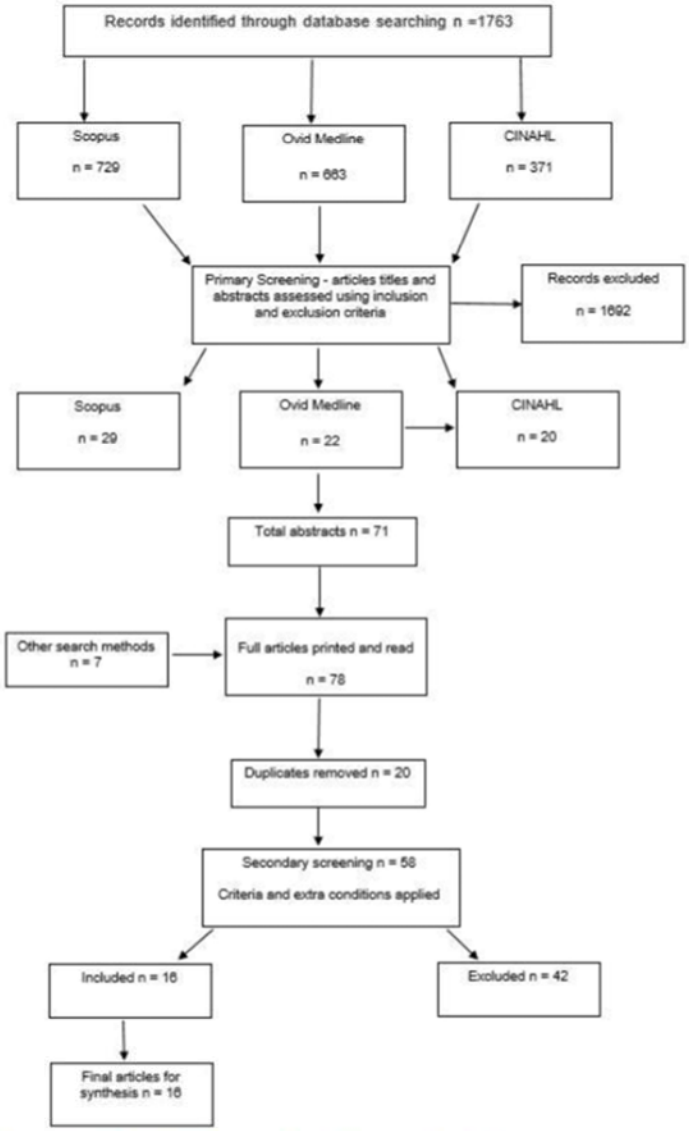

Figure 1. Modified PRISMA diagram indicating literature selection[12]

Table II. Literature summary included in review

Authors and year	Title	Country/ Region	Type	Aims	Methodology and design	Sample type	Analysis	Key findings
Allegranzi, Memish, Donaldson, and Pittet (2009)	Religion and culture: Potential undercurrents influencing hand hygiene promotion in healthcare	Global	Review	Investigate religio-cultural factors that may potentially influence hand hygiene promotion				An awareness of commonly held religious and cultural beliefs is vital when attempting to apply concept of modern medicine and good clinical practice.
Bardossy, Zervos, and Zervos (2016)	Preventing Hospital-acquired infections in Low-income and Middle-income countries: Impacts, gaps, and opportunities	Global	Review	Explore approaches to IP&C program implementation in low and middle income countries.				IP&C programs in LMI countries should be simple, cost-effective and designed to suit local needs and circumstances, however more studies are recommended.
Damani (2007)	Simple measures saves lives: An approach to infection control in countries with limited resources	Global	Opinion	Discuss simple measures to IP&C in countries with limited resources.				Application of basic infection control measures is achievable and affordable in countries with limited resources and subsequently save lives.
El-Nageh (1995)	How to combat nosocomial infections in developing countries	Global	Opinion	Combating nosocomial infections in developing countries suggesting multi-modal appraoches				Tackling nosocomial infections requires a surveillance system, provision of basic infrastructure and resources, wound infection management and antibiotic resistance testing.

Meers (1988)	Infection control in developing countries	Global	Opinion	Discuss problems and solutions to infection control in developing countries.				Problems arise from difficulties in communication between individuals, variation in the spectrum of diseases and from lack of money. Nurses should take take the lead in applying principles of IP&C.
Mehtar, Marais, and Aucamp (2011)	From policy to practice – Education in Infection Prevention and Control	South Africa	Original article	Address methods of teaching which may be helpful in imparting evidenced-based knowledge and understanding of the basic principles of IP&C at different levels of healthcare in Southern Africa.				IP&C should be promoted across all levels of health care workers but its success depends upon engaging the public in the process using simple concepts, local conditions and disease profiles.
Mugomeri (2018)	The efficacy of infection prevention and control committee in Lesotho: A qualitative study	Lesotho, Southern Africa	Original research	Evaluate the effectiveness of infection control committees in the Southern African country of Lesotho.	Qualitative exploratory study; open interviews	Purposive sample, 16 key informants	Grounded theory	Infection control committees were ineffective for the following reasons; poor sense of competence, administrative constraints, inadequate financial support, role uncertainty and negative staff attitudes.

Pittet et al. (2008)	Infection control as a major World Health Organization priority for developing countries	Global	Review	Review of the implementation of the first WHO Global Patient safety Challenge 'Clean care is safer care' launched in 2004.	The first Global Safety Patient Safety Challenge is offering a strategy and tool to make a difference in infection prevention and patient safety, however surveillance data is still lacking. Data acquired from a variety of settings in a variety of cultures and systems will help close the gap.
Raza, Kazi, Mustafa, and Gould (2004)	Developing countries have their own characteristic problems with infection control	Global	Review	Describe characteristic problems with infection control in developing countries, issues and suggestions for improvements.	Only policies adapted to local conditions, owned and practiced by local experts and workers are likely to be sustainable. Funding is the key issue and initiatives could fail due to a lack of sustainable resources.
Shears (2007)	Poverty and infection in the developing world: Healthcare-related infections and infection control in the tropics	Sub-Saharan Africa	Discussion	Discuss healthcare related infections in the tropics suggesting economic change and multi-modal approaches	Infection control activities are limited by poor infrastructure, overcrowding, inadequate hygiene and water supply and poorly functioning laboratory services. There is a need to reduce the burden of healthcare related infections in the tropics, and set up effective surveillance programs.

Sobayo (1991)	Nursing aspects of infection control in developing countries	Global	Opinion	Discuss nursing aspects of infection control in developing countries.				The problems that developing countries have with nosocomial infections are ill-defined and misunderstood by developing countries. Solutions will only evolve if there is cooperation between countries and provision of help where appropriate.
Zimmerman, Yeatman, Jones, and Murdoch (2015)	Success in the South Pacific: a case study of successful diffusion of an infection prevention and control program	Republic of Kiribati	Original research	Explore the role of the Diffusion of Innovation framework in adopting an IP&C program in a low and middle income country, the Republic of Kirabati.	Case study. Triangulation process using multiple sources of evidence, both qualitative and quantitative. Semi-structured interviews, IP&C documentation, program evaluation and healthcare worker surveys.	Single case study	Thematic analysis and descriptive statistics	The classic Diffusion of Innovations for Organisations is a model that can explain the adoption of the IP&C program in the Republic of Kiribati, and may be useful as a framework for other LMI countries to follow.

Results

The 16 articles included in the review consisted of three qualitative and one quantitative research design, four reviews, four opinion pieces, three original articles, and one discussion paper. Formal data collection methods consisted of interviews, surveys and observation, with the range of suggested practices including education activities for nursing staff and including consumer input to utilising a systems approach and restructuring hospital governance processes. Commonly a combination of practices was suggested to improve IP&C success but most often these reflected modified western practices.

The opinion pieces, practice forum and discussion paper focussed more generally on the overarching problems associated with implementation of IP&C and the change management needed to ensure a modicum of success.

Data quality varied across the 16 articles due mainly to the variety of documents included in the review. The four research papers had undergone peer review prior to publication but the opinion pieces reflect that they are an educated opinion and as such do not adhere to a rigorous study process. Despite this, all non-research papers were published in peer review journals.

Review of data quality revealed that one study[14] reported observation bias having influenced their findings. The same authors also described time constraints and non-representative sampling as limitations. Other studies cautioned against generalising results to a wider population due to the qualitative nature of the research methodology[15,16] and one study[17] identified that the sample size was relatively small which may have limited their results. Table II provides a summary of the articles included in this review.

The five over-arching themes identified across the sixteen publications in relation to the implementation of IP&C programs in resource poor settings were: (1) education, (2) governance, (3) systems, (4) consumer involvement and (5) multi-modal approaches.

Education

The education of healthcare workers is essential to improve practices and healthcare worker education has a positive impact in reducing healthcare-associated infections.[18] Despite this, education and training were only recognised in five publications as the primary driver in improving IP&C in developing countries. Meers[19] and Sobayo[20] both identified that nurses were the key and should take the lead in improving IP&C practices in developing countries, yet education about IP&C in nursing curriculum was very limited. Sobayo[20] suggested that in many developing countries nurses were more likely to introduce good infection control practices due to their concern for procedural standards, therefore should be appointed as infection control specialists and provided with appropriate education at approved institutions. The author did recognise that courses in developing countries were limited and expensive, and that more formal courses were required. Meers[19] also recognised that education for nurses around IP&C was limited and a lack of knowledge about emerging IP&C practices by nursing tutors made it difficult to educate nursing students, and suggested low-key input at the nurse training level as a strategy for least developed countries. Despite arguing that education was the solution to improving IP&C practices in developing countries, both authors recognised that a lack of material and financial resources, poor hospital infrastructure and the spectrum of diseases encountered all provided educational challenges.

In an attempt to understand what informed IP&C knowledge in rural Indonesian health care workers (HCWs), Marjardi and McLaws[15] found that despite the availability of IP&C programs HCWs still had limited knowledge which resulted in unsafe clinical practice. A lack of control systems in the education and clinical setting allowed for non-evidenced-based teachings and therefore non-evidentiary practice. The study revealed that IP&C knowledge was influenced by societal expectations, and HCW knowledge was influenced by their superiors, which was based on clinical experiences rather than evidence-based decisions. Nurses in rural Indonesia reported an unavailability of textbooks during their post-basic practice therefore relying on practical lessons to improve their knowledge. Again, this experiential learning was perceived to be of greater value than knowledge gained through formal education. The constructs of IP&C knowledge that emerged from the study revealed that in the absence of HCAI surveillance results, laboratory, and diagnostic support, clinicians opted for observed and experiential practices. Marjardi and McLaws[15] concluded that evidenced-based IP&C education would be beneficial for HCWs in rural Indonesia and that this should be appropriate for low-resource health care facilities.

Mehtar, Marais and Aucamp[21] agreed that changing ingrained practice through evidenced-based education is an important step in improving IP&C practice in developing countries and that formal IP&C courses in LMI countries were lacking. In South Africa, IP&C education was mostly undertaken towards the end of or after medical students' undergraduate training, therefore IP&C practices were behaviourally developed rather than being evidenced based. In describing a locally developed IP&C educational structure the authors recognised that courses should be contextually appropriate and that local capacity building around IP&C knowledge and teaching is important for courses to remain sustainable.

Education programs tailored to the specific local context was a recurrent theme across the five papers. Jones, Whitfield, Thomas *et al.*[5] described a program in Tanzania which abandoned traditional didactic teaching methods, and offered a blended approach using theoretical learning, group work, quizzes, role-play, self-assessment and practical hand hygiene. Transcultural strategies such as use of local language by the educators, allowing time for traditional greetings, sharing of photos of family, and praise for current IP&C strategies gained trust between the educators and the participants. Whilst there was no formal pre-course, post-course assessment to ascertain learning, feedback via daily quizzes indicated an improvement in knowledge. What was also fundamental to success was having specific "change champions" to persist with the implementation of change. Not only did this prove highly important in building capacity but it provided an avenue for sustainability.

Governance

Poor governance of IP&C leads to adverse patient outcomes.[22] Monitoring of evidenced-based practice and guideline use, adherence to clinical pathways and models of care, and provision of cost-effective health service delivery are all ways in which effective governance of IP&C can be measured.[23] The implementation of effective guidelines underpinned by IP&C programs requires the existence of, and leadership by, an IP&C committee, which in turn requires organisational support, yet only one paper discusses governance in depth as the way forward. Despite the acknowledgement that most referral and district hospitals in developing countries had established multi-disciplinary IP&C committees, only one paper described the effectiveness of IP&C committees in implementing infection control programs. Mugomeri[17] recognised that the strength of an infection control committee was indicated by their capacity to proactively deal with IP&C issues, however the study revealed that hospital infection control committees were largely ineffective. The central emerging theme was that weak leadership and poor governance was the major barrier to effectiveness, however subthemes included a sense of incompetence, administrative and time constraints, role uncertainty, financial disincentives and negative staff attitudes.

Systems

Utilising a systems approach has been shown to improve IP&C practice in developed countries. Systems such as continuous quality improvement (CQI) increase the effectiveness and efficiency of care, and can optimise systems of care while utilising existing resources;[24] however, publications that describe the experience that developing countries have in implementing CQI models or frameworks to improve IP&C practices are limited.[24] Three papers described the adaptation of western-based systems as models to improve IP&C. The 'Plan, Do, Study, Act' (PDSA) cycle as a CQI model for improving IP&C practices in developing countries is discussed in two papers. Huskins, Soule, O'Boyle *et al.*[24] described how the principles that underpin the PDSA cycle, which have been well tested as a healthcare CQI model in developed countries, were applied to a developing country. The authors took into consideration the lower resource setting and suggested possible changes from the western-based model at each step of the cycle.

A more successful translation of the PDSA cycle to a developing country is described by Kong and Kong[14] who explained a simple yet effective method of improving awareness and practice of hand hygiene. At the 'Do' stage of the cycle, localised and simple strategies were implemented and included educational presentations, simple diagrammatic posters, increasing the availability of alcohol-based hand rub (ABHR) and the introduction of '"infection control champions", all of which were found to be successful.[14] The authors recognised the limitations of their study; encouragingly, given the known biases, the authors found the improvement in hand hygiene episodes rose from 13.4% to 48.6%.

The diffusion of innovation framework has also been shown to be successful in the adoption of a comprehensive IP&C program in a low-middle income country. Diffusion of innovation theory describes "the process by which an innovation is communicated through certain channels over time among members of a social system".[8] Diffusion of innovation theory emerged from agriculture and education but is now widely used in health sciences.[25] Zimmerman, Yeatman, Jones *et al.*[16] demonstrated the model could be successfully used to explain the adoption of an IP&C

program in a developing country, and illustrated how the end users with little involvement from external agencies could implement an IP&C program.

Consumer participation

Health systems should be responsive to consumers' expectations and needs, which means health services should actively seek out opportunities to improve their understanding and awareness of consumers' views.[26] In the context of a developing country where consumers' culture, and spiritual and religious beliefs are central and vastly different from that of a developed country, considering these when improving healthcare practices is vital. In spite of this acknowledgement, only three of the 16 papers specifically commented on the importance of patient involvement, culture and religion when improving IP&C practices.[27-29] Bardossy, Zervos and Zervos[28] recognised that it was important to consider that behavioural, transcultural and religious factors may affect outcomes when planning IP&C interventions. Taking into consideration cultural dimensions such as power imbalance in the workplace had shown successful improvement when implementing IP&C strategies in some Anglo-Saxon and Scandinavian countries, however the authors acknowledged that the lack of information around cultural dimensions in developing countries made it difficult to translate these practices.

The importance of culture and religion is also recognised by Allegranzi, Memish, Donaldson *et al.*[27] particularly when implementing hand hygiene measures. Poor hospital infrastructure, such as a lack of sinks and running water, means that simple interventions such as hand hygiene are difficult to implement in developing countries and while Pittet, Allegranzi, Storr *et al.*[29] suggested the use of ABHR as a solution, encouraging the practice of hand hygiene and the use of ABHR is not culturally sensitive in some settings. The role that religion and culture have on influencing hand hygiene practices of healthcare workers was profoundly influenced by culture and religion.[27] Many hand hygiene practices were associated with daily prayer rituals and not necessarily for hygiene requirements. Alcohol prohibition in religions such as Buddhism, Islam and Sikhism prevented the use of ABHR by healthcare workers, and hand gestures such as the designation of a 'clean' hand and an 'unclean' hand, and the specific cultural meaning of folding hands as a form of greeting influenced how health care workers perceived hand hygiene education messages.[27] Consulting local religious authorities played an important role when developing local programs around the use of ABHR, and developing culturally appropriate hand hygiene promotional materials in collaboration with health care workers was suggested. The recognition of patient involvement, and religious and cultural issues when developing IP&C programs was discussed as a 'lesson learned' by Pittet, Allegranzi, Storr *et al.*[29] when piloting global IP&C recommendations.

Multi-modal approaches

Four of the 16 publications discussed that the successful implementation of any infection control program required a multi-modal approach. All authors agreed that designated staff responsible for infection control activities who were appropriately trained was essential to success.[6,30-32] Provision of training needed to be simple and practical[30,31] incorporated into other training activities two or three days very year and with uncomplicated textual materials.[31] Provision of a short list of 'do's and don'ts' was suggested as being more appropriate and liable to lead to success than using complicated infection control manuals.[6]

While the authors recognised that hospitals in developing countries are not well equipped with isolation facilities and that positive and negative pressure rooms are rarely available,[6] the provision of infrastructure that allowed for the isolation of patients with communicable or multi-resistant infections in either single rooms, or through cohorting, was a useful, simple and no-cost IP&C measure.[6,30,32] Appropriate antibiotic use was seen as challenging in developing countries due to increased numbers of unqualified providers, self-prescribed over the counter purchases, poor quality control in drug production,[6] a lack of susceptibility testing facilities[31] and practices leading to disproportionately high rates of multi-resistant organisms. The development of local antibiotic use programs which included a six monthly rotation of available prescription-free antibiotics was recommended to address the high antibiotic resistance rates[6] coupled with improving laboratory

facilities, improved susceptibility testing[32] and sample sensitivity testing to detect alterations in resistance patterns[31] were suggested as important measures to improve IP&C.

The improvement in hand hygiene practices was recognised as an important strategy in three of the four papers despite the acknowledgement of poor water supplies and a lack of resources.[6,30,32] Promoting good hand hygiene practice and the provision of soap and water was suggested despite evidence that compliance rates using the same method in some European hospitals was generally low.[6,30,32] The use of ABHR instead of soap was proposed as it negated the need for installation of extra taps and basins, however the authors admitted the lack of availability of ABHR was challenging. Local innovations such as supplying ABHR in appropriately improvised plastic dispensers was an inexpensive way of improving hand hygiene practices[6] but again this was contraindicated in a number of countries due to religious and cultural restrictions around the use of alcohol.

All papers identified administration environments as a potential problem to successful implementation of IP&C programs and practices.[6,30-32] Unclear accountability and responsibility of administrators and managers of healthcare facilities often resulted in stalled change processes with service delivery. El-Nageh[31] acknowledged that despite the similarities between health facilities in relation to services offered and number of beds, the differences between them made generalised infection control interventions difficult to apply. Although the authors advocated for simple multimodal measures such as a surveillance system which reflected the characteristics of the hospital in combination with an infection control committee which could implement programs suiting the size of the facility, and minimal, time saving education programs, the uptake and sustainability of the approach by health systems in many developing countries was poor.

Although the uptake of El-Nageh's[31] three tier IP&C program was poor, the essence of the design meant it could be applied to meet the essential needs of small facilities through to facilities which provided more complex care. Similarly, Damani[30] agreed that to reduce HCAI in developing countries, minimal, cost-effective measures that suit the local needs and circumstances must be applied. Damani highlighted that by monitoring hospital IP&C performance, changes in IP&C practice could be made. Importantly, only basic surveillance which identified the key issues or concerns relevant to the facility should be undertaken. Although Damani's suggestion mimics western IP&C practice, for resource limited settings simple process surveillance is not only cost-effective but identifies immediately unsafe IP&C activities, and feedback to healthcare workers to improve practice can occur without delay.

Discussion

There is much rhetoric in the literature around why and how IP&C practices in developing countries should be improved, but there is a paucity of research publications describing any comprehensive and sustainable solutions. There were individually tailored components of programs mentioned throughout all of the literature; however, there was little depth to most of these discussions. The colonialist undercurrent that pervaded much of the literature indicated that while the need for local solutions is recognised, there is very little to prove that this is happening.

Since the release of the SENIC project in the late 1970's, education has been recognised as pivotal in improving practice in developing countries, and both Meers[19] and Sobayo[20] recognised that nurses could undertake this role. Given that at the time of these publications the SENIC project was only ten years old, barriers such as a lack of formal courses, unavailability of textbooks and overall ignorance of this emerging specialty made it difficult for nurses to be educators. Almost 20 years on and the same challenges facing educating healthcare workers in developing countries continue to exist. In addition to the known barriers, in many developing countries there is evidence to suggest that community expectations depart from recognised programs which encourages non-evidentiary practice, and the continuation of ingrained behaviours over any formalised IP&C training.[15,21]

The scientific and bio-medical principles that underpin IP&C programs world-wide are the same, and for developing countries improving patient

outcomes requires the adoption of scientific based IP&C standards and programs, strong leadership and organisational support.[17] The literal adoption of programs developed by western countries into a resource poor setting has been limited in their success, and may be improved through an integrative approach between western-based and locally developed standards.[5,33] Education of healthcare workers and an understanding of what informs peoples practice have been shown to reduce HCAI rates; however, for this to occur in developing countries education programs need to be developed towards specific healthcare contexts. Using non-didactic, alternative teaching strategies and incorporating informed transcultural approaches not only help gain trust between educators and participants but also enable learning to occur in a culturally sensitive way.[5]

Continuous quality improvement is well recognised and actively practiced by healthcare organisations in developed countries; however, this is not the experience in developing countries. Resource limitations mean that the adoption of CQI activities in developing countries is absent or varied, yet when effectively applied, CQI models do have the ability to optimise care while utilising limited available resources. The PDSA cycle is one well-tested CQI model which has been theoretically applied to demonstrate the decrease in surgical site infections in a larger hospital in a developing country,[24] while in a smaller hospital, the PDSA cycle was effectively used to improve hand hygiene rates by adapting western concepts to the local setting.[24] Understanding the social connectedness and communication channels that occur during the natural implementation of an IP&C program in a developing country can motivate hospital staff to independently take ownership of the process.[16]

It has been acknowledged frequently in the literature that collaborating with community in adapting and developing programs and involvement in implementing IP&C programs in developing countries is pivotal, yet there were few realistic examples. Success has been demonstrated through locally developed educational activities, locally made hand hygiene products, surveillance activities that target locally relevant diseases, and adapting CQI processes to suit available resources.

Cultural information around healthcare implementation practices was scarce. The influence that culture, religion and spiritual beliefs have on patient and healthcare worker perceptions of causation and transmission of disease, and the impact these have on IP&C program implementation, was missing in much of the literature. The health systems approach to IP&C is based on the germ theory of disease transmission, yet it is only one of the explanations for disease transmission in many locations. Religion and culture play an important role in the health of people in many countries, so to adopt IP&C practices, such as using ABHR for hygiene purposes, may be detrimental to the health of populations due to breaking religious rules around alcohol use. So, while healthcare providers may believe in the germ theory of disease, other influential beliefs play a pivotal role in healthcare practices in some countries.

The differences in culture between countries mean that a blanket approach will be ineffective.[28] Building IP&C capacity through partnerships is a powerful strategy to improve IP&C in developing countries. For this to be successful and sustainable, healthcare facilities must be not be seen as passive recipients, but as active participants. When international IP&C programs ignore the social, economic and cultural determinants of health, the implementation of these programs will ultimately fail.[28] The importance of capacity building at an international level and the involvement of ministries of health and other health institutions when developing suitable programs are important because when people transcend borders, so do infections.[28]

Implications for practice

Understanding how healthcare workers from different cultural, religious and spiritual backgrounds view causation of infection and infection transmission, and identifying the issues around established IP&C practice as understood by healthcare workers, are areas needing further research. Only then can culturally relevant and sustainable IP&C practices be implemented to improve patient outcomes. There is

potential for experienced IP&C practitioners to work with healthcare providers in developing countries to enable them to come up with their own solutions to IP&C issues. Programs that are community owned and developed, and are culturally inclusive, can be enriched over time. There have been some successes in implementing segments of IP&C programs using locally adapted approaches and collaborating with healthcare organisations, however participatory research approaches must be considered to identify the meaning of IP&C as perceived by the people that deliver healthcare in developing countries.

Limitations

Searching for literature written in English language only was a limitation of this review. Given the aim of this review it is possible that studies, particularly by authors from developing countries, will have been missed. While the terms "developing country" and "limited resource" were entered into the databases, other terms such as "lower-middle income" were often used as a synonym within the literature, a term that was not used in the initial search.

Conclusion

Improvement in IP&C practices in developing countries is complex and while programs exist, barriers and challenges mean that a one-size-fits all approach does not work. What may be beneficial is a locally adapted, well-tested framework to support program development, which includes for sustainability, a bottom-up program for capacity building of healthcare workers. Embedded throughout the program to encourage success, must also be the principles of good governance and a clear regard for culture, language and religious or spiritual beliefs.

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2.3 Conclusion

It is clear in the literature that improving IP&C practices is difficult in LMICs and that something has to change. LMICs need to change the way they do things, but the 'rest of the world', including Western-based IP&C practitioners, need to transform the way IP&C is

conceptualised and practised. Health facilities that serve populations in LMICs need to go beyond merely adopting international IP&C standards based on a Western scientific understanding of disease transmission. For those with local religious and cultural beliefs that have served these populations for generations, this will only be lip service. Incorporating non-Western beliefs around how and why infection is transmitted in healthcare facilities into health service policy and procedure is necessary if we are to create a collaborative, sustainable and robust program that will become meaningful to the HCWs intrinsically involved.

Chapter 3 provides the geographical, cultural and spiritual context in which this study is situated. The chapter also provides a brief history of Western-based healthcare, introduced through missionisation and colonisation, and the influence that this has on the study site of AAH.

Chapter 3 Placing the Research in Context

3.1 Chapter Outline

This chapter is presented in two parts. Part A sets the scene for the study site. It describes the geographical, historical, cultural and spiritual context, which has influenced the Solomon Islands society and health systems. Part B guides and explains the alternative lens of sickness causation and transmission beliefs, the lens that does not incorporate the germ theory.

3.2 Part A—The Solomon Islands, Malaita and the East Kwaio Context

3.2.1 Geography, People and Economy

The Solomon Islands is situated in the south-west Pacific Ocean, east of Papua New Guinea (PNG) and north-west of Vanuatu, and consists of over 900 islands and atolls (Hodge et al., 2015) with a land area of 28,400 square kilometres (Asugeni, 2014). As a double-chain volcanic archipelago, the Solomon Islands sits within the Pacific 'ring of fire', making it vulnerable to earthquakes and tsunamis, and despite the mountainous topography, the terrain in many parts is vulnerable to sea level rises (Hodge et al., 2015). The climate is typical of the tropical zone, bringing high levels of heat, humidity and precipitation all year round.

The majority of Solomon Islanders are Melanesian, more specifically, descendent from the Austronesian peoples. The language is related to that of the Philippines and Indonesia and is ancestral to many of the languages of central and eastern Melanesia and Polynesia. Despite the closeness to PNG, which is largely occupied by Papuan speakers, culturally, Solomon Islanders are more closely related to the other Austronesian speakers of Vanuatu, and their religious systems are similar to those in Polynesia. The Austronesian speakers were thought to have sophisticated seafaring technology and had elaborate and complex cosmologies and religious systems. A system of hereditary chiefs with political-religious authority (Keesing & Kahn, 2014) remains reflected in much of the Solomon Islands society today.

The Solomon Islands consists of nine provinces (Figure 1), Rennell-Bellona being the smallest, with a population of approximately 5000, and Malaita the largest, with a population of approximately 171,000 people (Solomon Islands National Statistics Office, 2015). Many Solomon Islanders position themselves first as part of a clan, then as descendants from a particular island, and last as Solomon Islanders. Up until the late 19th century, Malaitans lived in kin-based groups, related to each other by descents in an established hierarchy

(Moore, 2017). There are over 70 language groups in the Solomon Islands, and well before colonisation, there existed longstanding conflicts between these language groups (Watson, 2005). East Kwaio, the location of this research, is located on the mid-eastern seaboard of Malaita, is home to over 10,000 people, and forms one of Malaita's 10 language groups (MacLaren, Asugeni, Asugeni, & Kekeubata, 2009). Malaita has a limited road system, with only three major roads traversing the island, which means except for coastal shipping, there is little modern motorised transport. However, carriage of goods and communication thrives because of the extensive network of walking tracks and waterways, where travel via canoes and small motorised boats is the norm (Moore, 2017).

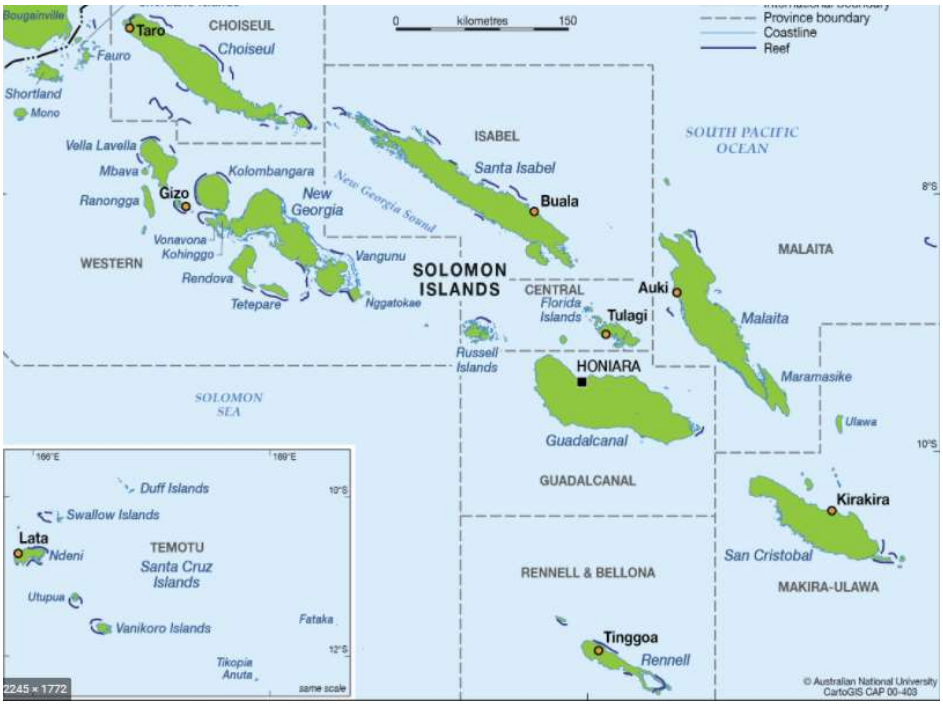


Figure 1: Solomon Islands provinces and capitals

The Solomon Islands Government provides little support to rural areas, yet 85% of Solomon Islanders still live there, supporting themselves by subsistence agriculture (Gegeo & Watson-Gegeo, 2002). Approximately one-third of the East Kwaio population lives in the mountainous interior, and the remainder live on the narrow coastal strip (MacLaren et al., 2009). Prior to colonialisation, most people of Malaita lived in the mountains; however, colonialisation brought schools, health clinics and Christianity, which along with government services, cash crop marketing and roads, attracted many modern Malaitans to the coast (Moore, 2017). The rich soil and warmer coastal temperatures provide the coastal villagers with excellent growing conditions for tropical fruits and vegetables, with root crops being cultivated in the cooler inland and mountainous regions. Large shallow lagoons surrounded by mangroves and reefs that fringe many of the shores of Malaita provide a rich environment

for fish, shellfish and other marine life, all of which help provide trade commodities such as porpoise teeth and essential dietary requirements such as protein (Moore, 2017). Raising pigs, and traditional artefacts and crafts, now form a strong part of the subsistence economy (Asugeni, 2014), and produce, which was traditionally traded between the coastal and inland peoples, is now collectively bought and sold for cash at coastal markets. Societal norms dictate that any wealth accumulated, in the form of pigs, food crops or traditional currencies, is shared with relatives, creating an obligate relationship where reciprocation is required. Similarly, wealth cannot be accumulated for transmission to future generations as social mechanics ensure the constant circulation of these valuables (Hauriasi & Davey, 2009).

3.2.2 History—Pre- and Post-Colonial

Malaitans have traced their ancestry as far back as 20–30 generations (between 3500 and 5000 years); however, archaeological and genetic evidence suggests that people have lived on the island for possibly longer than 10,000 years (Moore, 2017). Because of their Austronesian ancestors, Malaitans differ in language, skin colour and often hair colour from their Papuan-speaking western island neighbours (Moore, 2017).

The first recorded European contact with indigenous Solomon Islanders was by the Spanish explorer Álvaro de Mendaña de Neira in 1568. While both naval and merchant shipping through the Solomon Islands increased following the settlement of Sydney, Australia, in 1788, it was not until the 19th century that there was any substantial interaction with the Western world (Foster & Laracy, 2020). The increase in shipping traffic through the Solomon Islands brought with it exploitation, and in the late 19th century, many Malaitan men and some women were kidnapped or stolen from their island home as ‘indentured labour’ to work in the plantations of Queensland (Australia), Fiji and other islands (Foster & Laracy, 2020). By the late 1880s, much of the brutality of the slave trade, known as ‘blackbirding’, decreased, and a gradual transition to volunteer labour ensued (Moore, 1985).

The increased interaction with Europeans exposed Solomon Islanders to weaponry and steel tools. With a lack of central power among groups on Malaita and increased access to ‘modern’ weaponry, ‘blood feuds’ were numerous, and in an effort to solidify its interest, the British claimed central control over the Solomon Islands (Foster & Laracy, 2020). In 1893, the United Kingdom established a protectorate over the Solomon Islands (Asugeni, 2014). The alien sovereignty, including laws and taxation systems, forced the people of Kwaio to submit to ‘Pax Britannica’, a period of British naval superiority and unrestricted free trade, which had the underlying aim of industrialising PICs for British benefit (Foster &

Laracy, 2020). The enforcement of Pax Brittanica led to a resistance movement by the Kwaio as they fiercely defended their land, customs and culture (Keesing, 1992). The murder of government tax collectors in 1927 by members of a Kwaio ethnic group led to a backlash, which resulted in villages being looted and burned, and many Kwaio killed (Foster & Laracy, 2020). The leader of the group was hanged, but his descendants along with other anti-colonial supporters of the time continued their anti-government movements well into the 20th century (Keesing, 1992).

The path to independence for the Solomon Islands was paved following World War II, when the Solomon Islands played a crucial role in supporting the United States (US) forces against the Japanese in the Battle of Guadalcanal, a crucial turning point for the war in the Pacific. The political consciousness raising that ensued and the 1960s worldwide movement towards decolonisation saw the British Solomon Islands Protectorate being formally renamed as the Solomon Islands, with true independence gained in 1978 (Foster & Laracy, 2020).

Post-independent Solomon Islands has not been without its difficulties. An unfortunate legacy of the colonial state was the undermining of local legal systems and leadership through the use of force, removing leaders' autonomy and making them dependent on the state. This act served to ensure any dispute management was aligned with the colonialist governance systems, not traditional ones. The repercussions are seen in post-colonial Solomon Islands today, where colonialist governance still heavily influences justice and governance at a local level (Allen, Dinnen, Evans, & Monson, 2013). The civil unrest that occurred from 1998 to 2003 gave rise to a multi-national force being deployed to assist in the restoration of law and order, resulting in damage to civil infrastructure and near-collapse of the country's government (Foster & Laracy, 2020; Watson, 2005). The dispute behind the civil unrest dates back to post World War II when the capital of the Solomon Islands moved from Tulagi to Honiara on the island of Guadalcanal. With the development of Guadalcanal and growing business activity, in particular the expansion of the palm oil industry, many workers from other Islands, particularly Malaita, moved to Guadalcanal for paid employment. The inflow of workers placed pressure on the traditional land ownership system, either through purchase or marriage, and tensions between the Malaitans and the Isatabu (people of Guadalcanal) increased. Despite a new Constitution being formed with independence, failure to recognise traditional kinship rights allowed tensions to escalate, which resulted in the conflict of 1998 (Watson, 2005). The Isatabu Freedom Movement and the Malaitan Eagle Force, both well-armed and well-trained organisations, fought, resulting in significant violence, death and destruction of infrastructure and culminating in a parliamentary coup in June 2000 (Gegeo & Watson-

Gegeo, 2002). The government of the time could do little to provide services or safeguard the public, so the multi-national force known as the Regional Assistance Mission to the Solomon Islands was brought in (Foster & Laracy, 2020) to help broker peace and restore law and order.

Following the civil unrest, the country's progress towards recovery has been slow. Foreign aid has played a large role in the recovery process; however, anti-government riots, conflict between the Regional Assistance Mission to the Solomon Islands and the newly elected government, and corruption allegations between 2006 and 2014 have resulted in five prime ministers holding positions in 8 years. The Regional Assistance Mission to the Solomon Islands officially ended its mission in 2017 after reducing their policing operations in 2013, and despite the passing of anti-corruption laws in 2018 and a general election in 2019, there has been little progress in the proposed constitutional change (Foster & Laracy, 2020). In December 2021, there was further civil unrest, rioting and burning of many commercial buildings in Honiara. Troops and police from Australia, New Zealand, PNG and Fiji were deployed to restore law and order.

3.2.3 Society

Political unification of the Solomon Islands occurred during colonisation. Prior to colonisation, there was no centralised administration to govern the many islands; instead, numerous autonomous, kinship-based self-governing and self-sufficient groups, or clans, formed society (Hauriasi & Davey, 2009). Land in the Melanesian culture is communally owned by clans, which for coastal and lagoon dwellers, extends to their marine resources and reefs, and these clans dictate how the land and waters are used. For many generations, Malaita has been a patrilineal society, where land ownership, a society's main asset, is primarily passed down through the male line, and in a patrilineal society, the men make all the decisions regarding land holdings. Cognate descendants have secondary rights, with permission, to use and cultivate the land (Koian, n.d.). To the Malaitans, many of whom remain connected to their ancestral spirits, land is not just a physical asset, but represents a dimension of time where the ancestral spirits are ever present and under whose authority the living are positioned (Moore, 2017). When a woman marries into a patrilineal society, she forgoes her role as food producer and cook in her own family and becomes that of her husband's clan. Being an outsider, usually from another clan or village, a woman's role is to diligently observe the boundaries and requirements of her husband's clan and learn how each piece of land can be used so as to pass this knowledge onto her children. By working the land with her children, it is her role to teach them knowledge about her husband's land (Koian, n.d.). Navigating access to healthcare (both biomedical and customary) for women in society, particularly in the conservative province of Malaita, can be difficult as their roles

as women, mothers, daughters, sisters and wives come first and foremost (Hobbis, 2016). Kwaio women see themselves as responsible for the area in which they live. They play a vital role in reproducing social order, in maintaining the separations and virtues that guide their life and the way people live (Keesing, 1992). Women generally are under-represented in the paid workforce and overrepresented in the non-waged labour market, and while gender parity in primary schools has almost been achieved, the gap in the secondary and tertiary education sector remains large (Hobbis, 2016).

Many Malaitans still strongly follow *kastom*, or ancestral ways, which provides a distinct gender 'order' within society, and going against this order is considered *tabu* (Moore, 2017). For women, the release of bodily fluids (such as menstruation and defaecation) in an area that is not specifically designated for this purpose (i.e. menstrual house or communal toilet area) is considered *tabu.* An untimely or unexpected menstrual period will bring stigmatisation and indebtedness to men, particularly the woman's husband and husband's family (Hobbis, 2016).

3.2.4 Ancestral Relations

For many Malaitans and particularly the Kwaio mountain clans, the spirits of their ancestors are not in the past; they are ever present and continually guide their decision-making (Keesing & Kahn, 2014). Ancestral spirits monitor their descendants' emotions and private thoughts (Akin, 2004), and hand down age-old customs from one generation to the next (Asugeni, 2014). Success or failure in many everyday acts of living, such as crop production, fishing, attracting a lover and even acts of war, will only succeed with the support of ancestral spirits. Requesting permission or harnessing support from the ancestral spirits is elicited through magical formulas, prayer and sacrifice, and the success or failure of this is implied through the outcome. Health or illness, prosperity or disaster, are manifestations of the temper of the ancestors (Keesing & Kahn, 2014), and thus are not a separate realm but part of everyday life. The Kwaio who maintain their vigilance to ancestral spirits must not violate the rules that the ancestors enforce; however, ancestors are not homogeneous and each ancestor imposes their *tabus* differently, which allows for differences in interpretation by those who determine punishment or compensation (Akin, 2004). More recently, the Kwaio have attempted to codify ancestral rules and *tabus* into *kastom* laws. *Kastom*, a Melanesian Pijin word derived from the English word 'custom', refers to 'ideologies and activities formulated in terms of empowering Indigenous traditions and practices, both within communities of varying levels of inclusivity, and as a stance toward outside entities' (Akin, 2004, p. 300). While conservative Kwaio advocate strict *kastom* law in public settings, a pragmatic dichotomy exists in everyday life. People believe they can

bend and mitigate *tabus* laid down by their ancestors, as they did prior to colonialisation, to afford the commodities and experiences of modern life (Akin, 2004).

Just like the presence of ancestral spirits, witchcraft and sorcery are a constant. Unlike the Western ideology of witchcraft and sorcery, which is synonymous with magic, wizardry, voodoo and mumbo jumbo (Rio, 2019) and implies that the person themself is a witch, in the Melanesian society, witchcraft and sorcery take on many forms. Witchcraft is seen to be a foreign 'agent' that takes over the body of a person outside of that person's conscious control; thus, a relative or friend moving around in the community could unknowingly be possessed. The presence of malevolent forces is not realised until the person exhibits signs of mental or physical illness or dies, and if the death cannot be explained, or is preceded by unusual behaviour, then the cause is often rationalised as being the result of witchcraft (Rio, 2019). The relationship between ancestral beliefs and magical forces is often not delineated, and religious specialists, or diviners, are often used to rid a person of malevolent spirits or to prescribe an offering to an angry ancestor.

3.2.5 Infusion of Christianity

Christianity in the Solomon Islands is a by-product of colonisation and has been a powerful force of change since the late 1800s. As a result, the pressures of Christianity saw the traditional religion of ancestor worship give way (Keesing & Kahn, 2014). Anglican missionaries were first to settle in the Solomon Islands in the 1870s, and despite an earlier failed attempt, Roman Catholic missionaries followed in 1898. The South Seas Evangelistical Church, borne out of the 'blackbirding' trade in Queensland, Australia, came to the Solomon Islands with returned workers in the early 20th century, and both the Jehovah's Witness Church and the SDA Church followed. Currently, there are numerous religious denominations across the Solomon Islands, whose geographical pattern follows the history of missionisation (Allen et al., 2013). By the late 20th and early 21st centuries, the Melanesian post-colonial states were some of the most Christian nations on earth (Keesing & Kahn, 2014). The infusion of Christianity resulted in the disruption of traditional kinship land ownership systems as many inland communities moved to coastal areas, forming large villages around mission stations (Allen et al., 2013). As a consequence, the Christian church predominantly remains the centre of village life today.

Christianity changed the way in which Solomon Islanders lived and altered their social order. Local justice systems, which were once governed and administered by tribal chiefs using customary punishment and compensation, were replaced with rules and leadership structures and presided over by the church. Resolution of social conflicts and grievances came through forgiveness and prayer, without clear determination of the right or wrong of

the situation, and recourse was through counselling, Bible readings and confession (Allen et al., 2013).

The SDA Church is central to this story. First landing in the western districts of the Solomon Islands in May 1914, SDA missionaries Pastor Griffiths F. Jones and his wife were invited to set up a mission to counterbalance the existing Methodist presence. This fledgling SDA presence across the Solomon Islands saw the establishment of churches and schools. A focus on the holistic spiritual and physical health of SDA adherents meant medical services became an integral part of missionary life (Solomon Islands Historical Encyclopaedia 1893–1978, 2020d). Evangelical teachings of the SDA Church were enhanced when a printing press, donated by the SDA-owned Signs Publishing Company of Australia, was set up in Batuna on the north-east coast of Vangunu in 1922, and subsequently published the Gospel of John and some hymns in the Morovo language (Solomon Islands Historical Encyclopaedia 1893–1978, 2020d). SDA missionaries first began their work on Malaita in 1924, and in the 1930s, a tentative plan for a hospital was created for the slopes of Uru Harbour, across the water from where Pastor Anderson and his wife had earlier lived (Keesing, 1992). In 1964, the SDA Church on Malaita broke away from the larger organisation and pursued the earlier plan of building a hospital at Uru Harbour. In 1966, the 65-bed AAH was opened, the first official SDA hospital in the Solomon Islands (Solomon Islands Historical Encyclopaedia 1893–1978, 2020d).

The hospital development was not without controversy, however, as the SDA Church had paid a large sum of money to lease land from a court-appointed single owner, Ma'unisafi. According to *kastom*, Ma'unisafi did not have singular rights to the several tracts of land acquired. Many people had strong and direct collective ancestral rights, and the land extended close to several shrines still being used for ancestral sacrifices. Many non-Christians feared the desecration of sacred places (Keesing, 1992) and anger ensued. This anger resulted in the spearing and subsequent death of Mr Dunn, an early worker at the hospital.

Not all Solomon Islanders 'converted' to Christianity. The people of the mountain hamlets of East Kwaio were one group who resisted the influx of Christianity to remain observant of their culture, maintaining respect for gender taboos and ancestral power to this day (Moore, 2017). Unlike many Solomon Island communities, the 'mountain people' of East Kwaio made a deliberate decision to shun the Christian culture, and thus have remained autonomous in the practices that govern their everyday life (Asugeni, 2014). Paradoxically, despite their shunning of Christianity and Western ways, when in need of health services, some mountain people of East Kwaio choose to seek healthcare at AAH (MacLaren & Kekeubata, 2007), a seemingly divergent belief construct to their own.

3.2.6 Health—Services

Prior to colonisation, traditional healers were sought for the treatment of ailments, and if sickness was thought to be caused by a social digression, or through the magic of witchcraft or sorcery, then the services of a diviner were sought. The result of colonialism meant that health service delivery largely changed from the use of traditional healers to a Western biomedical model.

During the early declaration of the British Protectorate, social services were limited at best, with minimally trained touring officials attending to minor ailments and village sanitation only (Solomon Islands Historical Encyclopaedia 1893–1978, 2020b); however, the presence of missionaries across the Solomon Islands filled this void. The Protectorate Government did go on to establish biomedical health services, but while some locations such as Tulagi, the capital at the time, were apportioned with a government hospital, other areas such as Gizo received limited medical resources. The harsh environmental conditions and lack of ability to take leave resulted in a high turnover of staff, and at times, there were no staff at all to provide medical care (Solomon Islands Historical Encyclopaedia 1893–1978, 2020b).

The Anglican Church opened the first well-established hospital in the Solomon Islands in Maravovo on Guadalcanal in 1912, which, while well patronaged, closed 3 years later when the only doctor, Dr Russell Marshall, married the matron, went to World War I and never returned (Solomon Islands Historical Encyclopaedia 1893–1978, 2020b). In 1927, the Methodist mission opened a hospital at Roviana Lagoon and a second hospital on Choisuel a year later. The SDA Church established a nurse-led hospital at Marovo Lagoon and a doctor-run hospital on Kolombangara Island in 1937 (Solomon Islands Historical Encyclopaedia 1893–1978, 2020d).

Following the return of many Malaitans from the plantations of Fiji and Queensland in the early 20th century following the cessation of ‘blackbirding’, the South Seas Evangelistical Church missionaries gained many followers (Allen et al., 2013). The Deck brothers, one a dentist and the other a medical practitioner and both South Seas Evangelistical Church missionaries, provided medical and dental services to the South Seas Evangelistical Church adherents of Malaita from 1909 onwards. Despite their presence, the vast majority of Malaitans received no medical care from either the missionaries or the government. With the introduction of the profitable Head Tax, the Protectorate Government recognised the need to provide health and education services in return; however, despite the government subsidising the Anglican-run ‘Hospital of the Epiphany’, established at Fauabu, West Malaita, in 1929, the hospital closed in 1933 because of a lack of funds, only

to re-open 5 years later but on a much smaller scale (Solomon Islands Historical Encyclopaedia 1893–1978, 2020b). The only other hospital on Malaita at the time was at Su'u, on the west coast, funded by the Protectorate Government in 1926 and run by Dr Lily Holt-MacCrimmon, the wife of the manager of the Mala Timber Company. Dr Holt-MacCrimmon tended to the sick in her area for many years and was rewarded with a two-ward hospital. The government supplied surgical equipment and drugs and soon the hospital became an important facility for Malaita until 1932, when the couple moved away (Solomon Islands Historical Encyclopaedia 1893–1978, 2020b). While the missions maintained the hospital at Fauabu, the Protectorate Government realised the need for district hospitals, and in the mid 1950s, a hospital on the west coast of Malaita at Auki, the island's largest port town, was built.

AAH, constructed in 1966 by the SDA Church on Malaita's eastern seaboard, was designed by a white SDA missionary named Lester Hawkes, and despite his exposure to the Melanesian culture of PNG, the hospital lacked design input from the local community (Asugeni, 2014). Nested in a cove at the foot of a mountain range, the hospital was to serve communities with two distinct belief systems—the Christian villages dotted along the coast and pagan hamlets of the mountains. The structure presents many challenges for the Kwaio pagans' customary beliefs, beliefs which the SDA refused to acknowledge. *Kastom* laws, particularly pertaining to women's bodily fluids and the status of women, would be broken should a pagan man enter the hospital as the administration offices, largely staffed by women, are built on the floor above the outpatients ward, and the roof of the maternity ward touches that of the TB ward. For those that follow their ancestral spirits, these structural nuances make the hospital complex polluted as these are women's buildings and thus entry is considered *tabu* (Keesing, 1992). However, most of the people accessing health services at AAH come from the coastal Christian villages (MacLaren et al., 2009), and the Western colonial structure of the hospital, along with its theocratic governance, provides the SDA Church with the ideal environment for evangelistical teachings, and worshippers find little wrong with the hospital's governance, structure and healthcare provision.

The Solomon Islands Ministry of Health and Medical Services currently functions as the administrator and funder of nearly all health services across the Solomon Islands; however, a small number of non-governmental organisation (NGO) and faith-based controlled health services (such as AAH) remain a crucial part of health service infrastructure and healthcare delivery. While hospitals such as AAH operate under a theocratic governance structure, AAH is also required to operate within Ministry of Health and Medical Services national policies and guidelines. The Ministry of Health and Medical Services also provides considerable funding for faith-based health services (Hodge et al.,

2015). This duality makes governing faith-based hospitals, particularly in remote areas, complex because of the intersecting governance structures.

3.2.7 Health—Healthcare Workers

Prior to the arrival of the first government-appointed HCWs in 1914, traditional healers or 'diviners' used traditional medicines or spiritual practices to heal the sick. Many missionaries were also qualified nursing 'sisters', and although their role was mostly as missionaries, they attended to minor injuries and illnesses. Medical and nursing staff were often in short supply (completely absent at times), with poor retention being attributed to adverse environmental and living conditions, marriages and health issues (Solomon Islands Historical Encyclopaedia 1893–1978, 2020b). During this period, many Solomon Island women, particularly sisters of the churches, received informal nursing training (Solomon Islands Historical Encyclopaedia 1893–1978, 2020c). In 1922, Solomon Islanders from each district commenced training as orderlies at Tulagi Hospital, and by 1928, 20 native 'dressers' (medical orderlies) were scattered in villages across the Protectorate (Solomon Islands Historical Encyclopaedia 1893–1978, 2020b). The first 'native' medical practitioner was George Bogesi, based in Auki on Malaita, who trained as a medical practitioner in Fiji in the late 1920s (Solomon Islands Historical Encyclopaedia 1893–1978, 2020b). In 1938, a 'mothercraft' school began at Siota, teaching Western infant care techniques to women, who then returned to their villages; however, it was not until 1941 that the first cohort of Melanesian women commenced formal nursing training at the Hospital of the Epiphany at Fauabu, Malaita (Solomon Islands Historical Encyclopaedia 1893–1978, 2020c). Following World War II, the hospital at Fauabu established an official Nurses School, with the first Solomon Islands nurse graduating from the 4-year course in 1950. The training of both nurses and 'dressers' increased over the ensuing years, with the Central Hospital in Honiara extending their 'dressers' course from 18 months to 3 years, effectively giving graduates the title of 'medical assistant'. In 1956, a Nurses Training School was opened to supplement the school at Fauabu (Solomon Islands Historical Encyclopaedia 1893–1978, 2020c).

AAH commenced a nurses training program in 1969, and the hospital added to its infrastructure through two new apartments for qualified nurses and an 18-bed student nurses quarters. By 1971, the AAH maintained 13 infant welfare clinics and administered 2,509 childhood vaccinations, and the staff from the hospital's medical patrols treated 6,240 patients (Solomon Islands Historical Encyclopaedia 1893–1978, 2020d).

Similar to many PICs, a shortage of doctors and nurses is a key challenge for the Solomon Islands. As of 2012, there was one doctor for 3,300 people and approximately 13 nurses and midwives for 10,000 people in the provincial areas. A total of 2,728 health

workers worked within the public sector. The shortage of doctors and nurses at remote hospitals, such as AAH, is aggravated by social isolation and the lack of opportunity for ongoing professional development, meaning many experienced staff choose to work in Honiara (Harrington, Asugeni, & MacLaren, 2013). The paucity of experienced nurses, particularly at AAH, has recently been exacerbated by a call-out from their Melanesian neighbour Vanuatu in response to a nursing shortage crisis. Inadequate training for nurses in Vanuatu, together with an exodus of overseas qualified nurses, has seen a decrease in the overall quality of care (Srinivasan, 2019). A recruitment drive by the Vanuatu Government attracted many highly experienced Solomon Islands nurses, lured by better wages and conditions (Grause, 2018), with at least four senior nurses leaving AAH, including the infection control nurse. However, with only around 28 registered nurses (Harrington et al., 2013), the loss of approximately 14% of AAH's experienced nursing staff has had marked effects.

3.2.8 Health—Burden and Prevalence of Disease

Prior to European contact, Solomon Islanders lived in isolated communities with little contact between islands and the outside world—they were a 'virgin soil community'. Endemic diseases such as malaria, hookworm, TB, dysentery, filariasis and the skin disease 'yaws' were always present; however, Solomon Islanders' immune systems operated in a uniquely isolated environment (Solomon Islands Historical Encyclopaedia 1893–1978, 2020a). The increased maritime traffic in the second half of the 19th and early 20th centuries inadvertently introduced the new diseases of measles, chickenpox, smallpox, mumps and polio to a naive population; however, because of the isolation and low population of any single island, combined with the extended time periods that a ship's voyage would take, epidemics were relatively short-lived. It is estimated nonetheless that the newly introduced infectious diseases might have reduced the population of most islands by at least 50% during this time (Solomon Islands Historical Encyclopaedia 1893–1978, 2020a). Quarantining of ships containing epidemics of communicable diseases began following the establishment of the British Protectorate, which significantly reduced outbreak occurrences.

Currently, in the Western Pacific, approximately 400,000 people experience preventable diseases every year, with many more unreported and/or undiagnosed. This creates a 'double burden' for countries with limited resources as they have to manage non-communicable diseases with continued threats from communicable diseases (Australian Government Department of Foreign Affairs and Trade, n.d.). Limited burden of disease analysis has been recorded in the Solomon Islands, but 2008 data show that '51% of years of life lost' could be attributed to communicable diseases and the remainder to non-

communicable diseases (41%) and injuries (8%) (Hodge et al., 2015). Of the communicable disease, acute respiratory infections, skin diseases, TB, diarrhoeal disease and malaria remain common (WHO, 2015).

Despite the improvements in IP&C and public health measures, outbreaks of vaccine-preventable communicable diseases continue to cause hospitalisations and death across Western Pacific nations. A 2014 measles outbreak in the Solomon Islands resulted in an incidence rate of 349 per 10,000 population in the capital Honiara, and at Atoifi, 56% of people presenting to the hospital with the disease were hospitalised. Many more cases were suspected in the mountains of East Kwaio around Atoifi, with three-quarters of the mountain children reportedly contracting the disease. This figure included three unreported deaths, although these were not able to be verified for cultural reasons (Diau et al., 2015). The 2019–20 measles outbreak in Samoa resulted in an attack rate of 285 cases per 10,000 population and 83 measles-related deaths (Craig et al., 2020).

Increased population movement alongside a global resurgence of measles has been mooted as the basis of these outbreaks; however, inability to respond due to health system constraints was also cited as a confounding factor (Craig et al., 2020). Interestingly, low initial vaccination rates due to *kastom* beliefs (Craig et al., 2020; Diau et al., 2015), and declining vaccination rates due to public mistrust of vaccinations to well below what is required to maintain herd immunity, were cited as major contributing causes (Craig et al., 2020). These recent measles outbreaks only emphasise the urgent need for public health and hospital policymakers to investigate and integrate disease transmission prevention practices that are locally, culturally and spiritually acceptable into existing programs to prevent ongoing morbidity and mortality.

3.3 Part B—The Complexities of Sickness Causation and Transmission Through a Cultural, Spiritual and Western Lens: When Worlds Collide

Hospital IP&C programs have significantly reduced the risk of acquiring an HAI since their inception in the mid 20th century (P. W. Smith et al., 2012). The SENIC project undertaken in the US in the mid 1970s became the pioneering study that demonstrated the efficacy of hospital infection control programs in reducing HAIs (Huskins & Soule, 1998). The germ theory, which underpinned this study—the biomedical model of infectious disease causation and transmission by microorganisms (germs)—has informed the practice of IP&C since the 1800s. The outcomes of the SENIC are responsible for the direct development of international IP&C guidelines today. As a consequence, IP&C programs that have been developed and implemented in well-resourced settings that rely on Western scientific evidence-based processes have been ‘lifted-up’ and placed into healthcare facilities around

the world, regardless of the local setting, which may have quite different resources, language, culture, or beliefs about disease causation and transmission. Eighty-four per cent of the world's population live in 'non-Western' countries (Bloom, 2020). Within these countries, there is a huge variation in resource availability, beliefs around illness and disease, healing traditions, meanings of words (Vass, Mitchell, & Dhurrkay, 2011), and health system efficacy. Therefore, it is not surprising that adherence to imported IP&C practices that are wholly based on the Western germ theory may not take into account local resources, systems or beliefs (Department of Economic and Social Affairs Committee for Development Policy, 2018).

The premise of IP&C is based on Western scientific concepts. First, each infectious disease is caused by a particular organism (Lee & Bishop, 2016). Second, infections can be transmitted from one person to another through direct or indirect modes of transmission. Third, transmission can be interrupted through environmental and hand hygiene, vaccination, instrument sterilisation, prudent use of antibiotics, surveillance of hospital infections, and public health measures (P. W. Smith et al., 2012).

IP&C programs in some LMICs have been very successful, but after 40 years of evidence-based practice and knowledge, LMICs continue to have a higher prevalence of HAIs and higher rates of morbidity and mortality due to communicable diseases (Sparke et al., 2020). It is well documented that health systems in many LMICs may struggle to implement sustainable IP&C programs because of local factors such as climate; geography; and socioeconomic, political and demographic conditions (Raza, Kazi, Mustafa, & Gould, 2004). However, local beliefs about illness and disease causation and transmission are not often even considered in these IP&C programs. People across the globe live with complex cultural beliefs and often do not live with a single reality, rather engaging with co-existing worldviews that transcend multiple belief systems. These belief systems may or may not include biomedicine. Current debates in countries across the globe on the cause and transmission of coronavirus disease 2019 (COVID-19), which include wearing of face masks and scepticism over COVID-19 vaccination, demonstrate that the germ theory does not uniformly inform people's beliefs about illness, disease and prevention. Expecting uniformity across culturally and spiritually diverse populations, and these populations to directly replace their beliefs and behaviours regarding sickness causation and transmission with measures informed by the germ theory, does not reflect reality. IP&C researchers need to investigate a community's and individual's knowledge systems around disease causation and transmission and use this evidence to complement biomedical modelling to enable a more holistic approach to IP&C.

3.3.1 Sickness Causation

Despite modern biomedicine debunking the 19th century theories such as 'miasma', the strong belief that disease and disease transmission are due to inhaling air exposed to rotting matter such as corpses, sewerage and rotting vegetables (Halliday, 2001), the knowledge systems in many populations continue to be based on sorcery (Elliott & Taylor, 2020); witchcraft (Ahrens, 2011); magic (Kasereka & Hawkes, 2019); social interactions, moral wrongdoings and behaviour (Caprara, 1998; Freeland, Bodor, Perera, & Cohen, 2020); punishment from God (Eves & Kelly-Hanku, 2020); and customary ancestral beliefs (MacLaren et al., 2009). What increases complexity in some societies is that knowledge systems around sickness causation for a specific illness can contextually differ (Caprara, 1998).

Definitions applied to the terms sorcery, witchcraft and magic are not universal and are somewhat indistinct. Unlike in English, where they are clearly separated by both definition and meaning, these concepts in indigenous cultures are only approximations. Distinctions become blurred as people tend to use them in terms of differing techniques that take part in the trajectory leading to illness or death (Rio, 2019). Despite the ambiguity of whether someone is considered a sorcerer, a witch, or to have magical powers, what is understood across the world's cultures is that certain metaphysical beings have the power to make others sick (Ahrens, 2011). The illness and death caused by the 'magical powers' of witchcraft and sorcery, which provide the underpinnings for illness and misfortune (Tynan et al., 2011), could also be said to have the deeper underlying purpose of stabilising social and moral systems in society, and the ability to repress deviant behaviour (Ahrens, 2011).

Witchcraft, sorcery and magic is central to the epistemology around the causation of epidemics, chronic communicable diseases and non-communicable diseases in many societies. The second largest outbreak of Ebola virus disease (EVD) in history occurred in the North Kivu province in the Democratic Republic of the Congo (Kasereka & Hawkes, 2019). The WHO declared the epidemic over in June 2020 (WHO, 2020b). The refractory nature of the outbreak raised questions about the community's general preference to seek healthcare through traditional healers rather than engage with public health control efforts, a pattern found to be consistent with previous outbreaks (Kasereka & Hawkes, 2019). Further exploration revealed the origins of the outbreak, as told by the community:

> *At the beginning of the month of May 2018, two twins, about thirty years old, fell sick after eating their aunt's cat. The aunt was angry and bewitched them. They vomited blood and were brought to the hospital where they died two weeks later. Five others in the family died. The*

community was angry and chased away the witch aunt. (Kasereka & Hawkes, 2019, p. 151)

As with many stories, a correlation was found between origins of sickness causation and treatment. Because the sickness was of a supernatural origin, treatment was sought from traditional healers.

The universal belief in and acceptance of sorcery in Melanesian societies provides a causal explanation for illness and death, particularly in the development of non-communicable diseases such as diabetes, mental illness, stress and stroke, which subsequently influences their health-seeking practices (Elliott & Taylor, 2020). The Lelet of New Island Province of PNG classify some illnesses according to their origins. Some are exogenous (or Western), such as TB, cancer or human immunodeficiency virus, and some endogenous (illnesses of the place), which are caused by sorcery or spirits (Eves & Kelly-Hanku, 2020). Similarly, in East Kwaio, Solomon Islands, there is a common belief that TB is caused by sorcery (Massey et al., 2015). For cultures that follow non-mainstream or 'pagan' beliefs, such as those that live in the mountain villages of East Kwaio, the possession of *buru* (wild foreign spirits) explains suicide, marriage difficulties, destruction of property, murder and permanent retardation (MacLaren et al., 2009).

Stabilising systems in society and 'making right' the wrongdoings of people within a society can be intrinsically linked to sickness causation for many cultures that follow 'unworldly' or spiritual beliefs. Embedded deeply in the values of many societies, religion influences beliefs around sickness causation and healthcare access in many communities. Many African populations believe that everything is 'Gods will' and when screening or testing for 'unspoken' infectious diseases such as hepatitis B, it is better not to know. Believing that sickness is punishment by God for wrongdoing or immorality, a person will initially seek healing through the same means, via spiritual healing and prayer (Freeland et al., 2020). The infliction of both individual sickness and epidemics attributed to a punishment by God is common to many Christian cultures (Eves & Kelly-Hanku, 2020; Freeland et al., 2020; Kasereka & Hawkes, 2019), despite the practice of biomedicine residing along with Christianity.

Other dimensions that influence beliefs around the cause of disease are those of a non-Christian spiritual nature. The spirits of ancestors in some traditional societies, such as those of the Pacific Islands, guide many facets of daily life, including gender roles and gender mixing and growing of crops. Ancestral spirits are believed to be intrinsically linked to determining health, illness and misfortune of people, families and communities. Breaking a spiritual taboo without some sort of apology, often in the form of a sacrificial offering, is

believed to make the ancestors angry and can result in death, illness or crop failure (Tynan et al., 2011).

A different cultural belief system regarding the cause of sickness is that of the humoral causation of illness, which can be found in cultures such as the Khmer of Cambodia. The humoral system places the causes of sickness according to their qualities, being 'hot' or 'cold', and a balance of these is required for good health. Excess ingestion of hot foods, such as those with a sour flavour (guava, green mango or spiced food), is related to certain processes within the body that explain the symptoms associated with illnesses such as enteric fever, including fever and abdominal pain, and this belief subsequently drives lay treatment, which is to avoid certain foods and drinks (Kuijpers et al., 2018). The bacterial link between contaminated water and food is not made and therefore not seen as a direct cause of sickness, adding an additional complexity for disease prevention.

Belief systems are also not mutually exclusive when it comes to causation of disease. The interaction between witchcraft and malaria in Tanzania is described by Hausmann Muela, Muela Ribera, Mushi and Tanner (2002), where witches are said to create 'fake malaria' in that symptoms appear to be those of malaria but the actual illness is not, thus creating two possible causes of disease (malaria or witchcraft). Witches are also said to interfere with normal malaria by hiding the parasites, rendering them undetectable by the hospital. This syncretism of belief systems is also seen in the Democratic Republic of the Congo, where those who believe in witchery or the 'sorcerer cat' as the cause of EVD also endorse biomedical explanations of the causation of disease (Kasereka & Hawkes, 2019).

Despite the attempt to eradicate practices of witchcraft and sorcery and the condemnation of harmful magic by the Christian missions of the 19th century, the belief in witchcraft is still very much in existence in the Melanesian culture. In many areas of Melanesia people live and move in a society where the Christian God and Bible is believed in, yet there is also a fear that an intermediate being, a sorcerer of death, can intervene against an individual or group at any time (Ahrens, 2011). The coexistence of two belief systems can help explain the ways in which these systems interact to explain disease causation, particularly when the biomedical model is somewhat known, yet cannot explain treatment failure. A third belief system can be added to this syncretism, and that is a belief that the hospital, and thus biomedicine, can treat disease, but only diseases coming from God (Christian belief); however, other diseases that cannot be treated by the hospital are created by persons who want to torture others, such as witches (Hausmann Muela et al., 2002).

3.3.2 Sickness Transmission

A contagion, the central player in the biomedical model of disease transmission, is not recognised in the belief systems of many societies (Caprara, 1998). On the surface, in many cultures, sickness transmission can be seen to follow biomedical principles as the belief that if one person comes into contact with another person who is sick, the person will also develop the sickness. However, the underlying belief of how this occurs is not necessarily attributed to the biomedical model, but a complex culturally and spiritually influenced knowledge base. Further complicating this is that what is considered contagious in one culture may not be in another (Caprara, 1998).

When studying the beliefs around EVD causation and transmission, Kasereka and Hawkes (2019) found that some community health workers believed that in some way the disease left the forest and hid in the hospital, and was not transmitted through the eating of animals. Subsequently, it was understood that by going to the hospital, a person could contract EVD, but the health workers were not clear on why or how. It was also found that a person's or community group's occupation influenced sickness transmission beliefs. Those whose livelihood relied on hunting and selling bush meat emphatically believed that eating bush meat was not the source of EVD transmission. Further, although infectious disease transmission through animals was not always believed to be through direct contact (such as ingestion), the belief that diseases such as hepatitis B could be transmitted if a person sees a bat fly over their head was documented (Freeland et al., 2020).

Level of knowledge and education may also influence the decisions people make and affect disease transmission. People who believe in metaphysical explanations rather than biomedical models of disease transmission may have lower knowledge about transmission of disease. When conducting spiritual ceremonies around the dead and dying for victims of infectious diseases such as EVD, where bodies are washed by funeral attendees (BBC, 2021), attendees may not know to adopt personal preventative measures, therefore increasing the likelihood of transmission (Kasereka & Hawkes, 2019). A lower level of knowledge can also be attributed to disease transmission from hospital to community through family caregivers. The biomedical explanation of contagion is not understood by caregivers in many societies, and while caregivers may understand that diseases such as diarrhoea may be passed on through water, the faecal–oral explanation is foreign (Islam et al., 2014). Often, families provide much of the care, and this lack of familiarity affects transmission patterns.

Delays in seeking healthcare when sick, subsequently increasing the risk of transmission, are also well documented. Cultural beliefs combined with limited awareness

about early symptoms of disease can affect a person's decision on when they should present to hospital. Limited awareness of early TB symptoms was found to be a reason why people presented late for treatment in PNG (Massey et al., 2015). The status of women, particularly in patrilineal societies such as those in Melanesian cultures, can make access to healthcare difficult. A woman's role is first and foremost that of wife and mother, cook, and food producer, and to observe the requirements and boundaries of her husband's clan (Koian, n.d.). If a woman is unwell and requires hospitalisation, this is almost impossible, particularly if there are children to care for and gardens to attend. Additionally, there is the added burden of transport to distant health facilities, which needs to be organised and paid for. A parallel factor is the probability that the sickness experienced by the woman is seen as a result of a broken *tabu* or violation of *kastom* rules, and thus a traditional healer or diviner is more appropriate; therefore, a visit to the hospital is likely deemed unnecessary by the husband's family (Hobbis, 2016). Punishment by spiritual ancestors also delays presentation for biomedical treatment for men who follow pagan beliefs. Kwaio ancestors of the Solomon Islands strictly forbid any male to come into contact with female bodily wastes including menstrual blood, faeces, urine, vomit and products of childbirth (Akin, 2004), all commonly found in Western-style hospitals. The decision to present for treatment at a hospital, and risking the wrath of the ancestors is strongly influenced by *kastom* rules (MacLaren & Kekeubata, 2007), again increasing the risk of sickness transmission.

3.3.3 Treatment-Seeking Practices

Treatment-seeking practices are somewhat dictated by beliefs around the cause of the sickness. If it is believed that illness is caused by sorcery, then seeking help from informal health services such as Christian faith healers is more likely (Elliott & Taylor, 2020). If the biomedical model is perceived as the causation and transmission of disease, then accessing a formal health service, such as a hospital or health clinic, will be the primary point of contact. This notion is supported across many cultures including the Democratic Republic of the Congo, where those that believed the source of EVD was in the supernatural were more likely to seek a cure from traditional healers (Kasereka & Hawkes, 2019). Similarly, in the Solomon Islands, traditional healers will be more widely engaged to rid a person of harmful spirits (*buru*) thought to be the cause of mental health issues (MacLaren et al., 2009). It is apparent that regardless of the treatment sought, belief is vitally important to diagnosis, treatment and efficacy of therapy.

Many cultures adopt 'medical pluralism', where both modern and traditional medicine are used in combination for healing. Medical pluralism when treatment seeking is not always an ideological approach, but is a pragmatic one. Often those seeking treatment see nothing wrong in using modern and traditional healing strategies concurrently, and healers

themselves often span multiple worlds, placing themselves strategically between different genres of therapy (Eves & Kelly-Hanku, 2020). Medical pluralism could be said to contribute to late presentation to hospital and poor treatment compliance when a person becomes ill as traditional healers are initially sought (Elliott & Taylor, 2020). Likewise, when biomedicine fails to heal, it is often cast aside, opening access to more alternative treatments (Hausmann Muela et al., 2002). Severity of symptoms of disease often influence treatment-seeking practices and the order in which people choose to seek treatment. If a disease is not perceived as severe, then seeking treatment at a hospital may not be deemed necessary, despite the knowledge that the disease could worsen (Mulder et al., 2008).

Home remedies to treat humoral interpretations of sickness such as fever are guided by symptomology and commonly include ingestion of ginger and derma-abrasive techniques such as ‘coining’, a practice whereby a coin is used to firmly stroke the skin, resulting in red bands, which are thought to release heat. Coining is often combined with paracetamol, but a blend of treatments is only used for mild symptoms (Kuijpers et al., 2018). If symptoms persist or worsen, multiple pharmacies are visited to purchase medicines. Only if these fail, will a medical practitioner or hospital treatment be sought. Traditional healing practices, Christian faith healers, Western biomedicine, or a combination of two or sometimes three diverging treatments may be sought in the case of severe disease.

When seeking treatment for malaria, the people of Ifakara, Tanzania, believe that despite their decades long interaction with biomedicine, a person needs to ‘cool down’ the symptoms (when they experience high fevers in the more severe stage of the disease) in order to reduce the disease to a less severe stage. This converts the sickness to a ‘normal’ malaria before biomedical treatment can be applied. However, if symptoms persist despite hospital treatment, there is suspicion of malevolent involvement of witches, and therefore, treatment and information will be sought from a diviner (or traditional healer). If the biomedical model does not provide the expected outcome, then the disease is interpreted as being caused by witchcraft (Hausmann Muela et al., 2002).

Conversely, some fundamentalist Christian healers necessitate mutual exclusivity of treatment as they see the healing they offer being in competition with other therapies. In particular, some Pentecostal churches require a complete break with the past (a community’s traditional healing methods) and demonise local practices if their Christian-based therapies are to be effective. The strict approach in which this is applied disallows prayer to be used for healing if it is known that the person had previously employed the services of a diviner. Interestingly, other Pentecostal churches allow medial pluralism but

only in a certain order—biomedicine must be sought first, and only then can Pentecostal healing follow (Eves & Kelly-Hanku, 2020).

Discussion and dialogue around death and sickness is also seen as taboo in many cultures, and the fear of being 'labelled' influences people's decision-making when seeking treatment. This results in the use of traditional or herbal medicines, and calling upon family or spiritual healers, where a person will initially seek guidance for treatment prior to attending hospital. Experiences with hospitals also sway a person's decision-making. Very real fear exists that if they go into the hospital, they may never come out (Freeland et al., 2020). Suspicion of the healthcare system around confidentiality and fears regarding experimentation also lead to distrust of healthcare providers. Equally, confidence in doctors in the hospital system may influence people to attend for treatment earlier in the disease progression, thus reducing disease severity (Mulder et al., 2008).

3.3.4 Cultural Influences and Sickness Transmission Beliefs in the Healthcare Context

IP&C practices are most often based in acute healthcare, residential aged care, primary healthcare and rehabilitation settings, of which the community are the primary users. However, cultural differences may influence not only consumers' healthcare-seeking beliefs, but also HCWs' beliefs associated with disease transmission. Constructs of healthcare systems and hospital hierarchy can affect the quality of care a patient receives, particularly around hygiene and infection prevention. Historical and social construction of healthcare systems in Cambodia contribute largely to the hygiene practices undertaken by staff (Hancart-Petitet, Dumas, Faurand-Tournaire, Desclaux, & Vong, 2011). Perception of hygiene is one of what appears 'clean and nice', and not based on biomedical principles. Therefore, cleaning may only occur when a blood spill is observed rather than being based on policy and procedure. Staff training is unequal among HCWs, with access to training relating to hierarchical position. Hierarchical position also influences patient care as doctors and nurses delegate tasks to cleaners if the task is perceived as an infection risk. Such tasks include removing intravenous cannulas and assisting with surgical procedures. Cleaners are also observed to be of similar social and economic status to the patients and thus become patient educators and advisors, yet with little or no knowledge of hygiene principles (Hancart-Petitet et al., 2011).

The social healthcare hierarchy in Bangladesh, similarly to Cambodia, means that nurses avoid undertaking cleaning as it is perceived that such tasks lower their social status, leaving tasks to cleaners and family members (Islam et al., 2014). Family caregivers in Bangladesh undertake much of the patient care as religious, cultural and social norms prevent female nurses from having physical contact with male patients. Given that most

nurses in Bangladesh are female, family members are left to care for their male relatives, including bedside nursing such as feeding and administering medications, and cleaning of patients and their surroundings including faecal soaked sheets and clothes (Islam et al., 2014). The role that family caregivers have in providing most of the patient care is an inherent risk for sickness transmission from healthcare facility to community, which in turn adds to the already high burden of community disease. The self-perpetuating cycle of admission of infectious patients, leading to increasing community infection (Damani, 2007), which then cycles back to further hospital admissions, only places healthcare facilities already struggling with containment of HAIs at greater risk.

The role that religion and culture has on influencing hygiene practices of HCWs is also described by Allegranzi, Memish, Donaldson and Pittet (2009). Allegranzi and colleagues found that inherent hand hygiene practices were deeply influenced by culture and religion, citing that many hand hygiene practices are associated with daily prayer rituals and not necessarily for hygiene requirements. Alcohol prohibition in religions such as Buddhism, Islam and Sikhism prevented the use of alcohol-based hand rubs by HCWs, and hand gestures such as the designation of a ‘clean’ hand and an ‘unclean’ hand, and the specific cultural meaning of folding hands as a form of greeting, also influenced how HCWs perceived hand hygiene education messages (Allegranzi et al., 2009).

Healthcare facilities worldwide are staffed primarily from the communities in which they are located, so if the beliefs around sickness causation, transmission and treatment seeking are typical of the community, then it is plausible to think that HCWs may also harbour the same beliefs, despite their biomedical training. If the HCW is not a community member with the same belief system or if the HCW does not recognise the differing belief system, then conveying simple but effective messages around IP&C practices to staff and patients, such as hand hygiene, cough and spit etiquette, and patient education, will not be understood or applied.

The practice of IP&C has biomedical foundations and forms an integral component of patient care. Effective IP&C practice reduces HAIs, a patient’s length of stay and hospital-caused mortality. Because of the complex and interconnected role of religion, culture and spirituality, which in turn influences behaviour and beliefs around sickness causation and transmission, healthcare managers need to be aware of the beliefs of both the consumers (the community) and their staff when contemplating the implementation of effective and sustainable IP&C programs.

3.4 Conclusion

With the backdrop of a Pacific Island culture, infinitely old, yet more recently influenced by westernisation, the collision between cultural, spiritual and Western knowledge within a population is inevitable. There are vast differences in beliefs in the concept of sickness causation, transmission and subsequent treatment-seeking practices. Therefore, the coexistence of different thinking patterns and the contradictions within these across many of the world's cultures means introducing a biomedical model of IP&C is complex and difficult. Infection prevention and hygiene are challenging, and for implementation of a meaningful and sustainable IP&C program in a local cultural context, an understanding and interpretation of the hidden meanings behind people's actions is required.

The following chapter presents the methodological design of the study and importantly its decolonising and participatory approach. Photovoice as a data collection method is explicitly described, and an explanation on its capacity to reveal the underpinning knowledge systems that are developed through each participant's worldview is provided.

Chapter 4 Methodology

4.1 Chapter Outline

Chapter 4 is presented in two parts. Part A presents the study methodology and provides to the reader the overarching worldview and theoretical lens through which this study is cultivated. The chapter also includes a description of the data collection, which uses Photovoice as the primary method, and discloses some illuminating insights and moments captured through journaling. Part B is very much an introspective journey into the evolving process of praxis. Portrayed through moments of trust-building and vulnerability, it is used to support the validation of PAR as a true participatory process.

4.2 Part A—Methodology and Methods: Transforming the Way We Think About Infection Prevention and Control

> *I had to ask myself what was the best way to help them, and I didn't know how as this was totally different from anything else I had done before. The only way I thought was to tell them what needed to be done, and work with them, somehow, to achieve this. Therefore the relationship needs to change so that I could genuinely know how they live and what they know about infection control, which means I need to work closely with the staff, be seen to want to be a part of them. Given the situation they are in, particularly with such poor resources and infrastructure and little knowledge of infection control, I am never going to be able to help them improve their program to fully meet our standards, it is just not possible. What I need to do is transform the way infection control standards can be achieved, our way is not the only way. (Personal diary notes, 2016)*

To make sense of the above diary note and how it provided the foundations to the methodology and design of this research, some background to the relationship needs to be explained. In 2014, a measles outbreak occurred throughout the Solomon Islands, PNG and Vanuatu, with an estimated 4,563 cases in the Solomon Islands alone. East Kwaio reported 117 cases, of which 66 required hospitalisation at the region's only hospital, AAH (Diau et al., 2015). The community response to the outbreak was high; however, the hospital's response lacked formalised IP&C practices and knowledge. With the 2014 local measles outbreak and a dysentery outbreak in 2015, the staff of AAH self-identified as willing to implement IP&C measures and reduce disease transmission within their health facility. Local hospital researchers subsequently applied for, and received, a WHO-funded

grant, Strengthening Operational Research for Communicable Disease Control in East Kwaio, Solomon Islands (Impact Grant), of which a key outcome was improvement in hospital IP&C, an outcome that had not yet been met. In 2016, I was invited as an IP&C expert to visit AAH, meet with their staff, complete an IP&C audit and provide feedback.

This first 2-week visit, prior to the commencement of this research, had a profound impact on me. Not only did I speak with staff about IP&C and audit the hospital; I travelled and stayed with a group of researchers who had longstanding and very close relationships with the hospital staff and the people of East Kwaio, and from this I learned a lot about East Kwaio culture, religion and spiritual beliefs. Probably more important was the relationship I developed with the staff of the hospital. I played volleyball in the evenings with them, exercised in the mornings with them, went to the market with them, learned some basic Pijin language with them, ate dinner with them and prayed with them.

The request for IP&C assistance was fulfilled via an audit, followed by verbal and written feedback, and recommendations. However, it was clear from this first visit that improving the IP&C practices at AAH was not going to work in the way it does in the well-resourced Western healthcare system using the homogeneous healthcare IP&C culture of the biomedical model. Fraudulent was the best way to describe how it felt knowing that the recommendations provided to improve their practices were not only socially unjust, but also often simply impossible. I could not leave it at that—yet another 'studied' developing country population by a white Western outsider, providing a report where the recommendations were neither practicable nor doable. This type of research has been happening to indigenous populations since the early European invasions and subsequent colonisations, a process that has made indigenous peoples merely subjects of research (West, Stewart, Foster, & Usher, 2012). This historical pattern of non-consenting, ill-informed research practices creates a legacy of mistrust, animosity and resistance (Martin & Mirraboopa, 2003). What was required was a new way of 'seeing and doing' IP&C, not one that is premised in a well-resourced Western biomedical model, but one in which the Western biomedical model sits within a model that takes into consideration the cultural and spiritual knowledge of disease causation and transmission, informs the underlying epistemology of IP&C at AAH, and informs the inclusion of biomedical principles.

The resultant research had to be inclusive; I had all the IP&C knowledge, but I do not live with their reality and therefore could not conduct research *on* the staff of AAH, but had to do research *with* the staff of AAH. In collaboration with the senior nursing and medical staff of AAH and my JCU advisory team, the aim and research questions were identified.

4.2.1 Aim

This project aims to explore what IP&C means to the staff and community members at AAH, with the purpose of informing a meaningful and sustainable IP&C program that is culturally, linguistically and spiritually informed.

4.2.2 Research Questions

The primary question is:

- How can infection prevention and control practices be improved at AAH, Solomon Islands?

To answer the above research question, the following needed to be ascertained:

1. What are the current infection control practices at AAH?
2. Can culturally acceptable interventions be developed and implemented to enhance current infection control practices?

To truly give justice to the staff of AAH and to the people of East Kwaio, I needed not only to learn about their epistemological perspectives around IP&C, but also to know and understand their reality. I needed to dissolve boundaries and even out the power imbalance between 'me' as the researcher and 'them' as participants, and go 'inside' their world, thus challenging my ontological perspective. I therefore needed to make an active choice about my research design.

4.2.3 The Science of Infection Prevention and Control Versus Indigenous Knowledge—An Apparent Research Conundrum

Indigenous methodologies have become an important element in qualitative research, and while the author's research has not employed an 'indigenous methodology' per se, the methodology and methods were chosen to ensure the research was culturally safe and respectful, has acknowledged indigenous worldviews (Singh & Major, 2017), and included the following components:

- contextual reflection, where the primary researcher situates herself and the people with whom she is collaborating within the research process
- inclusion of indigenous people in the research process in a way that is reciprocal as well as decolonising
- prioritisation of indigenous ways of knowing (Drawson, Toombs, & Mushquash, 2017).

Indigenous methodologies challenge non-indigenous researchers (L. Smith, 1999), particularly around the contest between science and indigenous knowledge. A note of importance is required here; throughout this thesis the term ‘science’ will be used. This term will indicate that the author is referring to Western positivist science unless specified otherwise. Science has become an overriding knowledge system, one where validity is questioned should the evidence not support the results or should the research not be replicable, making the research method the all-important arbitrator (Durie, 2004). Conversely, indigenous people have dismissed science as a legitimate knowledge base because it seems incapable of explaining or recognising spiritual phenomena, and the connection with nature that indigenous peoples have, as anything more than mere observation (Durie, 2004).

Identifying culturally relevant and safe methods when researching with indigenous peoples can be difficult in the health sciences as historically, quantitative positivist research practices have prevailed (West et al., 2012). However, it is not uncommon for scientists or indigenous peoples to accept the contradictions that the two bodies of knowledge provide (Durie, 2004). Subscribing to religious beliefs that cannot be explained by science is not unusual; conversely, many indigenous peoples apply scientific principles in everyday life while still subscribing to their own indigenous values. One has to remember that indigenous peoples have long been researchers of the natural world and its relationship with humans (Iseke, 2013). A polarised debate around the validity of either epistemology rarely leads to new knowledge or fresh insights (Durie, 2004); therefore, it is critical that the research approach acknowledges the complexities of undertaking research with indigenous peoples, and is consistent with their philosophies (West et al., 2012).

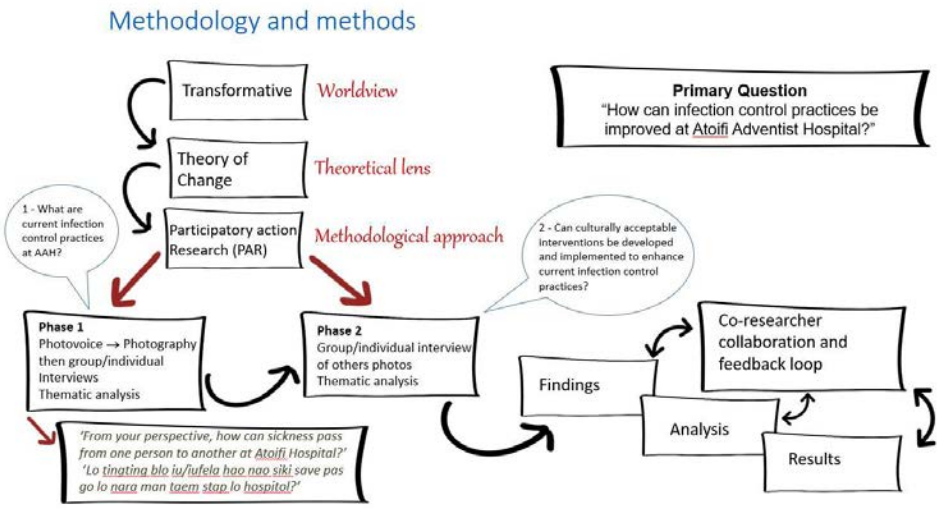


Figure 2: Methodology and methods

Participatory methodologies recognise that research needs to be conducted alongside community members, prioritising community needs (Drawson et al., 2017). PAR was chosen as the methodological approach because it is regarded as an acceptable approach to indigenous, community-based research (Drawson et al., 2017). Enabling a positive outcome from this PAR project requires co-researchers and participants to transform their thinking about IP&C as multiple views and insights into sickness transmission and causation will be revealed through the use of the Photovoice data collection method. These insights challenge and enlighten the researchers and enable a change process to occur. The overarching paradigm is, therefore, transformative, with theory of change (ToC) forming the theoretical lens.

4.2.4 A Transformation Process

The fundamental ethical assumptions of the transformative paradigm are enhancement of social justice, furtherance of human rights and, importantly, respect for cultural norms (Mertens, 2010). More traditionally used in mixed-methods designs, 'a transformative-based theoretical framework is a framework for advancing the needs of underrepresented or marginalised populations' (Creswell & Plano Clarke, 2011, p. 96). The underlying principles of the transformative paradigm, that is, one of social change, provide an overarching framework to address the conflicting ideologies at AAH between meeting international IP&C standards as required by the Ministry of Health and Medical Services and the minimally resourced, cultural, spiritual and linguistically diverse environment that AAH operates within. The inequities in health at AAH occur because access to and distribution of resources does not equal the expectations of the Ministry of Health and Medical Services, which are that of a well-resourced nation, and the lack of cultural, social and spiritual beliefs of the people who work in and are the consumers of the health service are not considered. Building trust and understanding the culture is paramount in the transformative design. Partnerships between researchers and community members are important throughout the process, with a goal to have research that contributes to a sustainable change in the community (Mertens, 2007). A strength of the transformative design is that researchers are able to use a collection of methods that produces results where new thoughts emerge through dialogue, leading to creative and fruitful activities that are unforeseen and unpredictable (Lifvergren, Docherty, & Shani Abraham, 2011). Importantly, outcomes must be useful to the community members and viewed as credible to stakeholders, the end users, and policymakers (Creswell & Plano Clarke, 2011).

Transformation assumes a system can be reshaped by someone with a privileged outside perspective (Lifvergren et al., 2011); however, as a white Anglo-Saxon Australian woman and an outside researcher, I also needed in the transformative paradigm to develop

an intrinsic link with the study participants to appreciate their epistemological perspective of IP&C, that is, their understanding of how infections spread from one person to another in hospital (Mertens, 2007). While there is an existing relationship with the staff at AAH, studying indigenous peoples by Western outsiders brings with it a certain cultural orientation and value set. Power differentials, competing theories of knowledge, and dissimilar language and meaning have the potential to influence the research process and findings (L. Smith, 1999). In the context of this research, the nature of the relationship had to be reconsidered, that is, the dichotomy of being an insider or an outsider researcher. I argue that I was not entirely one or the other, I was 'in-between'.

There is much discussion in the literature about what it means to be an *insider* researcher, culturally embedded and subjective, or an *outsider* researcher, detached and objective (McNess, Arthur, & Crossley, 2015), and the advantages and disadvantages of each. However, Dwyer and Buckle (2009) eloquently state, 'The core ingredient is not insider or outsider status but an ability to be open, honest, deeply interested in the experience of one's research participants, and committed to accurately and adequately representing their experience' (p. 59). Qualitative researchers, particularly those that employ participatory techniques, become intimately involved in the research, not separating themselves from the study or the participants, therefore not being complete outsiders (Dwyer & Buckle, 2009; Milligan, 2016). However, the power and privilege that comes from being a culturally and racially different 'outside' researcher does not allow the researcher to be a complete insider (Milligan, 2016). Occupying the position of an 'in-betweener' allows a researcher's identity to change and respond according to the cultural, social and political context the researcher finds themselves in. A qualitative participatory researcher cannot fully occupy one or the other; they will inherently occupy the space in-between (Dwyer & Buckle, 2009).

In the transformative paradigm, gaining trust and respecting cultural norms are essential. This does not mean that the researcher disregards their own epistemological and ontological perspectives developed through their own historically affected consciousness because they cannot escape them. What this pre-conceived, and ever-changing, knowledge does is enable the researcher to understand the nuances of new situations, experiences and points of view. This enables them to oscillate between the strange and the familiar, or the outside and the inside, with the intent of not necessarily agreeing or disagreeing but with the aim of understanding (McNess et al., 2015).

4.2.5 Theory of Change

ToC informed the theoretical lens for the research, seated in the premise that those in need can often solve their own problems if they are empowered to do so (International Network on Strategic Philanthropy, 2005). ToC is participatory driven, where the underlying principle is to improve understanding of how and why a program works (Breuer et al., 2014). It could be argued that ToC is very 'programmatic' in that to achieve Y and Z, you need to initiate X, thus not suiting the complex social, political and economic complexities that community-based participatory research is embedded in. However, ToC is based on the preposition that no one particular insight or view offers a complete picture of the processes of change that are required (Connell & Kubisch, 1998). Social change is not linear, rather it is a complex and unpredictable process, and importantly, to navigate and influence social change, researchers need to be adaptive and learn what works best (Laing & Todd, 2015). To achieve this, a variety of resources were drawn upon, including scientific and cultural knowledge, and community insight. Creating a model where a ToC is co-created through collaboration between academic expertise (IP&C expertise of the primary researcher) and practice expertise (co-researchers and participants view of 'how things work') to initiate social change underpins the transformative worldview.

A ToC approach is often used for evaluation; however, embedding ToC as the theoretical lens increases the likelihood that co-researchers and participants will develop clarity around the intended outcomes of a project. The contextual factors that may influence the outcomes, and actions required for outcome achievement, can also be specified (Connell & Kubisch, 1998). This structure means a ToC can be effectively used as an implementation planning tool as well as provide an evaluation framework (Breuer et al., 2014). As in the case of this research, the participants were guided by the Photovoice data collection method to articulate what they understood about IP&C, issues around IP&C, why they were an issue, what the hospital could do to fix the issue, and how this was to occur, a process supported by Connell and Kubisch (1998), who claimed that 'a theory of change approach can sharpen the planning and implementation of an initiative' (p. 2).

ToC has been increasingly adopted by the community development and NGO sectors for both program design and evaluation (Breuer et al., 2014), but more recently has been used successfully for non-NGO collaboratives within LMICs. Hamdani et al. (2021) used ToC to gain stakeholder engagement in the development and implementation of a pathway to scale up a mental health program in a low-income public school in Pakistan. Success was attributed to the ToC process, which not only made planning more fruitful and rigorous, but enabled researchers to build on the local knowledge base of the stakeholders and end users. Brima et al. (2021) used a participatory ToC process to assess the feasibility of

delivering and assessing a set of evidence-based interventions to improve the quality of nursing documentation, using the quality improvement 'Plan Do Study Act' cycle in a hospital in Sierra Leone. The strength of the co-designed pilot program was the involvement of stakeholders at all levels within the health system, ensuring that the specific needs of the health system were addressed.

Ultimately, the strength of ToC as a theoretical viewpoint lies in the ability to engage the stakeholders and end users at the outset, through co-designed clear outcomes and drawing upon the local knowledge base, which informs both the activities needed for success and the contextual influences along the way. In a Western context, IP&C implementation is embedded in evidence where the intervention most often is met with an expected output. However, this is not the case in culturally, spiritually and linguistically diverse populations; therefore, understanding the context is vital. 'The complex nature of the situational context is an important aspect of transformational change where unforeseen events might disrupt the expected chain of events and complicate the linear logic or planned change process' (Lifvergren et al., 2011, p. 101).

4.2.6 Participatory Action Research

Community-based participatory research (CBPR) is both a philosophy to research and an approach (Drawson et al., 2017). PAR is one form of CBPR, with its roots founded in the work of Paulo Freire, whose family became victims of the US economic crisis in 1929 and as a result were flung from the Brazilian middle class into the lower classes of society. As a result of being submerged in the lives of the poor, Freire realised that their lethargy and ignorance were not due to apathy, but situational circumstances of economic, social and political control (Freire, 1972). Freire drew on his experiences and used a participatory approach to education where he encouraged the marginalised population to examine and analyse the structural reasons for their oppression (Baum, MacDougall, & Smith, 2006). Freire subsequently realised that the educational system was a major catalyst in maintaining the oppressed peoples' 'culture of silence' (Freire, 1972).

PAR by definition is 'collective, self-reflective inquiry that researchers and participants undertake, so they can understand and improve on the practices in which they participate and the situations in which they find themselves' (Baum et al., 2006, p. 854). Being increasingly recognised as useful in indigenous research, PAR has the potential to reduce the colonising effects of more traditional research methodologies. The focus of PAR is to enable action through a reflective cycle (Figure 2) whereby participants collect and analyse data, then decide on action (Baum et al., 2006). In the context of health, HCWs aim to improve health and reduce health inequities through a cycle of data collection, reflection,

and action, which becomes perpetuating (Brown, Mccormack, Cooper, & Smith, 2012), consequently influencing a direction change ever so slightly at each successive phase. A crucial underpinning concept in PAR is power and the recognition that not only does the researcher bring privilege with them into the relationship, but the co-researchers also bring with them privileged knowledge about their own lives (Genuis, Willows, & Jardine, 2015). In PAR, the researched become the researchers over time as the nature of PAR advocates for the sharing of power between the two. A participatory approach to action research encourages the co-creation of knowledge and is a process through which the researchers and stakeholders (those who will potentially benefit from the results) work together to design and conduct all phases of the research process (Rai, 2012). Co-researchers in PAR are mostly marginalised groups who have little opportunity to articulate, justify and assert their interests; therefore, the participatory approach not only provides knowledge creation for the partnership, but also enables an 'awakening' and a process of empowerment (Bergold & Thomas, 2012).

The willingness to improve IP&C at AAH came from staff within the organisation; therefore, co-creating the design and implementation of the research through a PAR approach seemed the appropriate choice. For the staff of AAH, the creation of new understanding through the PAR approach will enable them to think more broadly about solving issues around IP&C without being limited to Western-style solutions. This method of research can be an effective way of addressing complex causes of health issues and has been increasingly used in health research in the 21st century (Baum et al., 2006). PAR was used as part of a mixed-methods study by Jacups, Kinchin and Edwards (2021), whose objective was to redesign a model of care to improve ear, nose and throat services across the largely Indigenous region of Cape York, Australia. The PAR approach enabled the researchers to identify failings in the current service provision model, including a poorly functioning primary healthcare service. The authors found that PAR maintained the relationship with the research objectives to develop a more relevant and appropriate service model than would have been designed otherwise (Jacups et al., 2021). Gardner et al. (2011) reviewed factors that enhance or interfere with continuous quality improvement programs in regional Australia and Fiji. Continuous quality improvement models mirror the PAR cycle of assessment, analysis, feedback and action, and the authors found that using this model, specifically in relation to chronic disease management, while placing importance on CBPR approaches enhanced engagement with all stakeholders and appeared to be a promising change catalyst that led to more sustainable and actionable solutions. More specific to PICs, Brown et al. (2012) used a PAR framework in developing a needs-based approach to building educational capacity for competent supply of essential medicines by non-

pharmacists in the Pacific Islands. The authors cite the suitability of the PAR method as it enabled change though local cultural norm processes, yet also met the expectations of donor organisations through its capacity-building approach.

This research project demands an in-depth understanding of the local social, economic, cultural and spiritual context, elements that the primary researcher as an 'in-betweener' may fail to fully understand. Therefore, the convergence of the two perspectives through PAR, that being the science of infection control and reconstruction of local knowledge and practices at AAH, informed the aim of inquiry and the development of the research questions.

While PAR suits the research question as it is community directed, knowledge building, and enables local research capacity building, the methodology has limitations. Bennett (2004) describes several challenges that researchers face when engaged in PAR, including willingness of the community to partake in research (as scepticism around the value of the research may be high), the barrier of time (particularly in oppressed societies where the importance of basic human needs surpasses the need for research), and the potential lack of continuity and unpredictability of research participants. Dilemmas of the PAR approach can also be experienced through the power dynamics of the research relationship. Acknowledging differences in perceptions of research priorities between researchers and community members, resolving conflict in the way the findings are interpreted, dealing with community politics, and negotiating differing value sets require a great deal of self-reflection and understanding (Baum et al., 2006; Whitehead & McNiff, 2006). Further limitations include the potential for manipulation of the community through coercion, particularly by those in powerful positions, and treating all community members as homogeneous peoples by not taking the differences of religion, wealth, ethnicity and power into consideration (Bennett, 2004). The potential for alienation of those involved in the research by their community, particularly community members whose spiritual beliefs are incongruent with the science of IP&C, is conceivable; however, the input of these co-researchers was vitally important to the project and its outcomes.

It was important that an open discussion with co-researchers about the design of the research occurred at the outset to outline potential problems that the primary researcher could foresee, but also to enable co-researchers to voice their concerns. This trust-building process aimed to mitigate challenges that may have occurred throughout the course of the research.

An initial discussion was held between the primary researcher, the director of nursing (DON) and the chief medical officer to identify the best way to approach improving IP&C

practices at the hospital. The discussion centred on the issues the hospital faced in complying with international standards (WHO, 2009, 2016). While there is some consideration of settings with limited physical, financial and human resources (WHO, 2009), they do not take into account applying the standards to a culturally different and spiritually diverse non-Western setting. It was during this discussion that a research project was proposed to identify 'what will work' in their location to enable the hospital to meet the required standards. A participatory methodology was suggested for several reasons. First, the senior staff of the hospital invited me to assist them, not necessarily 'fix it' for them; this brought with it connotations of participation. Second, they live their reality and therefore the input and expertise from hospital staff around the design of the project was essential to moderate my own reflexivity.

As a participatory project, the staff of the hospital, including the DON and the Chief Medical Officer, would have the opportunity to take part in the research, both as co-researchers and participants, with other staff being given the choice of participation. Verbal permission was granted, and this was confirmed with a letter of support from the Chief Medical Officer who was at the time also acting as the chief executive officer. Hierarchical and social structures in the Solomon Islands are complex to an outsider. Therefore, dictating the process around data collection had the potential to break cultural and social boundaries; hence, pre-travel communication with the DON and Chief Medical Officer regarding the research process was important, including input by senior hospital staff about the most appropriate way to gain consent, distribute the cameras and interview staff.

Gaining trust as a white Western outsider promoted a more open dialogue with participants. A local Kwaio, Pijin and English-speaking interpreter and translator was employed, who was also an experienced research assistant (RA). While a suitable local pay rate was negotiated for this service, the relationship had to be more than just around pay; it also had to be around trust, and in my case, trust was gained in an unexpected way. During the first phase of the data collection, an expedition ship was visiting a local island, and along with display and sales of local crafts such as wood carvings, woven bags and shell jewellery, a demonstration of dancing from both the coastal villagers and the mountain people had been organised. The dance by the mountain people, known as a 'Binu Binu', tells many different stories of the ancestral spirits and is accompanied by the pan pipes. Men and women wear ceremonial dress, which may or may not cover the genitals. For women, a belt is worn around the waist, with a minimal square of cloth covering the front only, and the upper part of the body is naked except for headpieces and necklaces. A practice the night before the ships arrival took place on the verandah of a thatched hut, perched on a hill overlooking the ocean. The mountain people had travelled for a day, and for some, two

days, to attend the dance so the practice in full ceremonial dress went well into the early hours of the morning. That evening, it was hard not to be swept up into the atmosphere of the constant pan pipes, stomping and handclapping as one tune after another was practised. I soon found myself dressed in women's ceremonial dress, wearing only a belt and a square of loin cloth. The following day, the passengers arrived, and when it came time to dance, the mountain people ceremoniously performed in front of the crowd. The crowd was then invited to join in, including adopting the dress code. It was my role to show the other 'white men' (women) that it is perfectly acceptable at this time to dance together and enjoy the liberation that being unclothed brings. That day, five women and four men from the ship danced the Binu Binu, mostly naked, along with the mountain men and women. This was the moment of trust between myself and the RA, and myself and the participants, as I became known in the community as the 'white woman who did the Binu Binu'.

4.2.7 Research Approach, Method, Data Collection and Analysis

4.2.7.1 Research approach

Within action research methodology, a number of approaches can be applied. For this project, a critical qualitative research approach was used to address the research problem. Critical approaches, particularly in healthcare, can address power imbalances in relationships and organisations, and can change the assumptions and expectations of normal practice that have developed through events and influences over time. Often, HCWs develop the impression that their work conditions and relationships cannot be changed, nor can the social and political injustices that they face (Richardson-Tench, Taylor, Kermode, & Roberts, 2014). However, being transformative oriented, the broad aim of critical theory is to integrate theory and practice so that people become aware of discrepancies in their beliefs and social practices and are inspired to change them (Polit & Beck, 2012). Critical researchers often triangulate multiple methodologies and emphasise multiple perspectives, and typically interact with participants in ways that emphasise participants' expertise (Polit & Beck, 2012). In critical social science, from which critical research methodologies have developed, there is the view that collective social action can influence change over oppressive systems and conditions (Richardson-Tench et al., 2014).

4.2.7.2 Data collection

Photovoice

Photovoice, developed in the 1990s by C. Wang and Burris (1997), is a qualitative action-oriented research method (Stevens, Clough, Judd, Brimbecombe, & Watt, 2016) that

is growing in popularity in the education, health and social sciences because it addresses and incorporates values of power, trust and ownership (Castleden, Garvin, & Huu-ay-aht First Nation, 2008; Johnston, 2016). Founded on the principles of feminist theory, constructivism and documentary photography (Hergenrather, Rhodes, Cowan, Bardhoshi, & Pula, 2009), Photovoice enables people, typically those with less power, to record and reflect their community's strengths and concerns about an issue, thus creating critical dialogue and knowledge sharing through the taking and discussion of photographs. The use of photographs leads to a richer understanding of salient issues, more so than interview techniques alone, as participants are compelled to reflect on their own perspectives. Importantly, photographs can also convey sociocultural perspectives of an issue (Castleden et al., 2008).

Aligning with the transformative paradigm, Photovoice has been used in a range of health research to empower marginalised recipients of health systems. I would argue, however, that the people of Atoifi are not marginalised per se; in fact, being Malaitan, they are powerful and strong, self-sustaining, and self-assured, so with respect to the people of Atoifi, I will not ‘label’ them as marginalised and powerless. Ironically, social labels can be an unwanted effect of this type of research, and it is often the very social label that groups are looking to discard through their photography (PhotoVoice, 2019). The story is different, however, when it comes to functioning within their health service. The design of the hospital, that of a colonial-style floor plan, and a health service model based on biomedicine marginalise many staff of the hospital and health service recipients because of cultural and spiritual incongruence with Western-based health management theories and biomedical beliefs. The use of Photovoice in this context aims to elicit the voices of staff within the health service to explain these incongruences and provide a safe forum where they can initiate transformation, fulfilling the aim of Photovoice, which is the promotion of dialogue between participants (the photographers) and policymakers (those with power) to influence change (Castleden et al., 2008).

Photovoice provides insight into IP&C issues and practices as perceived by participants, and therefore challenges the dichotomy between what the researchers think is important and what the community thinks is important (Wang & Burris, 1997). The daily lived experience of participants captured through their photos is acknowledged as being their own ‘expertise’ and as such is considered valid (Johnston, 2016). In 2012, Photovoice was used as a CBPR method to identify culturally relevant health education tools when opening a new health clinic in rural Kenya (Kingery, Naanyu, Allen, & Patel, 2016), and closer to home, Photovoice was used to study governance in operating room nursing in an Australian hospital (Riley & Manias, 2003). In this study, recognition of participant insight and expertise

through the taking and discussion of photos helped explain the causal chain that influences IP&C practice at AAH and allowed for a collaborative ToC action research approach, leading to outcomes while taking into account the specific context (Laing & Todd, 2015). The ambiguity between the theory (researcher importance) and the practice (community importance) helps provide enlightenment to both the researchers and participants to inspire change; this transformative process is an integral part of critical theory research (Polit & Beck, 2012).

Photovoice was chosen for this project because successful implementation of an IP&C program relies on not only 'educated' HCWs, such as nurses and doctors, but also the involvement of 'ancillary' staff, such as cleaners, laundry workers, kitchen staff and maintenance staff, who play a pivotal role in hospital hygiene. These positions are often occupied by those with poorer 'common' language skills, a lower level of education, lower socioeconomic status, and of the same cultural group as patients (Hancart-Petitet et al., 2011). Photovoice offers flexibility because anyone can learn to use a camera; therefore, participants are not required to be educated in reading or writing, which provides an avenue for those who do not speak the dominant language, are illiterate, or have physical or developmental disabilities to participate in the research process and to be given a voice (Hergenrather et al., 2009; Wang & Burris, 1997). Providing the use of a camera to educated HCWs and to ancillary staff at AAH to document their concerns and understanding of IP&C removed the barriers of language, position, educational level and socioeconomic status, and enabled open discussion around IP&C problems and solutions. The use of Photovoice also assisted with reflexivity throughout the research project as it helped remove the values and assumptions developed by the PhD student over 15 years of IP&C experience.

The use of photography in research does have limitations. Despite photographs depicting the world through the eyes of the photographer, abstract concepts such as power and economics are not easily observed (Riley & Manias, 2003), and the capacity to both reveal what is happening, and hide what is not, is possible (Wang & Burris, 1997). However, L. Murray and Nash (2017) argue that rather than being fixed representations of reality, photographs can be considered metaphors conveying a complex set of information and concepts that an interview may not. In this study, the use of semi-structured interviews about the photos, undertaken by the participants in socially and culturally safe homogeneous work groups and guided by the P_H_O_T_O acronym, enabled participants to discuss the unseen nuanced meaning behind the photos, whether that be political, social, cultural or spiritual, therefore mitigating the above risk. The P_H_O_T_O acronym represents the following:

- P: Describe your **P**hoto.

- H: What is **H**appening in your picture?
- O: Why did you take a photo **O**f this?
- T: What does this picture **T**ell us about your role at the hospital?
- O: How can this picture provide **O**pportunities for the hospital to improve?

(adapted from Amos, Read, Cobb, & Pabani, 2012).

In some cultures, knowledge sharing occurs through dialogue and by being in close proximity; therefore, using one dominant form of data collection could be disadvantageous (Castleden et al., 2008). However, in this project, homogeneous HCW groups (e.g. the cooks) could collectively take photos, sharing a camera between them, enabling communal dialogue about capturing the meaning of the Photovoice statement. Photographing in groups also provided a sense of 'safety' during interviews. It is argued in the literature that interviewing in a group setting may restrain commentary as participants may feel judged by others and therefore limit disclosure (L. Murray & Nash, 2017), so creating communal dialogue about the object of the photos meant that participants felt comfortable discussing their photos openly when it came to interviews.

Photography can also be intrusive and may lead to unintended consequences, and therefore requires careful ethical consideration (Castleden et al., 2008). To avoid this limitation affecting the research project, planning of the initial data collection was undertaken, including careful training of research participants. There are three ethical issues to consider when using photography as a data collection method. The intrusiveness of photography, particularly in the hospital setting, can raise ethical challenges, particularly where patients, their families or other staff are the object of the photo yet are unable to or do not provide consent. This in turn can limit access to what may be considered sensitive areas in the hospital, where patient privacy may be compromised (Riley & Manias, 2003) but which may also be an important part of the story. In this type of project, the researcher is no longer in control of the fieldwork; therefore, unless explicit instructions are provided, participants may willingly 'show' or disseminate their photos, either through sharing to other devices via memory card or on social media, breaching ethical boundaries (Hannes & Parylo, 2014; L. Murray & Nash, 2017). The second ethical consideration is the protection of the participants. In participatory photographic research, protecting the participants from embarrassment or harm and protecting their identities is central to confidentiality; therefore, clear discussion around procedural requirements, such as de-identification of participants and photos and data storage, is important (L. Murray & Nash, 2017).

The third ethical issue is related to false hopes and expectations (Johnston, 2016). Most CBPR assumes that the research will be a tool for social change and provide direct benefits to the participants or community in a noticeable way (L. Murray & Nash, 2017);

however, these assumptions may be unrealistic. There has been a noticeable paucity of discussion in the literature about enacting social change and outcomes as a result of Photovoice projects (Johnston, 2016), despite this being a central tenet of the research methodology. Therefore, there is a risk of over-promising community action. From the outset, participants need to know what the project is likely to mean for them in concrete terms (PhotoVoice, 2019). On the whole, Photovoice aims to empower oppressed and marginalised communities; however, as discussed earlier, the community of Atoifi is not marginalised as such. The key focus of this research is to gain insight into people's perceptions of IP&C and associated issues, and elicit suggestions on how the issues could be addressed; therefore, the aim is not to change an overarching social system.

To mitigate ethical problems, a discussion was held at the outset around 'being a participant'. The voluntary nature of participating, being able to withdraw at any stage (without prejudice), and using participant codes to maintain the confidentiality of the participants as photographers and during subsequent recorded interviews were discussed. Similarly, a discussion was held around the 'ethics' of taking photos of people without their permission for research purposes. As this study did not allow for consent of patients having their photos taken, it was advised that participants not take photos of people and, if they did, ensure their faces were not visible and that they could not be recognised in any other way. Interestingly, one participant, a family member of a patient, saw this as an opportunity to take some family photos as living in a remote area of East Kwaio they had never had access to a camera before, nor had they ever seen photos of themselves. Obligingly, I took several photos (until they were satisfied), printed and laminated them, and gave the family the finished product. The family was pleasingly animated with the outcome. The photos were not used in the actual project, and the digital versions were deleted.

4.2.7.3 Participant recruitment

Recruitment occurred via purposive sampling of participants through word of mouth and recommendations from co-researchers. Co-researchers organised meetings with hospital staff and an RA who spoke fluent English, Solomon Islands Pijin and Kwaio were employed to translate information between the participants and the primary researcher throughout all phases of the data collection process. Each meeting commenced with the co-researcher introducing the RA and me, although with such a small community, we were already known. The research process was verbally explained to potential participants, and for those who did not understand English, the process was translated by the RA into their first language (Kwaio). Eligibility to participate included being voluntary, being at Atoifi for the following 3 weeks, and understanding what was required of this project. The RA and I then left the room, and where required, the co-researcher clarified the research process

further and asked for volunteers. Once volunteers nominated themselves, they were provided with a participant information sheet and a consent form. For participants who could not read or understand English, both of these forms were verbally translated into their first language. Consent was gained from all participants, and along with signed consent forms, permission was given by each participant for the primary researcher to photograph them holding a card that identified them by their unique participant identification code. This helped with the consent process as it offered a further form of consent and assisted the primary researcher in contextualising the participants:

> *I read the info to them in English and then let them talk with Kenny (co-researcher) and Dorothy (RA) about the project. There appeared to be lots of questions and also lots of doubtful faces. After about 15 minutes I was told it was OK to continue. Dorothy read out the participant information sheet as they held them in their hands. I explained that I had to give them one each as this was the 'rules' of research—but had to make sure it was translated verbally. After this there was more discussion. The consent forms were given out and Dorothy and Kenny read through them with each participant, four out of five never learned to write so writing their name and date and signature was something they couldn't do. One of the cooks was very apologetic about this. I explained that Kenny and Dorothy could write their names and DOB, but the participants had to 'mark' the paper in a way that was unique to them. There was lots of laughter about this and much dilemma, so crosses and circles dominated! (Personal diary notes, 18 October 2018)*

Initial recruitment consisted of 24 staff and two community members, enabling a maximum variation sample of different employment 'types' who could offer alternate viewpoints about the issue under study (Polit & Beck, 2012). Staff mix included two cooks, two cleaners, one pharmacy assistant, one radiology technician, six maintenance staff, three senior nurses, three junior nurses, three nurse educators and two pathology staff. The two community members were family of in-patients who agreed to take part. The two family members of patients were recruited through the Chief Medical Officer, also a co-researcher. The Chief Medical Officer approached the family members and explained the research aims and process, and when they agreed, the RA and I went through the research protocol, participant information sheet and consent form.

Once consent was gained, homogeneous work groups were each given a camera, with simple instructions on its use. In this study, mobile 'smartphones' (model LG K4 2017) with an 8 MP rear camera and a 5 MP front camera were used. Smartphones were chosen

over standard cameras because of the lower cost of initial purchase, and from a practical and participatory perspective, the phones would be more useful than cameras for participants once the research was finished. The smartphones had an internal memory; therefore, there was no requirement for a memory card, and they did not contain a sim card, which meant the photos could not be shared via SMS or social media. While the charging cable was not provided to the participants, there was the possibility that photos could be downloaded to another device as the charging cable was a generic type.

About half the participants already owned a mobile phone with a camera; however, some had not even held a phone in their hands, let alone used one:

> *The camera/phone was then explained and this was the part that blew me away. I hadn't considered that these women had never held a phone or camera before. These women would be in their 50s and 60s and watching them handling it for the first time was like watching an infant walk for the first time. It reminded me of the movie 'The Gods Must Be Crazy' and the Coke bottle. Kenny (Infection Control Nurse) explained how to turn the camera on, how to take the photo, to keep the camera still, to use in portrait and landscape and also how to delete photos. I said they can practice before they take the real photos. I think it was a real enlightening experience for them, and for me! One of the cooks wanted to pay for the phone when I left (Atoifi) and keep it, but I had to explain that they couldn't and why. (Personal diary notes, 18 October 2018)*

Training for participants around the 'art' of photography is advocated in much of the Photovoice literature. Workshops highly prescriptive in nature, including photo composition, use of light, use of flash, correcting distance, posing versus non-posing, and framing objects meaningfully, as well as 'homework' in the form of practice for participants, are described (Switzer, 2019; Wang & Burris, 1997). Some authors conducted brainstorming sessions on suitable photos to capture (Kingery et al., 2016), while others showed participants examples of photographic styles and objects (Switzer, 2019). In this study, as recommended by Wang and Burris (1997), technical advice was kept to a minimum to encourage participants' creativity, and to reduce photographic bias and reinforce the participatory nature of the research; examples of photos and brainstorming were not used (Wang & Redwood-Jones, 2001).

4.2.7.4 The Photovoice statement

Participants were given a statement, determined by the co-researchers, relating to IP&C in the hospital and asked to take a number of photos. Providing a statement frames

the participants' photography and helps prompt participants where required (Esau et al., 2017). It also helps participants understand what the study is about (L. Murray & Nash, 2017), and is essential in answering the research question. To answer the research question 'How can infection prevention and control practices be improved at Atoifi Adventist Hospital, Solomon Islands?', I first needed to identify what people's perceptions were of IP&C. For the staff educated using the biomedical model, such as nurses, doctors, pathology staff and other biomedical staff, the concept of IP&C is known; however, for the ancillary staff and family members, the connotation of infection transmission, based on the germ theory of disease, was likely to be foreign. Scientific literacy and biomedical health concepts are informed by the microscopic world, which has significant implications for understanding the germ theory (Vass et al., 2011). If one's worldview of health and illness does not incorporate the microscopic world, then a literal translation for the word 'infection' and thus the term 'infection prevention and control' might alter the intent of the statement. Senior hospital staff, those that self-identified as needing assistance with their IP&C program, and those that invited me into their hospital became my co-researchers, and together, a meaningful statement was created, which formed the basis of the participants' photographs (Figure 3). Using the whiteboard to articulate meanings and ideas, the group came up with the statement:

- 'From your perspective, how can sickness pass from one person to another at Atoifi Hospital?'

Translated into Pijin, the statement is as follows:

- 'Lo tingting blo iu/iufela hao nao siki save pas go lo nara man taem stap lo hospitol?'

Figure 3: Designing the Photovoice statement

4.2.8 Data Collection and Analysis Phase 1

The practicalities of the research were generated by the co-researchers. I came with the theoretical knowledge; they brought to the table the practicalities. Co-researchers helped organise the participant photographic 'groups'. From a cultural and social perspective, the co-researchers decided that homogeneous work groups was the appropriate approach to group selection. It was explained to the co-researchers that they too could be participants when using a PAR approach (Figure 4) as they could oscillate between being co-researchers at the various program development and data analysis stages and falling back to their normal roles within the hospital at the data collection stage (MacLaren, diary notes, 2018).

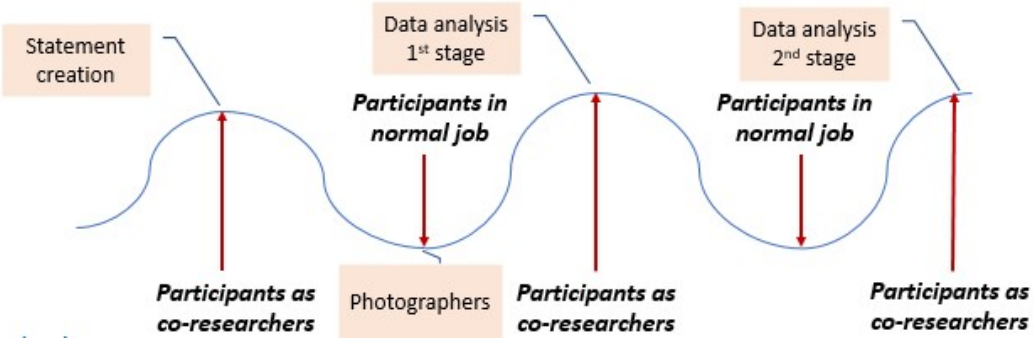


Figure 4: Participants as co-researchers

Harley (2012) describes the Photovoice method as commonly involving three steps: (1) training, including use of cameras, ethics, misuse of photographic 'power' and the returning of photos back to the community; (2) taking the photographs that participants

believe best depict the issue; and (3) participatory analysis. The final step is a three-part process and involves selecting the most meaningful photos; contextualising photos by telling stories about the pictures, a process described by Wang and Burris (1997) as VOICE (**v**oicing **o**ur **i**ndividual and **c**ollective **e**xperience); and finally codifying the photos (Harley, 2012). A discussion was had with the RA about research ethics, specifically in relation to this project, ensuring she did not contribute to any bias such as influencing the participants' photography or influencing their responses during interview. This was an important discussion as much of the translation was in Kwaio language, a language that is completely foreign to me, and also Pijin, a language I can somewhat understand and speak but without fluency.

The RA was briefed about the Photovoice protocol:

- Each group is given a camera for 48 hours, along with a statement, written in both English and Pijin, that forms the topic for their photos.
- Each group is advised to take no more than 30 photos.
- After they have finished taking the photos, each group is to return the camera, the photos will be downloaded and cleared from the camera's memory, and the camera will be given to the next group.
- Downloaded photos will be printed, laminated and numbered according to group code and photo number (e.g. JN1 = Junior Nurse, photo 1).
- Interviews will then be held with the photographers, in their groups, about their photos. The photos will be placed on a table, and participants will be given 15 minutes to choose their 15 most meaningful, around which they will be asked questions.
- Interview questions will be semi-structured around the P_H_O_T_O acronym; the interviews will be recorded on paper as well as by audio voice recorder, and the RA's role is as a translator where required.
- Interviews will take about 1 hour, and refreshments will be provided.
- A $20 (SBD) mobile phone top-up voucher will be given to participants for their time, with an equivalent, such as reading glasses, offered to those without mobile phones.

There is no standard timeframe articulated in the literature for participants to take their photos and return their cameras. Stevens et al. (2016) collected their cameras after 24 hours; Riley and Manias (2003) gave their participants 2 weeks, and Kingery et al. (2016) allowed a timeframe of 1 week. The timeframe of 48 hours was chosen mainly for logistical reasons. With a limited data collection time of 3 weeks, only four cameras available and 11

groups participating, there was a need to give all groups time to take their photos and return the cameras, and for the primary researcher to download, print and laminate the photos and interview each group. With the study population being a small community and a small hospital, there was also the risk of early data saturation (can only photograph so many things); therefore, keeping the timeframe short kept the participants on-task. In some circumstances, the participants were given the Photovoice statement days ahead of receiving their camera. Consideration was given as to whether this would bias their photography as they had time to consider the statement, and think about and discuss the topic with others; however, in many studies, the cameras were with participants for weeks (Riley & Manias, 2003) and even months (L. Murray & Nash, 2017). Having the statement prior to receiving the cameras might have encouraged the staff to take note of the practice of others and the environment, structures and equipment that surrounded them. This awareness raising of IP&C could be an unexpected positive consequence of this project as they may take more care around what they do and increase their interest in IP&C.

4.2.8.1 Logistics of producing a printed photo in a remote part of the Solomon Islands

There is little written in the literature about the actual mechanics of producing photos from the cameras. Some authors described using their projects to not only teach and empower participants through the use of photography, but also teach participants to develop the film in a darkroom (Wang & Burris, 1997). Kramer, Schwartz, Cheadle and Rauzon (2013) and Wang and Pies (2004) provided disposable colour-film cameras to their participants and commercially developed the films, while L. Murray and Nash (2017) downloaded photos onto a laptop to view the photos with the participants. However, with the concept of Photovoice being the facilitation of a participatory needs assessment and evaluation, with the aim of enabling social change (Wang & Pies, 2004), the technique is used widely in oppressed and marginalised populations, many of which are in poorly resourced countries where these techniques may not be practicable. Esau et al. (2017) briefly discussed the complications that may arise in the material application of Photovoice in a resource-challenged country; however, overall there is little in the literature about logistical challenges to produce photos in these settings. The study site at Atoifi is in a remote area of Solomon Islands, with access being by plane twice a week or boat. There is limited power, with the generator providing power twice per day only and sometimes not at all, and while computers, a printer and printer paper were available in the hospital administration area, access to these was not ‘a given’ and reliability of these items was not guaranteed. ‘The implementation of Photovoice can be challenging in rural settings, but with careful planning these challenges can be surmounted’ (Esau et al., 2017, p. 7). Thus,

thorough planning was required to ensure the first data collection phase went ahead with minimal setbacks.

First, it was absolutely necessary that any powered equipment such as computers, cameras and printers were also powered by battery. A laptop computer was taken as part of the author's normal equipment, and initially, the option of using digital 'Polaroid' cameras was explored, as these devices print the photos instantly; however, the photo size and quality were not adequate. Once the decision to use smartphones instead of cameras, with the ability to download the photos, was made, the location and time in which the interviews would potentially take place had to be considered. With limited power, there was no guarantee that the laptop could be powered by 240V to show the photos during the interviews, and there was also no guarantee there would be a 240V power point available. The other thing to consider was the participants. To ask the participants to choose a smaller number of meaningful photos from a larger amount meant that participants would have to scroll forward and back through the photos on the computer. Given that many participants might not have ever used a computer, let alone being used to navigating one, meant that this could potentially disrupt the flow of the interview process, interrupting trains of thought and making the interview take longer than anticipated.

Burden of participation is described as the amount of time and resources participants are required to invest, in relation to the intensity of the participatory design (L. Murray & Nash, 2017). Studies with a higher quality of participation demand more intensive training, longer meeting times and an overall higher investment by participants. Given that participation in this study was voluntary, consideration to not burden participants with lengthy interview times was respected as many had paid work to return to, gardens to tend (as subsistence living required many women to attend to their crops after work), families to cook for and social activities to attend.

With the ability to charge electrical equipment in short bursts, a travel printer that contained battery back-up was purchased. This enabled the photos to be downloaded to a laptop and printed during non-powered times of the day, causing minimal disruption to research activities. A laminator was also purchased, and while this did not have a back-up battery, the RA was able to laminate the photos, to preserve their integrity, during powered times of the day. Taking a printer and laminator needed further consumables; requirements for printer paper, printer cartridges, laminating pouches, labels, scissors and other stationery items had to be over-estimated and taken to Atoifi to ensure nothing ran out as there was no way these could be purchased during the data collection time.

The careful planning proved to be successful as when the camera was returned from one group, it was connected to the laptop, and while charging, the photos were downloaded and deleted from the camera, enabling a quick turn-around to the next group. Given that the interviews were mostly done after-hours to avoid interrupting participants during work hours, the photos were printed during the day and laminated when the 240V power was on.

4.2.8.2 Participant interviews

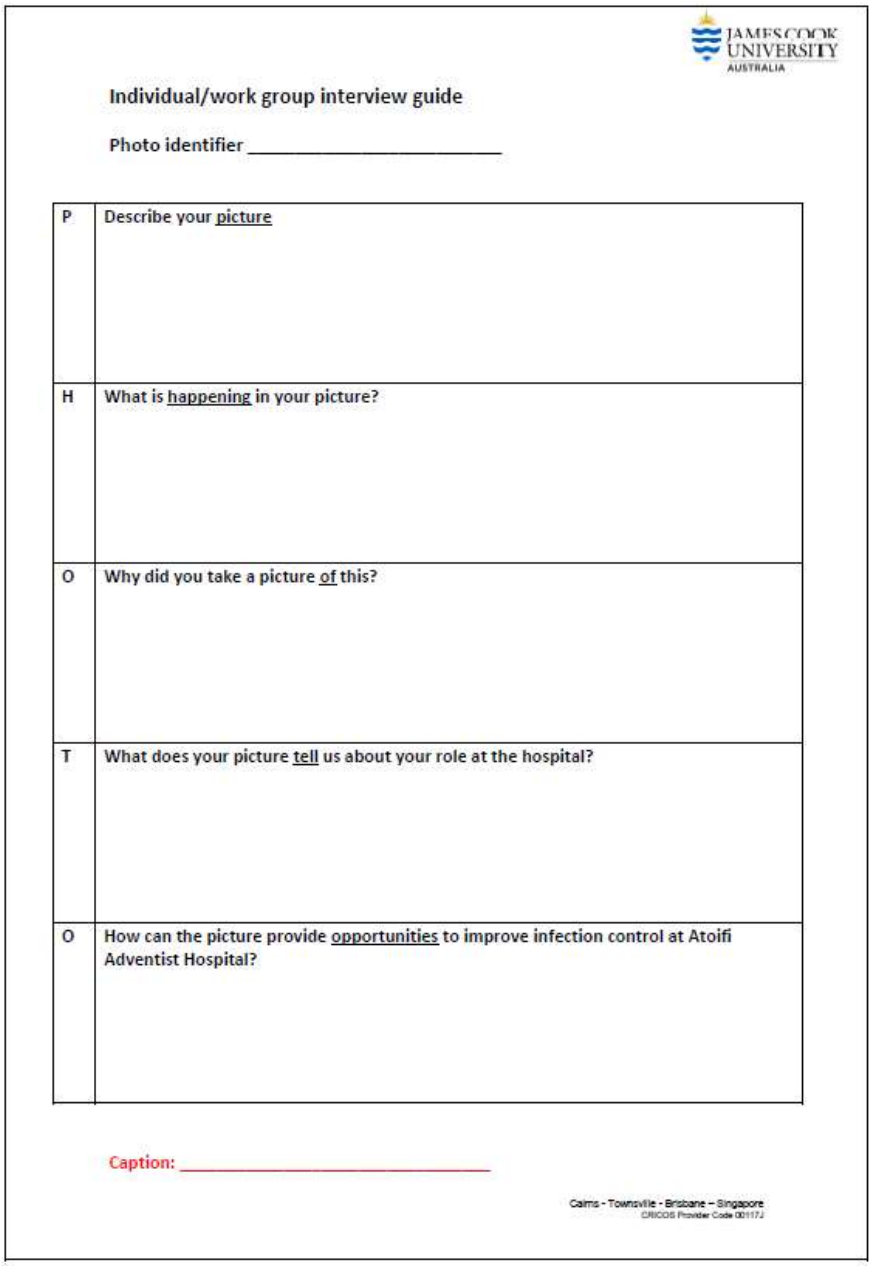
Interviews with participants were undertaken in their homogeneous work groups. While all participants were recruited during initial group meetings, not all participants followed through to interview. Additionally, not all participants took their photos in a group, nor were they interviewed in a group. With only one pharmacy assistant and one radiology technician at AAH, these participants took their photos by themselves, and also interviewed on their own. Despite two pathology staff participating, they chose to take photos and interview individually.

Group interviews can open up discussion and reveal the social and cultural context of people's understandings and beliefs, and can be thought to be more valuable than a representative sample or an individual encounter with a single interviewer (King & Horrocks, 2010). Group discussions enable people to reflect on the photos they produced, and analysis of the photos without the 'voices' of the photographers would be at odds with the essence of Photovoice (Wang & Burris, 1997). When considering the epistemological underpinnings of action research, where the process of interacting is also a process of testing and critiquing what is already known and transforming into something better (Whitehead & McNiff, 2006), group interviews allowed researchers and participants to explore components of the research question, namely, what the current practices of IP&C at AAH are and what the issues are, and also enabled practical and culturally acceptable solutions to be discussed. A translator was present, and interviews about the photos were recorded using a digital audio recorder.

All printed photos belonging to the work group being interviewed were laid out on a table at an agreed location. The location was chosen according to accepted cultural norms (Gegeo & Watson-Gegeo, 2002), and 'neutral' spaces where interviewees felt safe to discuss their photos were used. Each group of participants was asked to choose 15 photos from their collection (Figure 5), which they felt most meaningfully related to the Photovoice statement; for some groups, less than 15 photos were taken and all photos were discussed.

Figure 5: Choosing photos that best depicted the Photovoice statement

Allowing those who took the photos to choose the photos aligns with the participatory approach in that it is the participants who lead the discussion (Wang & Burris, 1997). Once photos were chosen, the interviews were guided by the P_H_O_T_O acronym. For each photo, the primary photographer was identified from the group and the story of the photo was told, and once they finished, the rest of the group members were given the opportunity to add their insights. Before moving on to subsequent photos, the interviewees were asked to provide a 'caption' for each photo (Figure 6). A caption is a statement or word that depicts how the photo represents their experiences (Mader et al., 2016). Because of language barriers with some participants, the concept of a caption was difficult to describe, and it was crucial not to put words into their mouths during this process (Kramer et al., 2013); therefore, clarifying questions were used, such as 'What were you trying to show in this photo?' Interviews typically went anywhere between 45 minutes and 2 hours depending on the number of photos discussed.



JAMES COOK UNIVERSITY AUSTRALIA

Individual/work group interview guide

Photo identifier _____

P	Describe your picture
H	What is happening in your picture?
O	Why did you take a picture of this?
T	What does your picture tell us about your role at the hospital?
O	How can the picture provide opportunities to improve infection control at Atoifi Adventist Hospital?

Caption: _____

Cairns - Townsville - Brisbane – Singapore
CRICOS Provider Code 00117J

Figure 6: Phase 1 interview guide

Recorded interviews were translated (where required) and transcribed verbatim. Interviews requiring translation were downloaded from the voice recorder to the laptop and transferred onto a USB memory device. These were transcribed by the RA, based in Atoifi, over a 2-month period following the first phase of data collection. Interviews completed in English, therefore not requiring translation, were transcribed by the primary researcher. Transcriptions were sent from the RA to the primary researcher, with a sample of transcriptions checked against the audio recording for accuracy by an independent fluent

Solomon Island Pijin speaker. Transcriptions were also checked against interview hand-written notes taken at the time of each interview.

4.2.8.3 Data analysis and handling

Data from phase 1, including photographs, interview transcripts and field notes, were collated using NVivo software (QSR International, https://www.qsrinternational.com/) and inductively analysed to interpret the data. The initial open coding did not follow a specific coding method because of the multiple data sources created throughout the data collection. A combination of 'elemental' methods, including structural, in vivo and process coding, was used, as well as aspects of 'affective' coding methods, such as values and emotion coding (Saldana, 2009). Each interview transcript was printed with highlights and sticky notes applied to identify similarity of conversations, perspectives, beliefs, concepts and actions. Nodes (codes) based on these emerging clusters were created using the NVivo software, with sections of dialogue and related photos being allocated to the nodes. Twenty-six nodes were identified following the first round of open coding.

Following this initial coding process, a screen shot of the code list was taken to find relationships between the code names. Each node was then individually opened, printed and re-examined, with dialogue sections being cross-checked and verified with the initial transcripts. Scrutinising each node set again enabled individual sections of dialogue to be coded to more than one node, highlighting that there may be more than one meaning or perspective arising from the discussion. Refining the data by working deeply and reflectively within the nodes meant that some data were relabelled or dropped, while allowing patterns to emerge.

After working within the data, a second cycle of coding began by working across the data (Saldana, 2009). Categories emerging from the data were developed based on the first part of the research question, enquiring 'what the current IP&C practices at AAH are'. Topics around IP&C revealed within the raw data were viewed from multiple angles; therefore, first round codes were pulled apart and reassembled according to their relationships with each other. The process of reassembly was continuous and evolving until an in-depth view of the phenomenon was gained. Second cycle coding revealed nine patterns that identified current IP&C practices at AAH.

4.2.9 Data Collection and Analysis Phase 2

4.2.9.1 Data collection

Phase 2 data collection at Atoifi occurred 1 year after phase 1. Since the first data collection phase, some staff (and thus participants) had left AAH and new staff had joined.

A discussion was held with a member of my advisory team and also the co-researchers about asking the new staff if they wanted to participate, despite not having participated in phase 1. It was decided that the new staff would offer valuable insights into the project as they brought with them their own interpretations of IP&C and of the Photovoice statement. Additionally, this movement of staff reflected the reality of life in many PICs. Capturing their interpretation was important to replicating reality and the potential implications for IP&C. As a result, six new participants were recruited using the same recruitment process previously discussed.

What became apparent during the data analysis stage of phase 1 was that just because one participant or one group of participants have specific views about what causes sickness within the hospital, it did not mean that this is a shared view. The non-linear nature of PAR and Photovoice is that one photo can be viewed from multiple perspectives, and there can be multiple meanings behind a single photo.

Photo-elicitation was used as a conduit for discussion at interview in phase 2. Photo-elicitation is a method where a photo is inserted into a research interview to enrich the research process as it elicits memories and information about the content of the photo that would not be otherwise be discussed at a traditional interview (L. Murray & Nash, 2017). Each photo discussed during phase 1 was printed, along with their captions, in the centre of an A3 piece of paper. Each photo was titled with its code and two questions guided the interview:

1. From this photo, how does sickness pass from one person to another in the hospital?
2. What is the solution (how can this be fixed)?

Co-researchers decided to maintain the same interview groups as phase 1 and organised them accordingly. At the start of each interview, the group was first shown their photos and associated captions from phase 1, and the interview discussion was described to ensure the primary researcher had recorded the participants' interpretations accurately. This 'member validation' is an important ethical component of participatory research as it not only ensures quality of the research, but also allows participants to have a stronger voice in how they are represented (King & Horrocks, 2010). Member validation proved challenging, however, as there had been a turnover of staff since the initial data collection phase, with some of the participants having resigned or taken leave.

Following member validation, each of the groups was shown all participant photos, excluding their own. Each group was reminded of the original Photovoice statement and given 10 minutes to choose five photos that they thought best represented the statement.

The participants were permitted to self-organise the way in which they chose the photos. The two cleaning staff collectively chose five photos, whereas the workshop participants chose one photo each. Once they had chosen the photos, they were asked the above two questions, with their responses written next to the photo on the A3 paper (Figure 7). The interviews were undertaken in a mutually acceptable location and were audio recorded, and the same RA was again employed to interpret where necessary. Writing discussion points next to the photo and summarising what was discussed and written at the end of each interview performed the role of member validation for this phase of data collection.

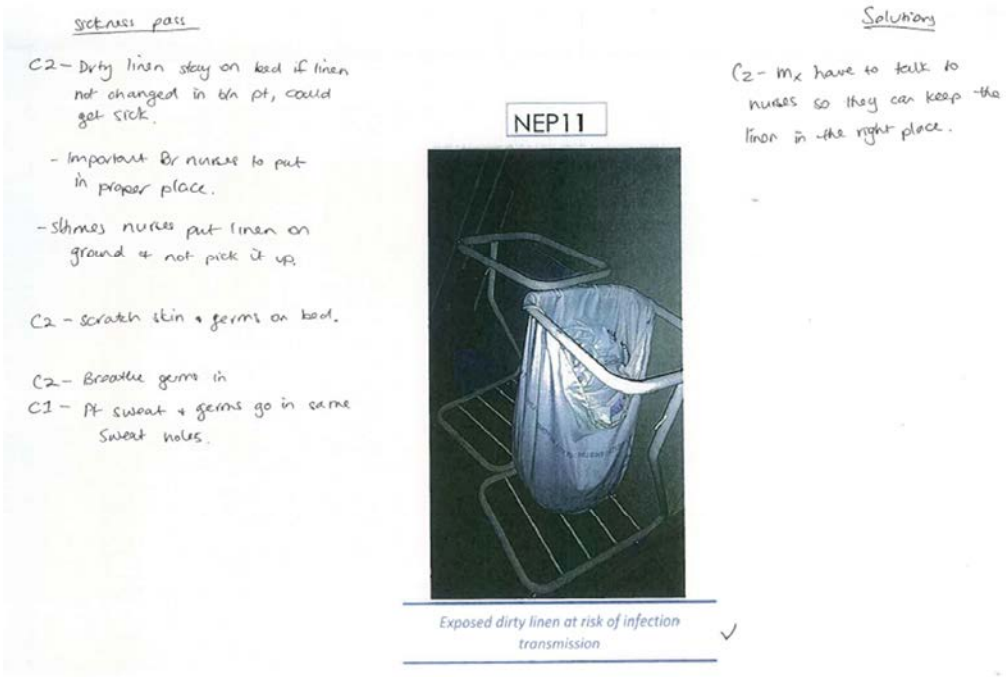


Figure 7: Phase 2 interview guide

To ensure participants' responses were not influenced by other groups, a 'clean' photo was presented to each group. With 67 photos discussed during phase 1, and 11 groups to interview, with the potential that each group could choose the same five photos, 10 copies (a group could not choose their own photos) of each photo were taken to Atoifi, resulting in 670 pieces of A3 paper.

As with phase 1, interviews were translated and transcribed verbatim by the RA (for non-English interviews), and transcribed verbatim by the primary researcher for interviews conducted in English.

4.2.9.2 Data analysis

Initial open coding of phase 2 data was undertaken using the same processes as phase 1, with 15 nodes created. The second round of coding for phase 2 was undertaken differently, being to identify photos that were not chosen at all, or conversely photos that were consistently chosen across all HCW groups. This might have indicated that no-one except the original photographers thought the objects of the photos were an issue, or that the objects of the photos were an issue for everyone. The focus for the photos that were chosen was on why they were chosen and what interventions or solutions can be done to fix the identified problem, thus addressing the second sub-question of the primary research question.

In round two, 22 photos were coded into nodes titled by the name of the photo (e.g. NEP11). Multiple photos of the same object, taken by different photographers, were coded to the same node. Discussions relating to the photo, elicited either from phase 1 or phase 2 of the data analysis, were then cross-coded against the photo. Each photo node was then printed with coding stripes included, enabling a visual representation of the linkages between codes that occurred around a single photo across the entire data collection set.

To maintain rigour, a number of processes occurred throughout the data collection. Reflective journaling was used to identify and document potential biases. Member checking occurred through all stages, including at the end of interviews, following informal conversations with participants, and when asking for any written or oral commentary prior to the submission of a final report or publication. These processes not only added to the rigour and trustworthiness of the research process, but also maintained community input and involvement and sustained community momentum.

4.3 Part B—The Woven Fabric of Theory and Practice Across Different Epistemologies: 'No-One Has Ever Asked Us This Before'

Inherent in action research is the generation of knowledge and the transformation of practice, which in turn generates new knowledge (Cordeiro, Soares, & Rittenmeyer, 2017), a cycle that is ongoing as new knowledge expands (McEldowney & Connor, 2011). In PAR, it is understood that researchers and participants are analogous and that each is capable of contributing to the knowledge building process, collaboratively sharing responsibility for decision-making and practice transformation (Cordeiro et al., 2017). Critical for the researcher in this praxiological process is the awareness of self. 'Reflexivity within the praxiological process permeates all aspects of the model through increasing consciousness of the underlying cultures, ideologies, and politics of practitioners and those for whom they

care' (McEldowney & Connor, 2011). Decolonising research methodologies recognise that participants are knowledgeable agents of their own contexts of study (Monzo, 2015), and that the historical legacy of a dominant knowledge, which was that of the researcher, only produces practices that address the dominant interest, therefore not liberating the knowledge of the 'researched' (Cordeiro et al., 2017). In CBPR, rarely are all aspects of the research completely in the community's hands; however, praxis and emancipation are core to this methodology (Cordeiro et al., 2017). The important recognition that researchers and community are co-learners and co-consultants, thus legitimising the active role of the community, 'make research praxis inclusive, organic and bottom-up' (Dutta, 2020, p. 1178).

The outcome of PAR is that the understanding of theory and development of knowledge produce a change in practice through a useful and sustainable transformation, which then in turn promotes new knowledge. If this occurs, then the results should demonstrate this praxis. However, for this to happen, a qualitative researcher needs to develop trust and build the relationship so that participants feel validated as experts in their own context, with the understanding that they are equally important in the research process. This is not a way of thinking *about* action, but a particular *kind of* action, and produces better actions and better understanding (Cordeiro et al., 2017). Validation encourages participants to 'open up' and reveal insights that might not have been revealed had the relationship and trust not been developed, and while the words they speak may not greatly differ, the meaning and innuendo behind what they say may be telling.

Moments of trust and relationship development have previously been mentioned; my first visit prior to starting the research where I went to Atoifi as an outside IP&C auditor, but through participation in community activities, I became, for a short time, a community member. There was public dancing of the 'Binu Binu' semi-naked, taught to me by my RA, and then dancing alongside her, further building my relationship with her and with the wider community. The third relationship and trust-building moment was when my partner accompanied me to Atoifi. As a carpenter, he volunteered to work with the maintenance men while I undertook data collection. I knew a positive relationship had been built when my partner told me that one morning during the prayer and briefing session conducted prior to starting their daily work, one of the maintenance men held his hand. While this was somewhat disconcerting for a white man from a culture where hand-holding between two men could signal an intimate relationship, I felt quite honoured for him as hand-holding between same-sex people in the Solomon Islands is a symbol of true friendship.

The relationship-building changed my position as a researcher somewhat during the data collection as a certain closeness developed between myself as the primary researcher, the RA, and the co-researchers and participants. It also made me consider in whose interest

the research serves and whether a true representation of the participants is possible (Monzo, 2015). While 'positionality' is commonly described by researchers as part of the interpretive process, generally details about the relationship between that positionality and the interpretive process are not (Dennis, 2018). The change in positionality, the closeness that developed, made me determined as a researcher not to govern what is seen and not seen, yet instead reflect the true difference of cultures (Monzo, 2015):

> *The issues are grass roots stuff. Lack of reliable water, lack of supporting infrastructure, lack of money. When asked how their role fits into the photo, at the start their standard answer was, 'As the charge nurse of my ward, I must work together with staff and IC nurse and everyone to educate … bla, bla, bla'. But as the interview went on, they started telling me how they felt 'guilty', 'scared that they may become a patient through needlestick', how they had already told maintenance but nothing gets done—frustration came out in their voices. (Personal diary notes, 24 October 2018)*

When interviewing the senior nurses above, it would have been easy to draw the discussion to a quick close and move on as they were citing the well-documented reasons why IP&C does not work in resource-limited settings and their solutions to improve IP&C were textbook responses. However, I chose not to end the discussion; instead, I just sat and listened. Dennis (2018) admits that during her interviews, she has been uninterested in the factual aspects of a story and more interested in the way the interviewee is situating themselves *in* the story; the author calls this 'Praxis as listening passed the facts'. Praxis as listening passed the facts infers that the factual nature of what the interviewees are saying does not provide absolute validity; it is also what is found underneath the surface. The interviewee is asking the researcher to look beyond what is being said and to gain a mutual understanding of the essence of the story, a connection between the two in which each person recognises and affirms the unspoken (Dennis, 2018). The interview with the senior nurses was the first interview undertaken, and it was clear that infrastructure was an impediment to IP&C; however, more important was the frustration behind the lack of action to improve the situation. The praxiological trajectory was not going to be around education as a solution, as the senior nurses cited, because the unsupportive environment disallows praxis to be realised (Cao & Wang, 2021); it was going to be something else.

Interviewing the nurse educators allowed a different form of validation and knowledge sharing, one which Dennis (2018) terms 'Praxis as joining together'. Being a university lecturer of nursing gave me a connection with the nurse educators as a 'knowing' counterpart. While the interview started off in a formal manner, I was able to elicit responses

from the interviewees by assuming a set of shared norms (Dennis, 2018) around the education of nurses and IP&C. Probing the nurse educators around the IP&C educational content of the nursing curriculum, and the translation to practice (or lack of), raised a heightened discussion, which revealed frustration around the lack of leadership from the IP&C nurse and other senior staff to enforce IP&C practices. Once again, the factual nature of the discussion around the photos evolved into a process where I validated their concerns through the connection of sameness and evoked a depth of understanding seen only through the eyes of the participants, informing theory and practice through a different perspective.

A natural process of the PAR cycle of action is that the theory-practice-theory cycle does not wait until the end of the project to commence; it is an ongoing evolving cycle. True to the transformative paradigm, where a process of interacting is also a process of testing and critiquing what is already known and transforming it into something better, the very action of discussion and interaction about an issue leads to change. In 2016, my first visit to Atoifi prior to the research commencing, AAH was using an incinerator to burn biomedical or potentially infectious waste. The incinerator was working but was old (Figure 8).

Figure 8: The original incinerator

During my first phase of data collection in 2018, the incinerator had disintegrated completely and a pragmatic solution of using 44 gallon drums was in place. This was not an optimal solution as the steel was not graded to withstand high heat and the drums were quickly degrading. The disintegrating drums meant that biomedical waste and sharps, not

completely burned, were spread across the ground. This was an obvious issue for staff as many participant groups took photos of the drums, citing issues of safety for the community, as the area was not fenced off, and also for the staff taking the waste to the drums for burning (Figure 9).

Figure 9: The (not so) temporary solution

The Chief Medical Officer/Chief Executive Officer (also a co-researcher) was interested in the issues brought up by the participants during the first round of data collection, and the incinerator situation was brought to his attention. He was aware of the problem and asked for some potential solutions that were workable in their setting. A number of designs, specifically aimed at resource-limited settings, were sourced, and the Chief Medical Officer/Chief Executive Officer presented these to the staff and the maintenance workers. Together, they chose a design that appeared to be the most practicable option, and over several months, a new incinerator and concrete sharps pit were built. By the time I visited in 2019 for phase 2 of data collection, the incinerator was operational.

The new incinerator (Figure 10) and concrete sharps pit were fenced off from the public and provided a safer environment for staff to dispose of their biomedical waste; however, during phase 2 of data collection, the participant groups still chose a photo of the 44 gallon drum incinerator despite what I thought was a resolution of the problem. I questioned the choice of photo as they knew that there was a new incinerator; however,

they pointed out that while the new incinerator was good, the chimney needed to be higher as the smoke drifted through the village, and the smell made people sick. Bingo! This new information was fed back to the maintenance men, who were going to alter the chimney design, a lovely example of praxis.

Figure 10: Their pride and joy!

This convergence of what I term 'praxis in action' and the true essence of Photovoice, where the object of the photo does not depict the underlying story, exemplifies the PAR process, where an achievable outcome was generated, not as a result *of* the research process but *through* the research process.

During phase 2 of the data collection process, the participants from the maintenance department grouped together to choose their five most meaningful photos that depicted the Photovoice statement, and provide a discussion around how the photos depict sickness transmission and what their solutions to fix the issue were. An interactive discussion between the participants, the RA and myself ensued, and because of the language barrier between myself and some of the participants, I used some engaging non-verbal cues to encourage the flow of discussion (Dennis, 2018). Two apprentices from a local village joined the research during phase 2, and while they were not as familiar with the hospital, they were transcribing their knowledge around sanitation at their village level to that of the hospital, particularly around the issue of rubbish. I prompted them for some solutions around the

rubbish problem and asked them what the hospital could do to fix it. It was then that the statement was made by the head of the maintenance department, 'No-one has ever asked us this before'.

Hearing that statement silenced me. IP&C in the Western model incorporates all hospital staff including kitchen, laundry, cleaning and maintenance staff as they all play a pivotal role in maintaining IP&C. However, it dawned on me that the insights and voices of the ancillary staff about IP&C at AAH were never considered, and the staff were never provided a platform to impart their expertise in their own workplace context. Praxis as intention and personal interest (Dennis, 2018) is not an instrumental process—it is not about eliciting and reproducing the interviewees information; it is about being genuinely interested in the stories and the lives of the participants and validating them as a person with their own knowledge base and in their own right. It is not about obtaining a kind of information; it is about care and interest in the person themselves (Dennis, 2018):

> *The 2 laundry women did not want to participate. I sat aside & Dorothy (RA) spoke to both of them separately. We left reasonably quickly & told Kenny (IP&C nurse) on the way out. I suggested to Dorothy and Kenny that if the laundry staff and cleaners talked, the cleaners could take photos of what the laundry staff suggested … Dorothy said the laundry worker said that there is a lot of research but they never see any change. (Personal diary notes, 18 October 2018)*

When the scourge of COVID-19 wanes, most of the world's population is vaccinated and international travel resumes, the final act of validation and trust will occur when the findings of this research are personally presented to the staff of AAH and the 'theory informing practice informing theory' (Monzo, 2015), the praxis, perpetuates. It is not appropriate to communicate these via email, nor is it appropriate to present them via a web-based video platform, as Solomon Islanders are a culture that values and listens through face-to-face oral communication. The findings will be verbally presented to the participants, whose valuable insights and knowledge, culturally diverse yet complementary, are woven and interlaced (Tofaeono et al., 2019) with the biomedical perspectives of IP&C.

4.4 Summary

Part A of Chapter 4 justified the methodological approach to the study and has provided an in-depth explanation of the data collection and analysis methods. Study ethics and rigour have also been explained within this part of the chapter. Part B provided insight into the evolving and cyclical nature of PAR in real time. Outcomes of the research process

do not have to wait until the end, meaning change because *of* the research, but can happen as a part of the research process, with outcomes occurring *within* the research.

Chapter 5 describes the findings of the study in two parts. Part A is written as a manuscript for publication and presents the first theme identified from the findings. Part B portrays theme 2, the current practices of IP&C at AAH, and also represents the participants' voices as they discussed solutions.

Chapter 5 Findings

5.1 Chapter Outline

Chapter 5 will present the findings of this study. Theme 1, 'what is known and believed about sickness transmission', is presented as a manuscript (under review), and theme 2, 'what the IP&C practices at AAH are' is presented within this chapter. To contextualise IP&C practice and appreciate their solutions, it was important to first understand what the participants knew and believed about sickness transmission in the hospital setting. The manuscript provides voice to the understanding of how infections spread within the hospital as seen through the lens of the participants.

5.2 Part A—What is Known and Believed About Sickness Transmission

5.2.1 Declaration and Contribution for Thesis Chapter 5—Journal Article

This article is under review by *PLOS Global Public Health* and is not yet published. The article has been written as part of this study and after commencement of PhD candidature.

Details of the publication	**Nature and extent of the intellectual input of each author**
Sparke, V. L., MacLaren, D., Esau, D., & West, C. (2021). Changing the lens through which we see others and the world: Infection prevention and control insights using Photovoice. *PLOS Global Public Health.* (submitted, under review)	**VS** collected the data, collated the findings, described them and drafted the manuscript. DE as the RA was present at interviews where required to interpret, and translated and transcribed the audio recordings. DE reviewed the manuscript in this context to ensure correct representation. CW and DM provided guidance throughout the draft, and all authors approved the final manuscript.

PLOS Global Public Health

Changing the lens through which we see others and the world: Infection prevention and control insights using Photovoice

--Manuscript Draft--

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Opposed Reviewers:	
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Question	**Response**
Financial Disclosure Enter a financial disclosure statement that describes the sources of funding for the work included in this submission and the role the funder(s) played. This includes grants and any commercial funding of the work or authors. This statement will be typeset if the manuscript is accepted for publication.	The author(s) received no specific funding for this work

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Data Availability Before publication, Authors are required to make fully available and without restriction all data underlying their findings. Please see our PLOS Data Policy page for detailed information on this policy. A **Data Availability Statement**, detailing where the data can be accessed, is required at first submission. Insert your Data Availability Statement in the box below. Please see the data reporting section of our submission guidelines for instructions on what you need to include in your Data Availability Statement. This statement will be typeset if the manuscript is accepted for publication.	The data underlying these findings are held within the James Cook University data repository. These findings are part of a PhD thesis and as yet is unpublished.

Full title

Changing the lens through which we see others and the world: Infection prevention and control insights using Photovoice

Short title

Seeing infection prevention and control through Photovoice

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Abstract

Healthcare associated infections are the most common complication of a person's hospital stay. Contemporary infection prevention and control programs are universally endorsed to prevent healthcare associated infections. However, western biomedical science on which contemporary infection prevention and control is based, is not the only way that staff and patients within healthcare settings understand disease causation and/or disease transmission. This paper reports on perceptions of disease, and disease transmission and how these influence infection prevention and control practice at Atoifi Adventist Hospital Solomon Islands. Photovoice was used as the primary data collection method with staff and patients. The germ theory was only one of many explanations of disease causation, transmission and prevention at the hospital. Many social, cultural and spiritual influences played an important role in how people understood disease to be caused, transmitted and prevented. Although infection prevention and control models based on western science continue to form the premise of reducing healthcare associated infections in Solomon Islands and locations across the globe, local beliefs need to be considered when planning and implementing infection prevention and control programs to ensure success.

Introduction

Infection Prevention and Control (IP&C) programs in healthcare settings aim to reduce disease transmission between patients, visitors and staff. Healthcare associated infections (HAI) are the most common complication of a person's hospital stay and are an ongoing cause of morbidity, mortality and excess healthcare expenditure (1, 2). Contemporary biomedical (Western) based IP&C programs were only formalised in the 1980s as a result of the Study on the Effectiveness of Nosocomial Infection Control (SENIC), which proved that comprehensive infection control programs can reduce healthcare associated infection rates. Before these formal contemporary IP&C programs,

the deliberate intent to reduce infectious agents passing between people in public health and hospital settings had only been occurring for little more than a century (3). It was only in the 1850's that Holmes and Semmelweis, separately published findings on the transmission of puerperal sepsis and described the role of hand hygiene in disease transmission (4). In 1884 Koch and Friedrich then formulated four criteria to establish a causative relationship between a microbe and a disease (5). Thus, it was from this relatively recent evidence base that the germ theory of disease became the foundational concept of contemporary Western-based IP&C programs.

International IP&C guidelines are based on the relatively new (in human history) germ theory and even newer SENIC study. These international IP&C guidelines are assumed to be universally implementable across all healthcare settings to prevent and control infectious disease transmission. Comprehensive IP&C programs informed by these guidelines are both human-resource and financially intensive. Surveillance and reporting systems, antibiotic stewardship, performance improvement strategies, highly technical sterilisation and disinfection practices, environmental controls and the supply and use of optimal hand hygiene agents all form essential components of comprehensive IP&C programs (3). Such IP&C programs have often been 'lifted' from well-resourced healthcare settings with an assumption that they can be directly placed into health care facilities anywhere in the world, regardless of different resources, language, culture or beliefs about disease causation and transmission. Lifting and placing these IP&C programs into different settings also assumes that health systems and staff are informed by - and base their work on – western scientific evidence and that the germ theory underpins decision making. Although fundamentally important, there is little evidence that these assumptions are systematically scrutinised before IP&C systems are transferred or implemented across the globe. However there is evidence that health systems in lower-middle income countries (LMICs) (countries with less than $1,230 US gross national income per capita) face fundamental challenges when attempting to implement international IP&C programs (6). High burdens of communicable

and non-communicable disease, poorly functioning or maintained health infrastructure and governance, high costs of treatment and local geographical and climatic factors make the implementation of high cost and intensively resourced contemporary western-based IP&C programs almost impossible in many resource limited settings (6).

There is clear evidence that different populations around the world, including those in LMICs, have a variety of beliefs about how sickness is caused and diseases are transmitted. These beliefs may or may not align with the germ theory (7). However there is little evidence on how health system leaders are investigating these beliefs and incorporating them into local IP&C programs. The influence that social, cultural and spiritual practices and beliefs have on health care workers (HCWs) and their IP&C practice is also poorly described. This is despite healthcare facilities being staffed by HCWs who serve their own communities and balance their own biomedical training (including the germ theory) with their community's underlying belief systems about sickness, disease and health (6). In an attempt to find solutions to infection control challenges in LMICs, Sparke, Diau (6) found western-based IP&C programs embedded in countries where cultural, spiritual and religious beliefs were often at odds with the biomedical (germ theory) premise of contemporary international IP&C interventions. The lack of IP&C program success in these countries was exemplified by Allegranzi, Memish (8), who poignantly illustrated that the use of alcohol-based hand rub (ABHR) for hand hygiene was still recommended in countries where alcohol is prohibited due to religious convention.

To apply sustainable IP&C guidelines and practices in LMIC with culturally, spiritually and linguistically diverse populations with any modicum of success, a new model of IP&C needs to be considered. Not one that is founded in the Western-biomedical model alone, but one which also takes into consideration the cultural and spiritual context, knowledge and beliefs of disease causation and transmission and one within which the biomedical model can sit.

Culturally centred approaches to understanding infection prevention and control

People across the globe live with complex cultural beliefs and often do not live with a single reality, rather engage with co-existing beliefs that transcend multiple belief systems. These belief systems may or may not include biomedicine. The current debates in countries across the globe on the cause and transmission of COVID-19, IP&C protocols that may or may not include face masks, and scepticism over COVID vaccination demonstrate that the germ theory does not uniformly inform peoples' beliefs about disease and prevention in every setting. A contagion, the central player in the biomedical model of disease transmission is not recognised in the belief systems of many societies (7). On the surface, in many cultures' sickness transmission could be seen to follow biomedical principles as the belief that if one person comes into contact with another person who is sick, the person will also develop the sickness. However the underlying belief of how this occurs is not necessarily attributed to the germ theory, but can be a complex mix of a culturally, ethereal and spiritually influenced knowledge base (7).

Beliefs around the cause of sickness also dictates treatment-seeking practices. If it is believed that illness is caused by witchcraft or sorcery, then seeking help from health providers such as a traditional healer or Christian faith healer may be more likely (9), however if a germ is perceived as the causation of disease then a health service such as a hospital or health clinic may be the primary point of contact.

Most, if not all any cultures adopt some form of medical pluralism where both modern and traditional/folk medicine is used in combination for healing. Medical pluralism when treatment seeking is not always an ideological approach, but a pragmatic one. Often those seeking treatment see nothing wrong in using modern and traditional healing strategies concurrently, and healers themselves often span multiple worlds, placing themselves strategically between different genres of therapy (10).

With vast differences in beliefs in the concept of sickness causation, transmission and treatment-seeking practices and the reality of medical pluralism, introducing an IP&C system based on the biomedical model alone will, by design, always ever be a partial solution to reducing infectious disease transmission. The complex mix of cultural, spiritual and Western knowledge within a population makes implementing IP&C systems based on the germ theory challenging. The implementation of a meaningful and sustainable IP&C program cannot simply follow an external 'blueprint' but requires an understanding of the local cultural context and an interpretation of the fundamental meanings that inform people's actions.

Research context

The context for this study is Atoifi Adventist Hospital (AAH), located in a remote area of the Solomon Islands. AAH serves a population of around 80,000 people, many living in small remote villages, and is located in the East Kwaio region of the island of Malaita (11). Around 95% of Solomon Islanders identify themselves as Christians, particularly those living in coastal villages, however many ancestral religious beliefs and traditional practices are still strongly held and actively practiced by those that live in the surrounding mountain hamlets (12). For the residents of the mountain villages, interacting with ancestral spirits are integral in everyday life as they are ever present, continually guiding their decision-making (13). The success or failure in many everyday acts of living, such as crop production will only succeed with the support of ancestral spirits. The rules dictated by their ancestors and followed by the mountain people of Kwaio are complex, and a violation of these rules or 'tabu' brings punishment in the form of social and economic misfortune, sickness and death (12). Likewise, the residents of coastal villages interact with a range of introduced Christian deities and spirits that include Jesus and his 'guardian' angels and Satan and his 'evil' angels. These deities and spirits are integral to everyday life and guide decision making. The rules dictated by Christian leaders are complex and violation of 'Christian teaching' brings punishment from God and social and economic exclusion from villages.

The 65-bed AAH, opened in 1966, is operated by the Seventh Day Adventist (SDA) church in the Solomon Islands. AAH was designed by white SDA missionaries as an evangelical tool to covert people from 'heathenism' to become members of the SDA church. From the opening of the hospital in 1966, staff identified themselves as 'medical missionaries'. This terminology and approach continue today. Despite the early Missionary's exposure to the Melanesian culture of Papua New Guinea, the hospital design lacked input from the local community and as such presented many challenges for the Kwaio people's customary beliefs (14). The layout of the hospital where the maternity ward and women's toilets is incorporated within the main hospital building does not reflect the Kwaio cultural systems or ways of maintaining a healthy individual, family or community. In Kwaio *Kastom* law it is *tabu* for a man to enter an area containing women's bodily fluids, thus breaking ancestral law, and as such many Kwaio who worship their ancestors do not access hospital services (11, 15). The services provided at AAH strictly follow SDA interpretations of Christianity including SDA food taboos that enforce Judaic rules of 'clean and 'unclean' foods. Despite these challenges for people who practice ancestral religion, the hospital has had a solid reputation for delivering high quality care to a predominantly Christian population.

In determining how IP&C practices could be improved at AAH to aid the development of an acceptable and sustainable IP&C program, the meaning of IP&C needed to be explored with staff and the community members to which the hospital serves. Infection prevention and control practices needed to be ascertained, and culturally informed solutions needed to be sought and implemented to enhance infection control practices.

Methods

Participatory Action Research (PAR) was used in this study because it provides a framework for community-based participatory research (CBPR) in partnership with a variety of people within this complex setting (16). Within this PAR, Photovoice was the specific

method used to directly investigate how people understood disease transmission between people and how to prevent this transmission. Photovoice is a method of data collection, analysis and interpretation using photography (17). Photovoice was developed in the 1990s by Wang and Burris (18) and is a qualitative action oriented research method (19) commonly used in education, health and social sciences. Photovoice is a method that provides cameras to research participants to take photographs based on a co-designed statement. Photographs are then reviewed in partnership between the research participants and the researcher to explore the story behind the photograph and how that story helps answer the research question. This process is foundational to CBPR because it values a re-balancing of power and trust between research participant and researcher and increases ownership of the research process and research results by research participants (20, 21). This method allows an in-depth investigation of the meaning behind the photographs to gain a richer understanding of salient issues because participants reflect on their own perspectives. Importantly photographs taken within a Photovoice study convey socio-cultural perspectives of the issue being studied (21).

The successful implementation of an IP&C program relies on the commitment of both trained HCW and 'ancillary' staff such as cleaners, laundry workers, kitchen staff and maintenance staff, all of whom play a pivotal role in hospital hygiene. Ancillary staff often have a lower level of formal education, meaning they may be of lower socio-economic status and have not been taught the same medical or technical terminology as healthcare workers. Ancillary staff are often employed from communities surrounding health care facilities and are often the same social and/or cultural group as patients of the facility (22). Photovoice therefore provides an avenue for those who don't use medical or technical terminology and/or may have not been taught reading or writing to participate in the research process and have their stories and their 'voice' prioritised in a research project (18, 23). Providing a camera to HCW and to ancillary staff at AAH to document their concerns and understanding

of IP&C removed the barriers of language, position, educational level and socio-economic status and enabled open discussion around IP&C problems and solutions.

Data collection

Data collection occurred at AAH over two time periods. Phase one in October and November of 2018 and phase two 12 months later in October 2019. Meeting with senior AAH staff, senior staff from the co-located Pacific Adventist University (PAU), and a research assistant (RA) who spoke fluent English, Solomon Islands Pijin and Kwaio (who translated information between participants and primary researcher throughout the data collection phases) created a list of HCWs and ancillary staff who played a pivotal role in IP&C at AAH. Initial recruitment consisted of 24 staff and two community members (Table 1). The two community members were included at the recommendation of the Chief Medical Officer, to include perspectives from patients and their families about disease transmission. This provided a sample of different employment roles, educational levels and village backgrounds who could offer alternate viewpoints about IP&C at AAH (24).

Table 1 Participants recruited at phase one

Participant code	Age (years – if known)	Education	Role at hospital
C1	30	Grade 2	Cleaner
C2	40	No schooling	Cleaner
F1	Unknown	No schooling	Wantok (Family member)
F2	30	Primary school	Wantok (Family member)
JN1	23	Diploma of Nursing	Junior Nurse (First year post graduation)
JN2	23	Diploma of Nursing	Junior Nurse
JN3	23	Diploma of Nursing	Junior Nurse
K1	45	No schooling	Cook

K2	Unknown	No schooling	Cook
K3	40	No schooling	Cook
NE1	31	Diploma of Nursing	Nurse Educator - PAU
NE2	31	Bachelor in Nursing – Primary Health Care	Nurse Educator - PAU
NE3	45	Master of Nursing Science	Nurse Educator - PAU
Pa1	49	Bachelor of Medical Laboratory Science	Medical Laboratory Technologist
Pa2	36	Bachelor of Medical Laboratory Science	Medical Laboratory Technologist
Ph1	23	Pharmacy Assistants course	Pharmacy Assistant
SN1	30	Diploma of Nursing	Senior Nurse
SN2	40	Diploma of Nursing/Master of Midwifery	Senior Nurse/Midwife
SN3	30	Diploma of Nursing	Senior Nurse
W1	38	Certificate in Electrical	Maintenance worker
W2	Unknown	Unknown	Maintenance worker
W3	Unknown	Unknown	Maintenance worker
W4	49	Certificate in Building	Maintenance worker
W5	36	No Schooling	Maintenance (Groundsman)
W6	46	Certificate in Building	Maintenance worker
X1	30	X-ray Technicians course	X-ray technician

Data collection procedure

Data collection followed the three common Photovoice components: Firstly training, that included the use of cameras, the ethics of photography, the misuse of photographic

‘power’ and the return of photographs back to the community; Secondly photo taking of objects or situations that participants believed best depicted the issue; Thirdly was participatory analysis. The participatory analysis had a three-part process which involved (i) selecting the most meaningful photographs, (ii) contextualising photographs by telling stories about the pictures, and (iii) codifying the photographs (25).

Following the training exercise, participant groups were given a camera (a smart phone) and a co-designed Photovoice statement. The statement designed by the primary researcher and co-researchers, was provided to the participants in both English and Solomon Islands Pijin and depicted the meaning of infection control and disease transmission in non-technical terminology. The English version ‘From your perspective how can sickness pass from one person to another at Atoifi Hospital?’ translated in Pijin to ‘Lo tinting blo iu/iufela hao nao siki save pas go lo nara man taem stap lo hospitol?’ The statement helped participants frame their photographs, provided a prompt, and also helped participants further understand the study (26). Participant groups were homogenous work/professional groups as recommended by the co-researchers. The participant groups were given the cameras for 48 hours and asked to take no more than 30 photographs around the hospital that best depicted their perception of the Photovoice statement. When returned the photographs were downloaded to the laptop, the memory was cleared and the camera was given to the next group.

Each homogenous work/professional group was interviewed about their photographs at a mutually convenient time and in a neutral or convenient place. Participants were provided with a printed and laminated copy of their photographs and asked to choose 15 of their most meaningful, in cases where groups took less than 15, all photographs were discussed. The acronym PHOTO was used to guide the semi-structured group interviews:

P: Describe your **P**hoto

H: What is **H**appening in your picture?

O: Why did you take a photo **O**f this?

T: What does this picture **T**ell us about your role at the hospital?

O: How can this picture provide **O**pportunities for the hospital to improve?

(Adapted from 27)

The guide enabled participants to discuss the nuanced meaning behind the photographs, and allowed researchers and participants to explore components of the research question. Participants were asked to provide a caption for each photo which depicted the essence of the story. The discussions were undertaken in a combination of Kwaio language, Solomon Pijin and English – and varied between groups. A translator was present and interviews about the photographs were recorded using a digital audio recorder.

In phase two of the project (12 months after Phase 1), Photo-elicitation was used. Photo-elicitation is where a photo is inserted into a research interview to evoke a deeper level of thinking about the object of the photo (28, 29). Each group were presented with all participant photographs taken in phase 1 (excluding their own), and they were reminded of the original Photovoice statement. Participants were given 10 minutes to choose five photographs that they thought best represented the statement. To elicit responses that best answered the research question, two questions were asked; from this photo, how does sickness pass from one person to another in the hospital, and what are the solutions? The differing educational, religious, work role and cultural backgrounds of the participants meant researchers did not assume that one person's perception of what causes sickness transmission in the hospital was a shared view.

Between phase one and phase two a major staff turnover occurred. Some staff moved to other hospitals in Solomon Islands and/or were involved in a major nurse recruitment drive to the neighbouring country of Vanuatu. This included the AAH Infection Control Nurse. As a result of staff turnover some new participants were recruited for phase 2. Their involvement was carefully considered as they were not involved in the initial photography in

phase 1, however the technique of 'photo elicitation' did not require participants to comment on their own photographs (29). New participants were valued because they offered their own valuable insights and their own interpretations of IP&C. As a result five newly recruited participants became a part of the study (Table 2).

Table 2 Additional participants recruited at phase two

Participant code	Age (years – if known)	Education	Role at hospital
NE4	44	Bachelor in Midwifery	Nurse Educator PAU
SN4	43	Bachelor in Clinical Nursing	Senior Nurse
W7	55	Grade 7	Maintenance worker
W8	22	Form 6	Maintenance (Apprentice)
W9	24	Form 5	Maintenance (Apprentice)

Data analysis

Data from phase one; photographs, interview transcripts and field notes were entered into NVivo software (30) and inductively analysed to explore initial themes/issues. This identified similarities and differences of conversations, perspectives, beliefs, concepts and actions. Nodes (codes), based on these emerging clusters were created using the NVivo software with sections of dialogue and related photographs allocated to nodes. Twenty-six nodes were initially identified in the first round of open coding. During the second cycle, codes were disassembled and reassembled according to their relationships with each other and collated under five broad themes (Table 3).

Data from phase two were analysed and a further 15 nodes created which all 'fitted' within one of the five existing themes created during phase one. Using Photo-elicitation during the second phase enhanced the credibility and trustworthiness of the data as the analysis of the same photograph by different participants assisted with data triangulation

(31). Commonly chosen photographs indicated that the objects of the photographs were an issue not just for the initial photographer but more broadly across participant groups. In this cycle of data analysis twenty-two photographs were coded into nodes titled by the name of the photograph (eg. NEP11). Multiple photographs of the same object, taken by different photographers were coded to the same node.

To collate all the stories centred on a single photograph, from multiple participants, data from both phases which referenced the photograph was then cross-coded into the newly created node. Each photo node was then printed with their coding stripes, enabling a visual representation of the linkages between codes that occurred around a single photo across the entire data set.

Ethical considerations

This study received ethical approval from James Cook University (HREC - H7655), the Solomon Islands Health Research and Ethics Review Board (HRE No. 030/18) and a written letter of support from the Chief Executive Officer, Atoifi Adventist Hospital.

Consent to participate

Interviews were conducted after obtaining formal written consent from all participants involved in this study.

Results

The multidimensional stories behind each photo made the analysis multifaceted. When visualising the relationships between the photographs, stories and themes, a tangled web was revealed (Fig 1). This web of ideas, concepts and themes covered some of the formal/routine/orthodox biomedical processes of IP&C, however, the Photovoice method enabled a much richer, nuanced and locally informed way of understanding IP&C at AHH.

Fig 1 - Complex web of concepts ideas and themes

Data was aggregated from the entire data set with two overarching themes emerging. Firstly, what is known and believed about sickness transmission, and secondly, what the current IP&C practices at AAH are, and why. The second theme contained four subthemes (Table 3).

Table 3 Themes emerging from data analysis

	Themes
1	What is known and believed about sickness transmission
2a	Knowing and practicing
2b	Knowing and NOT practicing
2c	Practicing and NOT knowing
2d	NOT practicing and NOT knowing

This paper presents and discusses results from Theme 1. Future publications will present and discuss results from theme 2.

What is known and believed about sickness transmission

Knowledge about sickness transmission was conveyed by photographs in two ways: (i) photographs explained through the germ theory and hospital hygiene processes; (ii) photographs explained through a social, spiritual and cultural process.

(i) Photographs explained through the germ theory and hospital hygiene processes

Sickness transmission was explained by a Junior Nurse through a photograph that represented inadequate disinfection processes of operating theatre surgical equipment (Fig 2);

Fig 2 - JNP25 (Not proper soak inside)

The story here is that this is in theatre this is our soaking tray, so what happen is that … they bring it back, and we soak it here in this dish. Then after we soak it we wash it maybe after five minutes or fifteen minutes.

After use we pour the dirty one. And we use the new one, but when we busy, sometimes … all the nurses just put it in the same water the dirty water and that's increase more germ in the water in the dish. And so if we don't come and see this one, maybe the whole day we just use the same water (JN1).

A Senior Nurse explained sickness transmission through a photo of a dirty hand towel that represented how sickness could be transmitted by passing germs from one person's hands to another (Fig 3);

Fig 3 - SNP02 (Same hand towel, more hands, more infection)

…The nurses we just use the same hand towel throughout the shift, and sometimes those coming in the other shift they use the same hand towel as well. To dry their hands after touching patient.

I took this photo because it can cause infection to spread from one person to another, also the hand towel there have germs on the hand towels (SN1).

Sickness transmission was explained by a cleaner who followed routine hospital hygiene processes. Although not specifically talking about germs or infectious agents the cleaner did identify a photograph of a dirty patient toilet that represented how sickness could be transmitted when the toilet was not clean (Fig 4);

This is a toilet you see here, its have dirty on it, when the sick patient use this toilet, and then sometimes some of the patient doesn't use it properly, and it can pass sickness to another patient (C1 - translated).

Fig 4 - CP5 (A dirty toilet)

A cook explained sickness transmission through a photograph that represented the importance of wearing a uniform to maintain hygiene practices that would prevent sickness transmission (Fig 5);

Fig 5 - KP18 (It's important to have uniform)

She say that, we have to wear uniform and clean, to cover our body, because body is dirty, so we have to cover our body, otherwise the dirty go in to the food, and when we use it and will getting sick (K1 - translated).

Sickness transmission was also explained by the maintenance staff who described sickness transmission when hospital hygiene processes were not followed through a photo of a rubbish bin without a lid (Fig 6);

Fig 6- WSP3 (No good, it's bad)

The rubbish here smell, because the rubbish bin doesn't have any lid on it, and when its rotten the flies step in and go back like step on the food, and it will affect the patient and also it will cause diarrhea (W5 - translated).

(ii) Photographs explained through a social, spiritual and cultural process

Causes of disease transmission explained through social, spiritual and cultural processes were expressed by all participant groups regardless of their role, education or position at the hospital. Many participants, both HCW and ancillary staff, took photographs of rubbish around the hospital grounds and emphasised the influence of ancestral spirits on sickness transmission for themselves and patients. All participants were aware that people from the mountain villages believed the hospital rubbish contained female bodily fluids. When the rubbish was burned the smoke from the burning female body fluids would enter the realm of the ancestral spirits and anger the spirits. People need to maintain relationships

with ancestral spirits to ensure protection from harm and maintain good living. Because ancestral spirits were angered, protection could be withdrawn and people would become sicker or not recover from existing sickness (Fig 7).

Fig 7 - F2P3 (Polluted air)

> *The pagan/custom or bush people … they don't want Maternity (sic) ward … when they burn the rubbish there, it will cause for the sick mountain people, will gettem sick (F2).*

Hospital staff were fully aware that regardless of the fact that a person is taking hospital medication, when the people from the mountains return home they are required to restore their relationship with ancestors by providing a sacrificial offering to appease their ancestors which will improve their health.

> *Like when the bush people go back to their homes, they can sacrifice pigs for their Ancestors to make them better (F2).*

The maintenance staff responded to this explanation of disease transmission and implications for rubbish disposal sites;

> *…the problem is some mountain people they came down and say something they go "oh they burn something from the rubbish", and they will ask compensation on the hospital so, even we put the incinerator down there, they still talk about it, so we have no option to throw the rubbish so we go down strait to the wharf (W1).*

Despite knowing about the spiritual beliefs that have underpinned the mountain people's society and culture for thousands of years, a Junior Nurse argued that the mountain people *will* understand about the biomedical model of disease transmission if it is explained to them;

> *So if someone came from the hospital and they're from the mountains, do you think they understand the cause and effect of diseases (Researcher)?*

Some do, some don't… But I think if we explain clear to them, they will understand (JN1).

Some participants explained sickness transmission akin to Miasma theory;

The flies sometimes step on our food, the flies came and the rubbish getting rotten and smell and the worm get into the rubbish. It's easily to affect us patient…when the patient smell it and breathe it, and get into her body (F1 - translated).

Causes of disease transmission were not only explained through traditional spiritual frameworks, but also introduced spiritual systems. The Medical Laboratory Technologist (MLT) with university degree in biomedical science explained disease transmission and infection prevention through his belief in the protection from the Christian God when the biohazard cabinet designed to protect him from infectious agents in the hospital laboratory broke down.

Well, Am feel discourage, but you know working in institutions like this, I would say owned by the church, so our mind say, thinking the lord will protect me from this. From this things….So I think He will definitely protect me, because I am doing people good thing to serve people. That's the concept behind my thinking (Pa2).

Causes of disease transmission were also explained through social connections and social relationships. Social relationships determined by local Melanesian culture was commonly described as an underlying influence contributing to sickness transmission and facilitating and/or preventing disease transmission;

… we think of this infection prevention and control is very important it's seriously important for us to consider, that perspective then drives each of us to be seriously like helping each other. But as Melanesian cultures

sometimes we feel that like if somebody talks to us directly it gives us bad feelings like that. Sometimes our culture contributes to that (NE1).

Melanesian culture reappeared as a reason for staff sickness (Fig 8). The photograph of a potato on a plate that had been gnawed by a rat in a share house, was used to explain the transmission of germs from rats to staff as a result of eating the potato which had been left on the bench overnight. The social relationships in the share house meant the pharmacy assistant was obliged to supply medications to her housemates instead of hospital patients;

Fig 8 - PhP4 (The potato and the rats)

Like this one, the staff we live here so when we sick, there will be no workers for the hospital, and also when we sick the drug will be use...I feel very angry sometimes. Because I control the drug and I was just thinking, people should stay hygienic, careless, they come and take the drug that should be given to the people here in the hospital (Ph1).

Cultural traditions and expectations were also used to explain why medical supplies hadn't arrived on the monthly barge (there are no roads to the hospital on the remote east coast of Malaita and so all supplies come on the monthly barge). This was explained to impede supply and influence sickness transmission;

I place my order but they don't send it in the ship, so we're running low until now… there's one lady, her husband is very sick and he's died, so every workers they go and attend the funeral so they can't do my order (Ph1).

Finally, the pharmacy assistant described the cultural differences of personal hygiene and the differences between hospital and village toilets as a cause of sickness transmission;

Like we don't know, mainly here in Solomons, native people they go to the toilet, they don't have proper [flush] toilet, and some just use leaves to wipe with their backdoors, and some go to the sea, and sometimes the

patient they have like long nails, and some … like use their hands to wash their backdoors when after go to the toilet (Ph1).

Discussion

Knowledge and beliefs around sickness causation and transmission in this setting has multiple layers. An attempt to improve IP&C based on international imported protocols informed exclusively by the germ theory may appear straight forward but this study provides evidence of deeper contextual factors that need to be considered. Consistent with the evidence from similar settings, this study found that relying on the germ theory alone as the underpinning epistemology for disease transmission may not have the desired outcome to prevent and control infections. Traditional and contemporary beliefs about sickness causation always needs to be considered from a broader cultural perspective (32, 33). Whilst some studies have described the influence that religious and cultural convention have on aspects of IP&C such as hand hygiene (8, 34) and blood borne pathogen transmission (22), there are only very few studies investigating how spiritual and cultural beliefs impact HCWs perception of infection transmission and subsequently how these perceptions influence practice. This study is one step towards filling this gap.

Most participants stated a belief that some form of physical entity was involved in sickness transmission. Some with biomedical training stated this was a germ, others like cleaners expressed human faeces or hospital rubbish was the entity involved. However, this was not uniform with many other spiritual entities or cultural processes involved in sickness transmission. When improving IP&C processes at a hospital such as AAH, the germ theory should not be cast aside because people explicitly described practices such as cleaning the toilet, soaking surgical instruments and changing hand towels as important to prevent sickness transmission demonstrating the belief that ‘something’ transmits sickness.

This study also identified that, similar to other remote hospitals in LMICs, AAH had limited human, physical and financial resources to address IP&C (35). Resource limitations in any setting will ultimately lead to IP&C breaches and potential infection transmission. The ability of this study to delve into 'the causes of the causes' through Photovoice, showed that cultural and societal expectations can be the cause of supply issues, even when there are no financial constraints. Cultural obligations and kinship relations made it difficult for the pharmacy assistant in this study to manage the hospital medications appropriately.

Kinship relations and cultural responsibilities including the general rules of respect, obligation, mutual exchange and social property, govern much of the cultural construction of Solomon Islanders (36). Many family members work in various roles within the hospital, and kinship laws and cultural custom make it difficult for some staff to hold others to account. Expressing a professional and educated biomedical opinion such as reminding your kin about proper IP&C practice is problematic as it can break kinship rules and has the potential to lead to poor practice and infection transmission.

A compounding influence on the staffs' capacity to exercise their positional responsibilities is the theocratic governance of the hospital. As a SDA administered health facility, the hospital leader, the Chief Executive Officer (CEO), is a member of the SDA organisation which is guided by the church's doctrinal position (37). Staff of AAH are employed by the Church rather than the Ministry of Health and are guided by direction from the CEO. For staff with a biomedical background such as the medical laboratory technician, the outcome for IP&C practice due to the juxtaposition of their axiological values of science-based professional education and religious following was apparent.

Ancestral spiritual beliefs play a significant role in the mountain people's decision to attend AAH as the built environment of the hospital is not conducive to their beliefs (14). The *wantoks* and the maintenance staff openly discussed the *tabus* associated with the rubbish. The mountain peoples' ancestral beliefs are known by Christian staff members however the conflicting belief systems make it hard for staff to understand and accept, which

then influences the IP&C messages provided to patients. Using germ theory to educate the mountain people to wear footwear will, according to the Junior Nurses, make the mountain people compliant. On the contrary, whilst the maintenance men's practices were influenced by the belief in ancestral spirits. They knew that digging a rubbish pit by the side of the road was not an acceptable option for the mountain people therefore found an alternative, albeit one that is deemed poor practice from a formal IP&C perspective.

The biomedical model of disease causation and transmission in IP&C should not be excluded to make way for spiritual, cultural and religious world views. However the vast differences in sickness causation and transmission beliefs should provide a foundational view point that becomes incorporated into the planning and implementation of IP&C programs in settings such as AAH. Further research needs to be undertaken on understanding the interplay between the germ theory, societal and local culture, ancestral spirits and Christianity and how these influence sickness transmission knowledge and beliefs to provide the underpinning concepts for a workable, pragmatic and locally appropriate IP&C program to prevent infectious disease transmission in this and similar settings.

Conclusion

This study is revealing of participant's epistemology, that is what they know about disease transmission through societal norms, religion, formal education and cultural influences and beliefs. Expecting uniformity across culturally and spiritually diverse populations, and to directly replace their beliefs and behaviours regarding sickness causation and transmission with measures informed by the germ theory does not reflect reality. Nor can researchers ignore the structural nuances of culturally and spiritually different health contexts by expecting them to conform to Western hierarchies. IP&C researchers need to change how evidence is viewed. Paying credence to cultural connotations and implications and investigating a community's and individual's knowledge

systems around disease causation and transmission is required to understand the context in which IP&C is being implemented. Without this IP&C will keep ending up in the same place, with no progression.

Acknowledgements

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550 Fig 1

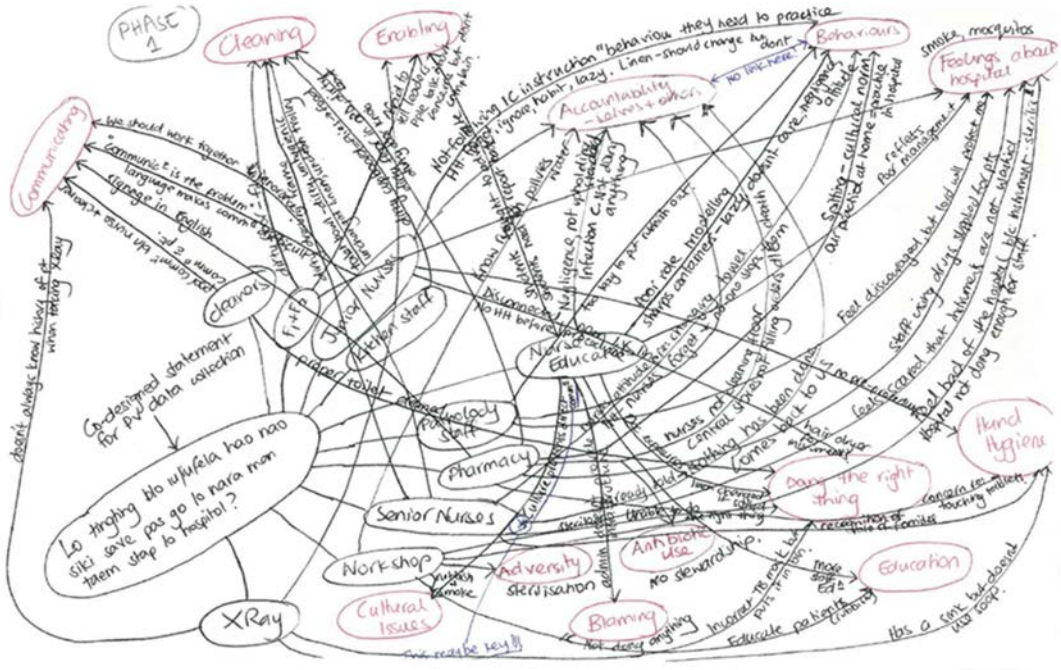

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Fig 8

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5.3 Part B—Infection Prevention and Control Practices and Opportunities for Improvement

As presented in the manuscript, sickness causation and transmission beliefs expressed by the participants are not straightforward. Importantly, their beliefs are not solely founded in germ theory or steered by a paucity of resources, but religious faith and cultural convention also play a foundational role. Nothing can be taken at face value because of the embedded societal complexities. Importantly, it is these complexities that not only influence IP&C practices, but also inform opportunities for improvement.

The participants in this study have identified important issues that they believe represent and affect IP&C practice and underlying solutions, and these are presented through five select photos. The photos capture the elemental issues of IP&C, and as in the manuscript, the findings in the thesis are presented through the lens of the participants.

5.3.1 The Story of the Rubbish

Figure 11: Rubbish

Taken by the junior nurses, senior nurses, maintenance men and X-ray technician in phase 1, and selected by the cleaners, the nurse educators, both medical laboratory technicians (MLTs) and the newly recruited maintenance staff during phase 2, this powerful scene (Figure 11) represents the depth of issues experienced by staff at AAH when it comes to IP&C practice. The rubbish bins, some without lids, often overflowing and maggot ridden, are placed next to the kitchen. The bins are used not just by kitchen staff but by many staff for dumping their household rubbish. Not all rubbish ends up in the bins, much of it strewn around the bins or in rubbish piles close by. As stated earlier, and synonymous with all the photos, the story of the rubbish cannot be taken at face value. IP&C practices meld with

potential solutions, often creating an inseparable conundrum where for every opportunity, there is also a barrier.

5.3.1.1 Infection prevention and control practices

The closeness of the bins to the dining hall was the crux issue for participants who discussed this photo. The junior nurses articulated the problem succinctly:

> *… it easily for germs or sick can pass to by air born maybe flies sitting on the rubbish and going to the kitchen where the cooking the food for the patient, and very dangerous for the patient because there's no proper disposal rubbish so the flies can stay there, and easily to go to the dining hall. That's one of the important thing that I take this photo. (JN2)*

The senior nurses agreed that the flies are also a big problem:

> *I took this photo because flies spread infection. There the dining is there, the hospital is there so, when the flies sit on the food, the patient eat the food or the student nurse eat the food, and they get admitted at the hospital with abdominal pain, diarrhea like that. (SN1)*

However, it is not only the flies transmitting sickness that creates an IP&C issue; the smell of the rubbish compounds the problem:

> *Because of the smell they don't want to open the lid and throw rubbish in they just throw it there. (C1, translated)*

> *Smell in our body or maybe it will cause sickness … maybe the smell of the rubbish it get rotten and we breath the dirty smell or and bad smell. (C1, translated)*

The empty food tins, which collect rainwater, which then turns stagnant, also pose a problem:

> *I can see some tins there, and they say that the mosquito going to breed inside … because some people just open it and use the meat inside … then it just collects the little bit water there, and then mosquito breed and then and mosquito come during the night … and then transfer the malaria from the patient that admitted and bite him, and then infects to another one. (W1)*

5.3.1.2 Opportunities for improvement

The problem of rubbish provided an abundance of opportunities for improvement, some very pragmatic and others requiring commitment and accountability from the hospital management and staff.

Improving infrastructure

Provision of more rubbish bins, new bins with lids, more frequent emptying, moving the rubbish and finding a new site for the rubbish pit were common suggestions; however, none of these were straightforward solutions.

Acquiring new bins with closing lids was problematic because of financial constraints:

> *He said that this hospital haven't have enough money to pay the new one, that's why we just use the same old rubbish bin. (W5, translated)*

A number of participants suggested the bins should be emptied more often than twice a week. The emergent barriers to this proposition showed that, although practical, it was not that simple. Sometimes, the arrival of the supply barge disrupted the maintenance men's weekly schedule:

> *Yia we got a work schedule we have three days in a week to empty the bins, but sometimes we have problem with the fuel come from Auki, some of our crew they go and lift the drum, and then we forget … to empty the bins, because it will takes us a whole day … and next day different job come in and come in and then we neglect the bins, sometimes it take us two weeks, three weeks or even a month. (W1)*

Emptying the bins more frequently is also reliant on the groundsman. Part of his job role is to empty the bins; however, there is an inherent problem with this arrangement:

> *… to empty that bin I don't know how to drive a tractor to where the proper place is. (W5, translated)*

The full rubbish bins are so heavy they are moved by tractor. Not only can the groundsman not drive the tractor, but the road to the current rubbish pit is unsuitable:

> *… we have a big pit … but we have a problem with the road, to access the road to where the big pit is … so we can't throw the rubbish there, because the bin is too heavy, even to wheel it down. (W1)*

As a result of poor access, the rubbish bins are emptied into the mangroves near the wharf, which the participants knew is a sickness transmission risk:

… hospital should seriously look at the bins and look for site that suitable for the bins, because we can't throw it in the sea, it affect the water, all the fish eat it and people take the fish and contaminate the water people use salt water for swim and it might causes sickness. (W1)

Adding to the problem of finding a new rubbish site close by were the implications this could have for the people of the mountains. The participants felt they had little or no options regarding the rubbish problem:

We want to move along the road that goes to the air strip, the problem is some bush people they came down and say something … 'oh they burn something from the rubbish', and they will ask compensation on the hospital … so we have no option to throw the rubbish so we go down strait to the wharf. (W1)

In addition to the above solutions, there were practical ideas to improve infrastructure and prevent sickness transmission:

… a small hut that can protected from rain, because sometimes it a lot of water, and mosquito too can also mix breed there with the flies. (NE3)

… that's a solution, build a higher bench, and they put bin on from the animal, and the frogs … Or a fence around it. (PA1)

Improving existing resources to make it more enticing to place rubbish in the bins provided a more immediate and pragmatic solution:

… those bins are need to be wash, when the rubbish is dumped, we need to wash carefully, maybe we have to use some of the disinfection detergent or something like that. (X1)

Personal and professional responsibility

Participants believed that more education about correct rubbish disposal was required, and most felt that their co-workers were careless and forgetful. Participants also agreed that working together to provide solutions was also important, for example, taking responsibility to remind each other about correct rubbish disposal and reporting when the rubbish required moving. While good in theory, these practices also had barriers to implementation. The power differentials within the hospital hierarchy and kinship relations make it difficult for some staff to articulate themselves, particularly those at the lower hierarchical levels:

For me as a junior nurses … I can't talk share out my problem because I see myself just a, not the powerful man to talk about this things. So that's, I can feel myself not fix this issue. (JN2)

This power differential also applied to the groundsman. Although responsible for managing the rubbish around the hospital, as an unskilled and uneducated worker, he felt powerless to do anything about the rubbish problem.

It doesn't good it's bad, it will cause sickness to the hospital, but we can't do anything. (W5, translated)

Leadership and governance

Many participants placed the burden of responsibility on the leaders of the hospital to improve the rubbish situation. Even though some participants acknowledged that rubbish management was everyone's responsibility, the hospital leaders needed to lead the change process. Better role modelling by the hospital by cleaning up the rubbish piles would set the benchmark for the wider community. This would not only decrease the risk, but also go some way to improving the mountain peoples' access to hospital services. The villagers would also hopefully desist from adding to the piles:

They won't see as a rubbish pile, because when people educate them, and then this place is clear and then they tell them proper place to put the rubbish it should be alright. (W1)

The family members similarly agreed that the 'hospital' needed to take action on the rubbish:

He think it's good for the hospital leaders/authority to know that rubbish cause sickness to us as a patient so it's good for you hospital, to know so that they can put proper place for the rubbish, so that our area can be clean as a healthy place. As a health area. (F1, translated)

It's good for the hospital to take in action on that, they have to move the rubbish from this area. (F2, translated)

Some participants felt that the hospital needed more staff to manage the rubbish:

It's good for the management of the hospital have to always every day empty the bin, they can put a man to empty the bin rather than just same maintenance man Andrew, it's a big work for him, he cleans around the hospital and also the rubbish. (C2, translated)

A more innovative and proactive proposal came from an MLT, who suggested that the hospital should create attitudinal change by increasing awareness about the rubbish through designated rubbish days and rubbish champions:

> *I think that concept is on champion. Whatever champion like that, that could be a good approach as well to introduce, the rubbish champion … so that that will be a good way forward you know. (PA2)*

> *And probably come up with some kind of the rubbish day … probably one day in the week to you know our rubbish day maybe something like that. (PA2)*

However, the simplest opportunity for improvement, as suggested by the majority of participants, was to implement rubbish segregation. Participants described how they managed rubbish in their homes, in the SDA compound and the surrounding villages. If this technique was applied by the hospital leadership to the hospital rubbish problem, significant improvements would be witnessed. All agreed that the organic waste was either composted or fed to the pigs (non-SDA villagers), the tins were buried, and the plastic was burned or buried, and when a pit became full, another was dug:

> *… tell people to select their rubbish, put the plastic things in separate rubbish bin … the hospital should provide the means of disposing the rubbish don't let … people to decide whether they can select these but like a rule that will guide it's individual. (PA1)*

> *We should separate them so that tin we can dispose there properly, and other organic matters we can put it in the gardens. (NE3)*

> *For the rotten food she just put it around the banana and the plastic she burn it and the tin she throws it in the hole. (C2, translated)*

> *Put it in the pit. And some of the rubbish just put it in the bottom of the banana, banana to grow. Because the rubbish like food something like these they just feed it with pigs something like these, they don't put it in the bin. (W8)*

5.3.2 The Story of 'Exposed Dirty Linen at Risk of Infection Transmission'

Figure 12: Exposed dirty linen at risk of infection transmission

The photo of the dirty linen (Figure 12) was taken outside the children's ward by the nurse educators; however, the senior nurses and the cleaners also felt that the picture represented inadequate IP&C practices. At times, the dirty linen skip remains in place for more than a week, causing consternation for participants. Interestingly, the nurse educators and the senior nurses, those with biomedical training, discussed the photo in terms of patient risk. The cleaners, while agreeing that the photo depicted some risks to patients, revealed that for them the photo really signified challenges with their work roles and work routines. Most revealing during the participant conversation was the risk concern for staff, which was linked specifically to the absence of a staff vaccination program.

5.3.2.1 Infection prevention and control practices

The nurse educators and the senior nurses associated the linen skip with sickness transmission through flies, the wind, poor hand hygiene practices, and via the children's hands, as the linen skip is unsecured and the linen is accessible to everyone:

… there has dirty linens there, it's open, flies can sit on it and fly around to sit on the food or the bed or on the hands. (SN4)

… there are some bacterias that are airborne yia and can easily spread through the air. And I think the idea that is stays right near the door this is where they receive fresh air…so when the winds blows it sort of … transporting the germ directly back in the ward. (NE3)

Even the nurses they don't wear the gloves they touch this and they came back and the patient or touch whatever the table, touch the book or biro or put it in their mouth whatever. (SN4)

Infectious patient use this linens and they are stored unsecured places like openly outside there the kids can just go and hold with their hands and with that they can just go and even without washing the hands they can also touch the foods and also they can hold the babies. (NE1)

Despite their lack of biomedical education, the cleaners also understood that dirty linen can transmit disease:

… if the sick patient stay and just leave it there and the other patient came and use the same one … that patient can transfer sick to other one, so that's why she choose this one.(C2, translated)

The cleaners knew that germs were involved, even though the 'portal of entry' (Lee & Bishop, 2016) for transmission was dubious:

Sometimes like the patient sweat, and she say that our body can have a hole, and when the sweat came out and sometimes the germ can go in. (C1, translated)

Additionally, the linen is often left unattended and exposed to patients and family members for weeks:

In this hospital we don't have any proper place to store used linens they just remove it from the beds and just put it in this bag and just leave it for weeks. (NE2)

Discussions regarding washing the linen more frequently posed certain challenges relating to the laundry schedules:

Usually the linens are changed after every three days … On the beds. Sometimes new patient came just changed the beds but usually they have weekly schedule for washing linens in every wards. (NE2)

Despite a 3-day schedule being in place, the nursing staff knew that linen contaminated with blood or other body fluids should be changed more frequently:

> *So if a patient was laying on a bed and perhaps there was a bit of urine or a bit of faeces or a bit of blood on the sheet, is the linen changed then or is it only changed according to the schedule? (Researcher)*
>
> *No usually they change the linens. (NE2)*

Regardless of the role they play in direct patient care, the responsibility of scrubbing the contaminated linen prior to it going to the laundry lies with the nursing staff:

> *Only those with blood stains and faeces they used to scrub it first before they get it directly to the laundry. (NE2)*

Once the contaminated linen is scrubbed, transferring the linen to the laundry outside the scheduled days creates additional layers of complexity. Both the nurse educators and the cleaners inferred taking soiled linen to the laundry is tricky:

> *Sometimes I usually tell the students they has to carry the linen directly to the laundry so they can be washed. But then the laundry worker usually told the student you have a set date to bring your linens. (NE2)*

There also appears to be some role ambiguity between the cleaners and the laundry workers as to whose responsibility it is to scrub the soiled linen:

> *Sometimes the big man they just pee on the linen and they just put it in there, so the [laundry] lady says it's their job. (C2, translated)*

Despite the acknowledgement that contaminated linen is a nursing responsibility, it is the cleaners who are more often left to deal with the dirty linen:

> *Where did they put it … On the floor? Who picks it up? (Researcher)*
>
> *Sometimes she have to do it, she have to pick it up and put it in the right place. (C2, translated)*

5.3.2.2 Opportunities for improvement

Participants proposed a number of solutions for rectifying the linen problem, but as with the rubbish problem, solutions required understanding and commitment from the hospital management for most.

Improving infrastructure

Suggestions by the senior nurses and the nurse educators included building a proper storage area, or creating a locked storage area within the wards, along with acquisition of new linen skips with lids:

> *In my opinion … I think each ward should have a room, separate room they can [keep] … those dirty linens before transporting it to laundry. (NE2)*

Clear onus was placed on the hospital 'administrators' to lead the change process in this space:

> *So, in fact there is no proper place to store linen especially for children's ward. For other wards that have it. So maybe this one is a problem with the administration they don't provide any place to store this linen. (NE2)*

The nurse educators, although senior in status and looked to by other staff to initiate changes, are employed by PAU and not the hospital, and therefore felt powerless to instigate change:

> *… sometimes as nurse educators we … I'm also frustrated with this but can't do anything about it. (NE2)*

Personal and professional responsibility

the nurse educators have a closer working relationship with the nursing students than they do with the hospital staff and hospital administration/management, and proposed that students should/could be advocates for IP&C, particularly when they see 'different' practice:

> *But they have the idea, knowledge, advocating for patients so with regards to infection control they should also advocate for them yia with regards to this ones. But it is important they report to us sometimes they can't do it so we are the one to help them advocate for those patients. (NE2)*

However, despite being taught correct clinical practice and patient advocacy, the nurse educators know that students struggle in advocating for patient safety because of the hierarchical nursing structure:

> *In my opinion how I observe the nurses and the students in the ward the students are those at the bottom. But most of the procedures that are done in the hospital carried out by the students so they should see them as somebody important in the hospital. (NE2)*

When asked about their potential to influence change at higher hospital levels, the nurse educators were unsure whether they have any sway over the hospital administration:

> *Do you have any power to change that, do you think with the hospital administrators? (Researcher)*
>
> *Not sure. Maybe. (NE2)*

Leadership and governance

A persistent response from participants who discussed the exposed dirty linen at risk of infection transmission photo was for greater awareness and education. Interestingly, all participants directed the need at the nurses, reiterating that correct linen management is a nursing responsibility. Nurses need to be educated on the correct handling of linen, and reminded about the principles of the germ theory so they will undertake correct IP&C practice:

> *So we should always remind our nurses about the principle how germs can easily travel from one patient to another. (NE3)*

The cleaners, to whom the task has ultimately fallen, suggested:

> *For the management of the hospital they have to do awareness or talk to the nurses, so that they have to keep all those linen in the right place. (C2, translated)*

This looped back to the nurse educators indicating that the hospital administration was unaware of what happens in the hospital with regard to linen management and a better supervision of policy is required:

> *Because I think some of the administrators they don't really aware of what is happening downstairs. Maybe it's in the policy but somehow because of the convenience they just do things on their own … there is no proper supervising what is happening there. (NE3)*

5.3.2.3 A story of hepatitis transmission

Qualitative research, particularly CBPR such as PAR and Photovoice, allows interview conversations to meander away from the loose script and reveal deeper narratives. In the conversations around exposed dirty linen at risk of infection transmission, this was epitomised by a sub-story called 'the story about hepatitis transmission'. The following story unfolded following questions to the senior nurses around the types of infections that could be transmitted by soiled linen:

Hepatitis A very infectious, and then diarrhoea if we touch we eat causing abdominal pain, what's cause by flies, rats or whatever. (SN4)

Is there much hepatitis A, do you see much hepatitis A here in the hospital? (Researcher)

Not really at this times but yia. (SN4)

Do you know if there's much hepatitis B or hepatitis C in the area? (Researcher)

Hepatitis B yia we have carriers in the area around but hepatitis C no I don't know. (SN4)

Do you as nurses get vaccinated for hepatitis B? (Researcher)

No, we don't because maybe we don't have any enough vaccination, or maybe I don't know why. But yia we don't have, and we don't get checked after three months, we just work, like you people you get checked. (SN4)

I think it's in your … Ministry of Health policy it and says that you should. (Researcher)

Yia infection control have. We have this needle prick forms if you needle prick you we get your name and consent, so you get we checked, lately after how many years now, there's no since 2006 I think the needle prick form. (SN4)

So people don't fill it out? (Researcher)

I was the only one using it when I was infection control, after that no one take the initiative of this. (SN4)

I think people would get needle sticks. (Researcher)

Yia they do I have some reports. (SN4)

Two staff they get needle prick and they got hepatitis. (SN4)

Oh they got hepatitis from needle prick? (Researcher)

But they did not consider, or I don't know what happen … I got two reports and I send them to Kilufi but … now we have the form, but we don't. (SN4)

5.3.3 The Story of 'Barefoot Attracts More Germs'

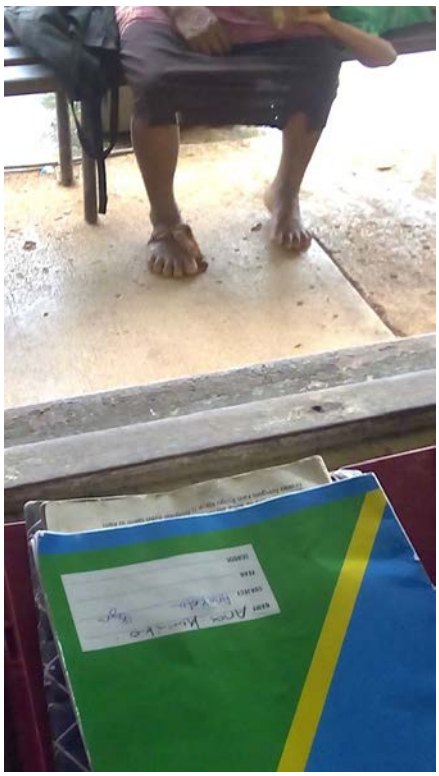

Figure 13: Barefoot attracts more germs

'Barefoot attracts more germs' (Figure 13) represents the junior nurses' concerns about the patients' absence of footwear, and the risk that poses for infection transmission. If the patients have open cuts and sores on their feet, and then stand on body fluids such as blood or vomit, then the risk for infection is high. The junior nurses were adamant that this practice should discontinue and the patients should wear '*slipper'* (shoes).

5.3.3.1 Infection prevention and control practices

Figure 13 is more telling of the patients' practices of IP&C rather than those of the staff but illustrates the clear cyclical nature of knowledge and interconnections present in a community such as Atoifi. In essence, it provides insight into the participants' understanding of the patients' worldview and the impact of their actions on the broader community. As with the other stories, this story is not told from the patients' perspective, but from that of the staff.

Barefoot ambulation is normal for many community members, and the junior nurses know that an infection risk exists for patients who have cuts or sores on their feet, more so if they stand on blood or other body fluids, inferring the germ theory:

If there's any vomiting, or bleed or, stain of patient fluid on the floor, and the patient have cut or sores in the feet, may have the high risk of getting infection … it's not safe they have bare feet when they came to the hospital. (JN2)

The assumption is made by the junior nurses that patients are unaware of this risk:

For them they don't have good knowledge about how infection pass on, so I mean they just don't care about when they come to hospital. (JN2)

You think they don't care, or they don't know? (Researcher)

For me they didn't know. (JN2)

This group of nurses is also familiar with some patients' sickness transmission beliefs, particularly those of the patients from the mountains:

… by talking with those people from mountain, they say that getting disease was because from the type of environment … mountain was too cool for them, that's why they believe they get sick … they don't really understand the sick was get pass … like what we do it … like how we interact together, they don't believe that, they just think that they just environment causes only. (JN2)

When quizzed further about alternate sickness transmission beliefs patients may have, the junior nurses talked about ancestral respect:

They believe that they especially for the people in the bush, if they don't follow the rules of their ancestors … that's why they get sick. (JN2)

However, they also admitted they did not know a lot about the people from the mountains:

… those from the mountain have a lot of those sort of condition, because sometimes we don't know. (JN2)

Regardless of the knowledge base they had or whether it was correct or not, the junior nurses were adamant that to prevent infection transmission, patients must wear *slipper*:

Just one comment, maybe one important reason is that we need to tell them, about the effect of disease so that they can know and when they came to the hospital they must wear slipper. (JN1)

5.3.3.2 Opportunities for improvement

Despite knowing some information about the mountain people's beliefs around sickness transmission, and knowing that most people in the community did not own shoes, solutions proposed by the junior nurses were limited. Suggestions centred on educating patients about the cause and effect of disease (the germ theory), making sure the patients wore *slipper*, reducing the number of visitors (to reduce the number of people contracting infections) and cleaning the floor to remove body fluids.

Improving infrastructure

Timely cleaning of spit and other body fluids off the paths and hallways was mentioned as a solution:

> *… notify cleaner and it's our part as well to try to clean up … if we know that there's a vomiting and spitting or along the path. (JN2)*

Personal and professional responsibility

Providing education to the patients on wearing shoes and advising them to watch where they walk were also suggestions:

> *In the outpatient we usually advise them … watch where you guys standing, in case you guys get infected. (JN2)*

The onus was placed firmly on the patients, however, with the junior nurses inferring that it is the patients' responsibility to do the right thing. The junior nurses appeared resolute that once the patients had been told, it becomes their responsibility and the hospital's job is then done:

> *I think, we just advise them to buy slipper, that's only solution that I thinks for them to have a slipper, when they came to the hospital. (JN2)*

Leadership and governance

Education by the hospital on the cause and effect of disease and the importance of wearing *slipper* was a recurring response by the junior nurses:

> *… lot of people don't wear shoes they don't have shoes, how you think the hospital can address this problem? (Researcher)*
>
> *I think it must better that the hospital must educate them, on the issue of those not wearing shoes when came to hospital, because there's a high chance for them to getting infection in the hospital. (JN2)*

Interestingly, despite knowing the ancestral rule system followed by the people from the mountains, the junior nurses were confident that once the people from the mountains had been educated, and realise they may become sick by not following the doctors' rules, they will start wearing shoes:

> *… so that's when they will realize 'oh we are not following the rules of the doctors that tell us, that's why we get sick', that's the time when they realise. (JN1)*

5.3.4 The Story of 'Spit on the Floor in Outpatients Department'

Figure 14: Spit on the floor in OPD

The story of spit on the floor (Figure 14) was brought to life by the pharmacy assistant (PA), who was concerned about the 'spit on the floor in OPD (Outpatients Department)' and the potential infection transmission risk. From the PA's perspective, infection transmission could occur by one patient coughing onto another, by patients stepping on the spit, or through ingestion by babies who put their fingers in their mouths after touching the floor. She was also concerned for her own health as the door to the pharmacy is in the OPD corridor, where this photo was taken. The maintenance workers and kitchen staff also discussed this photo, citing similar transmission risks. The photo revealed that both the PA and the maintenance staff could explain sickness transmission through a description resembling the germ theory, and while the object of this photo is spit on the floor, the interview discussion exposed many underlying cultural influences, both societally related and workplace relevant.

5.3.4.1 Infection prevention and control practices

For the PA, her disquiet was focused on crowding in the corridor, which provided an increased risk of infection transmission by the number of individuals coughing and/or spitting on the floor:

> *It's not safe for my health, and it's crowded … so if another patient cough they will give another cross infection to another patient that sit beside them. (Ph1)*

An additional concern was related to the frequency at which the floor was cleaned:

> *The floor it's dirty, like I can see in the outpatient, and also me here in the pharmacy, we have to (clean) houseclean the floor ourselves. (Ph1)*

Of particular concern for the PA was the potential for transmission of diseases such as hepatitis B, TB and Influenza:

> *Can you think of a disease that would be passed on? (Researcher)*
>
> *Hep B?(Ph1)*
>
> *Possibly Hep B. (Researcher)*
>
> *What else would be one that you think might be get passed from spitting on the floor? (Researcher)*
>
> *TB. (Ph1)*
>
> *What other types of sickness do you think can get passed on? (Researcher)*
>
> *Flu. (Ph1)*

TB cross-infection was also a concern for the cook and the maintenance workers:

> *She say that it's good for people like sometimes they come to the hospital they spit like that and when they spit on the floor and some of the patient have sickness like TB or things like that it can pass to another one if they step on it. (K1, translated)*
>
> *… people might got Tuberculosis TB if when they spit on the floor and then you came pass and breath the spit that infected and then you have a sickness. (W1)*
>
> *When someone have TB cough and you will get it. (W7)*

All participants agreed that there was an increased risk of disease transmission for small children and babies:

> *So for the small babies if they walk around and then they touch the spit, somehow they touch their mouth or their eyes, it will affect them like they will get the sickness. (Ph1)*

> *She say that for the kids when they walk around and they just a small kid they have to get sickness pass … because walk around and hold on the spit and things like that. (K1, translated)*

> *And even the kids it's not safe for them when they spit and some people got sickness spit and because they too young their body immunization is not really strong enough to fight against sickness so they easily got the sick from spit. (W1)*

Interestingly, while the PA would prefer patients to stop spitting in the hospital, she understood that this would be difficult to enforce or achieve because culturally spitting is normal in the Solomon Islands:

> *It's just careless, they think it's ok to spit, when others sit. (Ph1)*

> *But in a lot of Countries spitting is normal, so do you think it's normal? (Researcher)*

> *Yes it's normal, but it's not good. (Ph1)*

The maintenance workers confirmed this as well:

> *Ok, so in your Culture is spiting [sic] quite normal? (Researcher)*

> *Yes. (W1)*

The discussion around the responsibilities of cleaning the OPD floors regularly to reduce the transmission risk was complicated. Unlike other areas of the hospital, the OPD floors are cleaned by the nurses rather than being part of the cleaners' job:

> *So does the cleaner clean the corridor? (Researcher)*

> *Corridor no. (Ph1)*

> *So who cleans the corridor? (Researcher)*

> *The nurses. (Ph1)*

The nurses, however, do not always take on that responsibility:

… after work they clean the floor, sometimes when lots of patient the nurses are very tired, because they work until five or six o'clock … and sometimes they don't want to clean the floor. (Ph1)

When exploring why the cleaners do not mop the floor, the PA revealed that cleaning the administration offices was a priority over the pharmacy and the OPD:

They clean upstairs in the office, but not in here, we clean ourselves. (Ph1)

The PA also revealed that the pharmacy was not the only place she had to clean. It was also her responsibility to clean the sterile stock storage room:

But for me there's three rooms, this one the other side and another store room. (Ph1)

The implications for having cleaning responsibilities meant that while she cleaned the storeroom, her pharmacy work built up. With only one PA employed, deploying the load of these duties was not an option:

So if I go there and then I clean there the work load here will be....(Ph1)

The result being that the sterile stock storeroom was not cleaned as often or to the standard that the PA would have liked:

There's lot of items, and it's very dusty, and sometimes I do it twice a month. (Ph1)

The amount of stock in the storeroom steered the dialogue towards stock ordering, stock shortfalls and stock-take commitments:

National medical store, located in Ranadi. They give the list to us, and when our order's due, we prepare our order and we send it. We do the stock take, and we calculate what we need, and then I send. (Ph1)

The PA was asked how often this is done:

After two month. (Ph1)

As there was minimal alcohol-based hand rub (ABHR) on the wards, the PA was asked if these were on the ordering schedule:

We usually order fifty [ABHR], every two months. (Ph1)

For now since August I didn't receive any order, I place my order but they don't send it in the ship, so we're running low until now. I call them before

the ship depart, but they say they can't do it. (Ph1, interview undertaken in early November)

They say that there's one guy, there's one lady, her husband is very sick and he's died, so every workers they go and attend the funeral so they can't do my order. (Ph1)

Questioning about the soap supply and the lack of liquid soap in the wall dispensers on the wards elicited the following:

We still have soap … like soap bar … we don't have it [liquid soap] … [the containers for liquid soap were] … donated. (Ph1)

Alright so the refills, for those soap containers they were donated and central supply doesn't have those … what soap do they have on their list? (Researcher)

Only Antibacterial and that's a bar of soap. (Ph1)

As no soap bars had been seen on the wards, the PA was asked whose responsibility it was to order soap from the pharmacy:

The nurse in charge. (Ph1)

If there's no soap on the ward, then the nurse manager hasn't asked you for any soap because you have some in stock. (Researcher)

Yia. (Ph1)

5.3.4.2 Opportunities for improvement

Opportunities to improve IP&C practices relating to spitting in the OPD were focused on increased awareness about the dangers of spitting, and improving resources and infrastructure. Limited discussion addressed societal acceptance of spitting or hospital culture.

Improving infrastructure

In a culture where spitting is accepted as a norm, providing safer ways of spitting was offered as a solution. This included providing bowls in the OPD for patients to spit into:

Put the bowl in the outpatient so anyone like to spit, then they can spit there. (K1, translated)

… provide the proper container or bucket. (W1)

Providing ‘face towels’ for patients to breathe and spit into when they are sick was also proposed:

> *Face towel or something that when the person has a sickness … just breath or spit in or just cough. (W8)*

A further suggestion was for patients to dig a small hole to spit into, and then cover it up:

> *… if they got like cough they can dig a little bit ground and can just spit through and close it, otherwise it passes viral or infection. (W1)*

Although possible outside, this was not a practical solution for inside the hospital:

> *You can’t dig a hole on the floor of the hospital. (Researcher)*

As with the other stories, the solution for spitting reverted back to resources:

> *Just ask a small containers or, whatever bucket or plastic bag. (W1)*

Personal and professional responsibility

Discussing the importance of maintaining a clean environment in the OPD and the pharmacy, the PA demonstrated a sense of professional responsibility to both herself and the patients. The PA wanted a dedicated cleaner for the pharmacy and OPD:

> *I was thinking that the outpatient department and even me here in the pharmacy is very important because are the ones that will touch the tablets and medication to give to the patient, we should also have cleaners. (Ph1)*

When asked why there were no cleaners for the pharmacy and OPD, she responded with:

> *They say, we don’t have labour force to clean that, so that’s why they say the nurses and the pharmacy must clean by myself. (Ph1)*

Therefore, although there was a clear need, ultimately the only viable solution was to clean the pharmacy herself:

> *I wash the shelves … I go and get the mop and mop. (Ph1)*

Discussion of the issue of spitting with the cooks revealed that they felt it was the nurses’ professional responsibility to educate the patients about spitting:

> *She say that for like for the nurses here have to give awareness to the people, talk to the people here when they come to the hospital so that they can’t spit here around the hospital. (K1, translated)*

The same group identified that the responsibility lay with the parents to keep children safe (crawling on floor that has spit present):

> *… parent have to advise their kids not to move around in the outpatient. (K1, translated)*

Although pragmatic, placing the responsibility on the patients was not always a workable solution:

> *… so people from the mountain … do you think they would believe if the nurses told them they could get the sickness from the spitting or not? (Researcher)*
>
> *She says that sometimes some of the people don't listen to what the nurses say but some of them understand and follow that. (K1, translated)*

Leadership and governance

Ensuring patients understood the dangers of spitting by using educational messages was a constant dialogue across all participants. Awareness raising was the hospital's responsibility through the provision of signage, open discussion and clear communication. However, once again these solutions were not straightforward and easily implemented.

The suggestion of signage was proposed by the PA, and allowed for enlightening conversation:

> *Maybe put a notice … like don't spit on the floor, or if you want to spit or you feel sick, you can ask the nurse for vomit bags. (PH1)*

This simple and pragmatic suggestion to address the problem was unfortunately intrinsically flawed:

> *I was sitting out there when I was waiting for you, and I was reading all of the posters. There are posters from the WHO, from Australia and other places that are all in English. Do you think the many of people can read those posters? (Researcher)*
>
> *They can translate it in their language. (Ph1)*

Following additional conversation regarding the current signage, the PA thought further about her proposal:

> *They will read themselves, but some people don't even know how to read. (Ph1)*

An alternative solution was then offered:

… so maybe the PHD [Primary Health Department] department should go around, educate people. (Ph1)

The maintenance workers agreed with this revised suggestion that the hospital's community team were best placed to provide education about spitting to the community:

The best solution is … the community hospital team can go to the community and educate people. (W1)

However, they were of the same opinion as the junior nurses about the community's understanding of the link between spitting and disease transmission:

Some people go to education like school they understand it, but sometimes they just like forget it … it's like a normal routine because when it comes to a time they need to spit out they just anywhere they just throw the spit. (W1)

5.3.5 The Story of the Broken Tuberculosis Fume Cabinet

Figure 15: Broken TB cabinet

The story of the broken TB cabinet (Figure 15) is not long, but very telling of the influence that Christian faith has on IP&C practice. Because of a number of restrictions including finance, access to parts and labour, and the logistics, repairing or replacing the

fume cabinet has not been a hospital priority. The TB fume cabinet (or biological safety cabinet) is used to prevent laboratory-acquired TB infection transmission during the process of smearing and examining TB specimens (WHO, 2012). The cabinet has lain dormant in the pathology laboratory since it broke in 2012.

5.3.5.1 Infection prevention and control practices

The MLT voiced his concern for the potential of TB transmission through this photo. The lack of a fully functional TB cabinet, since 2012, meant that all TB samples from that date have been smeared, processed and examined without the protection of the cabinet:

> *… 2012 it's was still working, and then we move it to the other side of the laboratory … and while we move it because we are not specialize people to move it … I will say that's not good … But we did it. So we put it in the room, and we use it only few month in 2012 maybe three months like that, and then it's, you know not working. (PA2)*

Interestingly, the MLT does wear personal protective equipment (PPE) when smearing to decrease the risk of TB transmission, but the PPE provided and worn is the wrong type, providing little to no barrier against transmission:

> *I always wear personal protective equipment, it's recommended it's standard protocol, I always wear my Lab coat, and always wear the face mask. (PA2)*
>
> *What type of Face mask you wear? (Researcher)*
>
> *The surgical one. (PA2)*
>
> *And which one recommended for TB? (Researcher)*
>
> *Another one that look like, I don't what? (PA2)*
>
> *Looks like a duck bill? (Researcher)*
>
> *Yia that's the one. (PA2)*

When asked how he reconciled potentially being infected with TB in the absence of proper safeguards, the MLT cited his Christian faith as providing the overarching protection:

> *How does that make you feel knowing that you may be at risk, yet no-one seems to be listening? (Researcher)*
>
> *Am feel discourage, but you know working in institutions like this, I would say owned by the church, so our mind say, thinking the lord will protect me from this. (PA2)*

You think the lord will protect you from this thing? (Researcher)

It depend on … because you know, our strong believe … I have my own believe with my own God. So I think He will definitely protect me, because I am doing people good thing to serve people. (PA2)

5.3.5.2 Opportunities for improvement

Opportunities for improvement were limited to repairing or replacing the fume cupboard, and improving the laboratory environment; however, again these were fraught with barriers. Correct PPE surfaced as a solution; however, again this relied on management taking responsibility.

Improving infrastructure

The MLT discussed solutions in a logical order from the best possible solution to the most pragmatic. Optimally, he wanted the TB cabinet repaired; however, in order for this to occur, specialist service personnel were required:

Definitely yes. We need specialist mechanic but the problem is we don't have enough money. (PA2)

The most appropriate alternative to this was to purchase a new cabinet:

… or we just need to buy a new, and that will come under WHO or another funders that feel sorry for us, and you know to pay something for the Hospital. (PA2)

However, financial restraints made this option, outside full donation, not viable:

I was like acting in charge 2011, I work with Kilufi hospital … and we ask the one representative from the TB department, to come and see the machine, and he came over … but he say that we haven't got any money to support us … expensive to get specialized people to come and fix the machine, so someone from somewhere up from Millionaire to come and buy new cabinet. (PA2)

Personal and professional responsibility

Using the correct PPE including, at a minimum, an N95 mask type was warranted; however, the MLT placed the responsibility of ordering and provision of these essentials back onto his supervisor:

Because we don't have any … Supervisor [should] recognize it as a problem, she should have to order, consult our heads, say we have this

problem and can you buy this type you know it will help us, to protect us as well. (PA2)

Leadership and governance

In the absence of a working cabinet, changing the location where the specimens are processed to a more suitable area within the laboratory was the most pragmatic solution. Unfortunately, this also had associated obstacles:

> *… another room there, it's have very good air ventilation. XXX is my boss, so it's depends on her, but for me, as a work person I would recommend to move, but then I have to respect my boss, because you know, boss is always boss. The boss will make the final decision, but it's good to move there, so that there we have really good ventilation. (PA2)*

5.4 Summary

This chapter has presented the findings of the study in two forms, a manuscript describing participants' knowledge and beliefs around sickness causation and transmission, and a written chapter describing IP&C practices at AAH and solutions as put forward by the participants. The data, collected through Photovoice and Photo-elicitation, enabled the researcher to express the findings using the participants' voices. More importantly, the data eloquently depict the nexus between science, workplace and societal culture, and religion, and the significant influence of these realms over IP&C at AAH. On the surface, opportunities for improvement appeared simple; however, further interrogation revealed a myriad of factors that prevent solutions being plausible.

The findings add significant support as to why Western-based IP&C programs do not work in culturally and spiritually diverse environments. Improving IP&C program implementation in these settings requires a much deeper exploration of the context in which they are being placed.

Chapter 6 Discussion

6.1 Introduction

The purpose of this PAR study was to explore what IP&C means to staff and community members at AAH, Solomon Islands. Included is a discussion of major findings as related to relevant literature on implementing infection prevention programs in other first nation populations through both a Western and non-Western lens. Also included is a discussion on the complex individual and combined factors that influence and inform how people practise IP&C and what sickness transmission means to people at AAH. The chapter concludes with a discussion of the limitations of the study, areas for future research, and a brief summary.

This chapter contains discussion and future research possibilities to help answer the research questions: (1) 'What are the current Infection control practices at AAH?' (2) 'How can IP&C practices be improved at AAH?' and (3) 'Can culturally acceptable interventions be developed and implemented to enhance current infection control practices?'

The basis for what informs individuals' and community members' understanding of sickness and IP&C in Atoifi is multidimensional and complex, but could loosely be captured by two common themes and four subthemes:

(1) what is known and believed about sickness transmission at AAH
(2) IP&C practices at AAH
(2a) knowing and practicing IP&C at AAH
(2b) knowing and NOT practicing IP&C at AAH
(2c) practicing and NOT knowing IP&C at AAH
(2d) NOT practicing and NOT knowing IP&C at AAH.

Some knowledge, beliefs and practices are related to the individual, but most are related to the group/collective/community. Results from this study indicate that the influence of the group/collective is often greater than the individual, which is typical of many indigenous societies (Mark & Boulton, 2017). Much knowledge, and many beliefs and practices, are directly related to workplace systems, which are influenced by a combination of culture, kinship, spirituality, multi-worldview, education, hierarchy and theocratic governance. All of these factors contribute to how sickness is understood and the manner in which IP&C practices are performed at AAH. Interestingly, despite the influence that gender has on roles, expectations and interactions within Melanesian society, gender did not emerge as a major influencing factor for knowing or practicing IP&C in this study.

This study has shown that worldview, experience, knowledge and practice varied for each individual. However, the influence of complex but intricate external factors was prominent across and within each of the issues that participants discussed. This was crucial to how individuals navigated their world and the IP&C decisions they made. These interwoven factors and themes add a dynamic dimension to what is important to the people, what they know, and how and why they act. Importantly, all of this can and will change over time as experience and status within the AAH community and working life evolves.

Unlike traditional discussion chapters, this chapter is written specifically to capture the complexity of the findings. Theme one—what is known and believed about sickness transmission—is presented as a publication in Chapter 5 of this thesis. The discussion section of the publication in Chapter 5 specifically engages with the implications of this local knowledge and beliefs. The following section of this chapter is written to primarily focus on theme two—IP&C practices at AAH. However, results and interpretations from theme one, by necessity, will be interwoven throughout this discussion chapter because IP&C practices are inherently influenced by sickness transmission beliefs, and the two cannot be entirely separated. Therefore, from a traditional Western lens, this chapter may at first appear disjointed; however, to maintain authenticity, it is critical to portray the web of ideas, concepts and themes and how they inexplicitly loop back to each other. By doing so, this chapter captures the rich, nuanced and locally informed way of understanding IP&C practices at AAH. To the best of our knowledge, this is the first time this approach has been used in relation to IP&C and in the Western Pacific region.

6.2 Photovoice as a Storytelling Medium

The epistemological premise of contemporary IP&C programs is that everyone will understand and believe the germ theory, and that IP&C practices and behaviours will be systematically and logically guided by the knowledge and belief of the germ theory. The findings of this research argue the contrary. What is *not being argued* is that people do not know that sickness is passed between people and that preventing transmission is not important. What *is being argued* is that research methods are required that allow a deeper understanding of how people in different locations believe sickness is passed between people and what the implications are for IP&C programs. This research used CBPR to honour local indigenous and imported knowledge systems and allow storytelling through Photovoice. This method has afforded people the opportunity to express the differing ways they understand sickness transmission, and convey their position within the hospital hierarchy, not just from a biomedical perspective, but from social, cultural and spiritual perspectives.

Sustaining and protecting historical and ancestral knowledge within many communities has been, and remains, via storytelling (Mark & Boulton, 2017). Engaging in oral traditions to explain indigenous understanding of events, past and present, consistent with indigenous worldviews and cosmologies is primal to indigenous epistemologies (Iseke, 2013). Therefore, storytelling forms the foundational platform for teaching and learning and is vital for the human experience (Koki, 1998).

Privileging indigenous voices and respecting indigenous worldviews in research through storytelling means participants can share how they live and how they understand the world (Iseke, 2013). In this research, Photovoice facilitated this. Without the use of Photovoice, it is unlikely that the depth of the societal, cultural and spiritual underpinnings, ever present behind practice, would have been revealed. The participatory nature of Photovoice allowed participants to examine and discuss the nuanced meanings held within the photographs and tell the photographs' stories through their own worldview.

A person's worldview is developed throughout their lifetime through socialisation and incorporates ways people make sense of their environment, which in turn influences the way they see the world (Mark & Boulton, 2017). The participants in this study came from all walks of Solomon Island life. Some had formal 'biomedical' education; some had education through trade certificates; others had education to primary school or lower high school level, and some had never been to school at all. The varying levels of education of the participants and social standing influenced the language they used to depict sickness transmission, and affected the way in which they saw their role in implementing IP&C practice at the hospital. Cultural socialisation also influenced participants' worldview. People from the mountains who follow ancestral knowledge, which inherently guides their interaction with the world, depicted sickness transmission from a very different knowledge base, and this affected their use of hospital services.

The language used by the cook when describing the importance of a uniform to prevent the 'dirty' transferring from her clothes to the food was very different to that of the senior nurses and MLTs, who could discuss germs using biomedical nomenclature. Although their articulations were unique, both participants were referring to the same process, that of sickness causation and transmission. The differences in language demonstrate that despite their different social and educational levels, and different stories, which informed their understanding and shaped their worldview (whether that be formal educational, or informal through cultural and community messaging), the cook and the senior nurses both understood that an 'entity' could be the cause of and transmit sickness.

The participants' worldview also explained how they saw themselves within the hospital hierarchy and thus affected the way they practised IP&C and used the hospital services. Once again, the stories behind the photographs indicated that those who had little or no formal education felt they were at the lower level of the hospital hierarchy and therefore were unable to effect change. The traditional beliefs of the mountain people, developed from their ancestral knowledge, were at odds with both the introduced colonial-style hospital structure and the theocratic governance of the Christian-based hospital, and therefore inhibited their attendance at the health service. Dissimilarities between theocratic hospital governance structures and staff understandings and beliefs, and subsequent communication barriers, have been broadly cited as contributing to quality of healthcare and misinformation to patients (Albougami, 2015; MacVane Phipps, 2020).

While cultural and spiritual influences on sickness causation and transmission beliefs and health-seeking behaviours in culturally diverse populations have been described more broadly, there is little in the literature that discusses the influence that these factors have on the HCWs' role in applying IP&C principles. This lack of research and lack of literature only reinforces the seemingly unchallenged biomedical notion that Western IP&C knowledge is to be valued over indigenous knowledge in IP&C programs. This research gap also leaves the notion that Western knowledge is 'universalistic' rather than being socially constructed and unchallenged (Gegeo & Watson-Gegeo, 2002). This study has used Photovoice as a method to fill this gap and engage in a challenging examination of the epistemological premise of knowledge that is relevant to improve IP&C at AAH and in similar settings.

6.3 External Influencing Factors

Before discussing the domains that underpin theme two, it is important to help the reader understand the underlying influences that inform the participants' worldview and subsequently affect their IP&C practice. It is also important that the influence of science, which affects the worldview of those with formal biomedical education, is included here as the juxtaposition against the cultural and spiritual worldview developed through a lifetime of socialisation.

6.3.1 Science

The germ theory is a Western scientific idea/concept, and has not historically informed the way Melanesian people think about health and sickness. Sickness causation and transmission have historically been attributed to ancestral spirits or societal indiscretions. Many of these beliefs remain as a base on which the introduced germ theory sits. The introduction of Christianity was integrated into the British colonial enterprise in many parts

of the Pacific. It was through the colonisation-Christianisation process that people throughout Melanesia were introduced to, and interacted with, biomedical-based Western health services. Colonisation brought Christian missionaries, and Christian missionaries brought Western biomedical knowledge and integrated this biomedical knowledge within their Christian teaching in their nursing schools. This included the germ theory taught alongside the healing power of the introduced Christian spirits and deities and associated introduced Christian social rules. One such nursing school was established at AAH. The education of nurses in the Solomon Islands has now progressed to the tertiary sector. The AAH School of Nursing is now an affiliated campus of the Pacific Adventist University. The campus is co-located with AAH and is the main provider of nursing staff to the hospital.

The germ theory as a broad concept underpins the AAH staff knowledge about sickness transmission, even if the rationale does not quite fit. Concerns about contracting TB from sitting next to a patient, or breathing in while a TB-positive patient coughs and spits, indicate knowledge about person-to-person transmission. Touching inanimate objects after handling dirty linen in the absence of hand hygiene, and ensuring a clean toilet to prevent diarrhoea-transmitting infection, acknowledge the contribution to disease by fomites. These examples demonstrate some semblance of the germ theory and hygiene principles, even if the microscopic concepts are not described or articulated. The understanding that the germ theory contributes to disease causation and transmission in an IP&C context is difficult to ascertain in LMICs more broadly. Gawad (2017) and Kasa et al. (2020) in their studies also found that the understanding of ‘Standard Precautions’ by HCWs is varied, despite components including aseptic technique and hand hygiene, all of which are premised on the germ theory, being practised.

Just because staff at AAH suggested that disease transmits through an ‘entity’, does not mean that this is directly translated into practice. There is an interface where other influences exert their pressure. Other forces can influence IP&C practice, with some being more influential than others. Cleaning a dirty toilet to prevent sickness transmission is made more complex by a broken flushing cistern, yet maintenance requests to the administration are described as falling on deaf ears. A workplace culture that did not always respond to requests for maintenance was described as a consistent barrier for IP&C practice at AAH. This is not unique to AAH as hospitals with leadership teams that lack commitment and accountability are documented as contributing to ineffective IP&C program implementation in other LMIC locations (Ider et al., 2012).

While the science of IP&C was not necessarily understood or articulated through scientific terminology or concepts, for IP&C programs to work, acknowledging the science is crucial. However, what needs to be further understood is that espousing the science

through educational activities and policy and procedure is not necessarily going to change practice, and this is due to people's underlying belief systems or worldview and other influencing factors. Using the germ theory as a foundational premise for an IP&C program only works if it is supported by workplace and societal culture and does not collide with spiritual beliefs.

6.3.2 Workplace Culture

Strong governance and leadership set up a positive workplace culture; however, in many LMIC hospitals, governance structures do little to support sustainable, culturally and contextually appropriate IP&C practices. The purpose of hospital governance is to support and supervise all activities, including clinical care, and includes both financial and non-financial components (Tabish, 2012).

At AAH, many participants inferred the hospital needs to be more accountable by providing better governance and leadership, and this came from both staff and family members. However, they were unsure of their ability to influence change. While the terms policy, procedure and process, terms commonly found under organisational governance structures, were rarely used, the concepts were often referred to. Improving processes, such as checklists, for ensuring the OPD was cleaned at the end of every day; changing work routines so the dirty linen can be washed more often; and hospital management doing something about the rubbish, including being a positive role model for patients and their families, are all linked to policy and process, and ultimately governance and leadership. An absence of IP&C leadership was cited as an issue, as was the hospital administration, who were said to not have an understanding about infection control. In many LMICs, senior healthcare management may not be convinced of the importance of IP&C because of a lack of local surveillance data, despite the economic rationale being widely published (Damani, 2007), and financial structures that do not account for the burden of HAIs (Ider et al., 2012). Decisions about IP&C initiatives and resource funding in hospitals in LMICs are often made by managers who have little or no medical or IP&C knowledge, and therefore receive low priority (Ider et al., 2012). In addition, for faith-based hospitals such as AAH, theocratic structures add to the complexity.

AAH operates under a theocratic organisational structure and as such is guided by the SDA construct, and high-level decisions are influenced by this. This differs to some highly religious parts of the world where health governance does *not* link with faith (MacVane Phipps, 2020). Understanding the connecting influences between religion and hospital management structures helps to interpret the experiences of staff and patients, and separating the two paradigms is impossible. The influence of a theocratic healthcare

structure trickles down through to community (Albougami, 2015). The AAH motto is 'For God and Humanity' and expressly states that God is first and people are second. The influence of the theocratic governance, expressed through the motto, was evidenced in the words of the cook, who said that the pastor, not a nurse or a doctor, was the appropriate person to lead a meeting to discuss 'good health'.

Workplace culture cannot be completely separated from societal culture, and it could be argued that a society steeped in hierarchy will be emulated in the workplace (Glor, 2001). The community in which AAH sits is small; thus, the obligatory relationships between staff, which emanate from the society in which they live, affect IP&C practice greatly, which in turn affects the staffs ability to change the existing situation. Professional hierarchies combined with cultural expectations means lower-level staff are often reticent to challenge the status quo (van Gulik et al., 2021).

6.3.3 Societal Culture

The Melanesian culture of AAH influences how people behave with those they interact with. Characteristics common to culture include language, religious observances, customs, acceptable gender roles and occupations, and other aspects of behaviour (Encyclopedia of Public Health, 2019). At AAH, the cultural rule of kinship and the *wantok* system make it difficult for some staff to hold others accountable when they are not doing the right thing. The Melanesian *wantok* system involves providing support to people that share the same language, culture and values, and is an obligatory relationship in which it is expected that community members will support others in terms of personal and family needs, business transactions, caring for the sick, and compensation (Marme, 2018). Cultural expectations were verbalised by the nurse educators who acknowledged that Melanesian culture makes it difficult to talk to a colleague directly as it causes ill feelings, and by the PA when discussing her 'duty' to provide her share house colleagues with medications. Because of the *wantok* system, helping her colleagues or *wantoks* was a practice she was obliged to follow.

Cultural practices are also seen as an overriding force over the germ theory. At AAH, the cultural norm of spitting was commonly practised by staff, patients and family members despite knowing that there is a risk for transmission of diseases such as TB and influenza. Similarly, telling the people from the mountains not to spit was not plausible as their spiritual beliefs around sickness causation prevented them from believing the nurses' rhetoric. Culture prevailing over the germ theory is seen globally as many cultures maintain a strong connection with their traditional systems and do not have a historical connection with biomedical health services. Yet these cultures are increasingly involved with them (Vass et

al., 2011), either as patients or as HCWs, thus influencing their biomedical practice. This was poignantly illustrated during the Ebola epidemic in Sierra Leone. Many HCWs knew that touching the body of person who died from Ebola could cause transmission, yet their traditional burial practices, including washing the body with bare hands and kissing the deceased, overrode the science of the germ theory (Davies, Bowley, & Roper, 2015).

Dissimilarities in cultural understandings between the westernised built environment of the hospital and the communities that the hospital serves, and also language differences among the staff that work in the hospital, the patients and their family members, also influence IP&C practices. Many patients from the villages are not acquainted with the use of a flushing toilet, which means the toilets are left dirty after use, and a language barrier between some nurses and patients prevents appropriate instruction. Community literacy of Western-based health infrastructure affects patients' understanding of hospitals, the roles of staff, and their expected behaviours (Vass et al., 2011), and this influences the way in which patients behave in AAH.

Understanding societal culture in the local context is a vital inclusion in any IP&C program. Making alterations for kinship relations, and understanding the gap between patient and staff culture and the healthcare environment, and catering for these variances can help inform not necessarily IP&C policy, but its implementation.

6.3.4 Spirituality

In many cultures, the germ theory is not unquestionably accepted, and illnesses are often ascribed to supernatural causes (Davies et al., 2015; Quaresima, Naldini, & Cirillo, 2020). As is the case in the mountains of East Kwaio, those that follow ancestral beliefs may not access hospital services because of the *tabus* associated with the physical structure of the building and the way rubbish is managed. As a result, the hospital may become the last point of access when the people from the mountains become sick, increasing the risk of community transmission of disease or hospital-associated transmission, particularly if the person is exceedingly unwell when they present (Marme, 2018). A strong belief in sorcery as the cause of TB could also affect people from the mountains when treatment seeking (Massey et al., 2015). The use of spiritual healers in some Melanesian societies in preference to Western medicine is well documented in the literature (Marme, 2018), with patients only presenting for Western medicine when all other avenues of care have been exhausted.

An incongruence of belief systems was realised not only in the views of the pagan believers, but also in the Christian staff. When sound IP&C practices could not be supported because of unsupportive infrastructure, staff persisted despite the risk because it was

believed a higher order faith would save them. Protecting oneself from disease through Christianity has been documented as a way of responding to epidemics in LMICs, including the faith that 'good Christians' will be protected from disease, and non-believers will succumb (Davies et al., 2015). In Sierra Leone, many people believed that the Ebola plague was a 'punishment from God' as many Sierra Leonean people had forgotten how to worship (Davies et al., 2015).

The pluralistic practice of treatment seeking may see a patient treated by traditional or Western medicines (Schutz, Tanuvasa, & Jutel, 2019) but also pursue healing through Christian prayer (Tynan et al., 2011). The juxtaposition between biomedical treatment and Christian messaging was seen at AAH through the voice of the laboratory technician, who despite 4 years of biomedical science study, including microbiology, reverted to his Christian faith, believing that it is 'ok' to work without a functioning fume cabinet because God had his back.

Despite the biomedical premise of IP&C programs, the implications that a spiritual worldview has for implementation should not be ignored. This is not to say that IP&C practitioners and program developers need to suspend their own biomedical beliefs, but need to accept that a spiritual worldview exists and making sense of the 'other' worldview can help outsiders make the logic more discernible (Ahrens, 2011). The ancestral rituals of the mountain people and the Christian worldview of the coastal people signify and help constitute the society in which people live and cannot be dismissed for the sake of science. The two worldviews of biomedicine and spirituality should not be rivals, and the local cultural and religious preferences of a community should be used in combination with biomedicine to inform IP&C program implementation.

From a Western traditional lens, this practice seems nonsensical and unsafe, but just because that lens defines current accepted IP&C actions, it does not make it right. Many first nations people have the wonderful ability to balance multiple worldviews, and by doing so, create a balance and harmony in their lives that could be missing when living through a monothematic lens.

So, when all of these factors are taken into to consideration, what does it mean for IP&C in AAH?

6.4 Four Domains that Explain Infection Prevention and Control Practice at Atoifi Adventist Hospital

Articulated in the previous discussion are the contextually relevant influences that influence sickness transmission beliefs and IP&C practice at AAH. The intersecting

influencing factors make for a complex web, and to make sense of the findings and untangle the web, theme two (What the current IP&C practices are) has been underpinned by four domains:

- people who have IP&C knowledge and subsequently apply knowledge to practice
- people who have the knowledge but do not apply knowledge to practice
- people who practise IP&C without knowing why
- people who do not practise IP&C because they do not have the knowledge.

The four domains naturally emerged from the analysis and have provided structure for this part of the discussion in a way that shows that most participants, whether formally educated in the biomedical model or having informal education, know about and/or apply the principles of IP&C and hospital hygiene, and there are very few occasions where people do not know and do not practise.

6.4.1 Theme 2a—Knowing and Practicing

Despite the common rhetoric around the incongruence between IP&C knowledge and IP&C practice in resource-limited settings (Sethi et al., 2012), in this study, stories were told by participants that demonstrated a clear link between IP&C knowledge and practice. The different epistemologies between those with biomedical knowledge, such as the nurses, PA and MLTs, and those without biomedical education, such as ancillary staff and family members, were very clear. The cleaners understood that a dirty toilet could spread sickness, explaining ‘touch’ as the mode of sickness transmission. They therefore cleaned the toilets fittingly. However, they could not articulate the biomedical mechanisms underpinning the transmission of disease. Conversely, the PA understood that dust and dirt could harbour germs, so she cleaned the pharmacy shelves often. Similarly, the junior nurses understood that disinfectant killed bacteria and therefore soaked the surgical instruments accordingly.

Despite knowing that germs, or ‘something’, caused sickness transmission, the innate human behaviour of protecting self emerged as the strongest reason why study participants undertook sound IP&C practices. Cleaners wearing gloves to clean the toilet, mask-wearing by MLTs to prevent TB transmission, segregation of clinical and non-clinical waste to decrease the risk of contamination during transport by senior nurses, and undertaking hand hygiene after touching doorknobs were all examples of protecting self. Hancart-Petitet et al. (2011) describe this innate sense of self-protection as ‘ego-protection’.

Studies by Hancart-Petitet et al. (2011) and Sethi et al. (2012) recognising that HCWs are at greater risk of occupational disease transmission, and thus, any actions to prevent

disease transmission in healthcare were undertaken for the benefit of the HCWs, not the patients, certainly correlate with the findings of this study. This is also reiterated by E. J. Murray, Mason, Sparke and Zimmerman (2021) when discussing HCW willingness to respond to infectious disease outbreaks, citing personal safety and the safety of family members as a key barrier to participation. Similarly, Mattoo, Hameed and Asif Maqsood (2019) found the reason nurses practised satisfactory waste management is because they are inherently involved in high-risk practices and therefore are at greater risk of being a victim of healthcare-associated disease transmission.

This sense of self-protection indicated that there is a belief by participants that sickness can pass on from one person to another in the hospital; however, there is minimal evidence that this protection is extended or applied to patients. If the high compliance rates of HCWs who do undertake infection prevention practices, as cited by Markos, Sinkie and Garedew (2021) in their Ethiopian study, are taken at face value, it could be assumed that the practice is undertaken for the benefit of the patients and therefore positively influences HAI rates. However, this study articulates that self-protective actions highly influence practice, which changes the dialogue about IP&C and has implications for ongoing staff education and IP&C management.

6.4.2 Theme 2b—Knowing and NOT Practicing

Despite the availability of contextually appropriate, evidence-based IP&C guidelines aimed at low- and middle-income settings (Rasslan, 2016; WHO, 2016), the ability to achieve the level of practice described within these guidelines is unachievable in most resource-limited settings (Zimmerman, Yeatman, Jones, & Murdoch, 2015). Consistent with the literature, participant interviews exposed what was *not* practised to prevent sickness transmission at AAH, despite knowing what should be done, and the mismatch was sizeable. The incongruence between knowledge and practice was multifactorial and encompassed the layers of complexity that are inherent in the Solomon Islands society, the local community and AAH itself. A hierarchical management structure, behaviour of staff, respect for culture and strong Christian beliefs all affected the staff capacity to undertake correct practice. In addition, these factors overlaid the more commonly cited barriers, such as a lack of resources and non-supportive infrastructure.

The inability to act on a known IP&C issue because of the professional hierarchy of the hospital was described mainly by those who were in subordinate roles at AAH and those whose ‘kin’ sat in the higher ranks of the hospital as they were unable to ‘push upwards’ to effect change. The maintenance worker who had the role of groundsman was quite vocal about his inability to do anything about the rubbish as he was only the groundsman.

Likewise, the junior nurses knew they were at the lower level of the nursing structure and felt they could not speak out to their seniors. The respect for professional hierarchies and seniority is vital for the functioning of health services; however, the power imbalances that this creates are exacerbated in countries with strong cultural expectations (van Gulik et al., 2021). The influence of hierarchy not only affects IPC practice, but also influences access to training and education (Hancart-Petitet et al., 2011) and engagement in IP&C programs (van Gulik et al., 2021), both of which have a strong effect on healthcare-related behaviours (Joshi et al., 2015).

Behaviour as a reason for not following biomedical-based IP&C guidelines, despite knowing what is required, is only made more complex in a culturally different environment. Zin et al. (2014) argue that health workers perform best when skill mix is appropriate to the population served; however, this study reveals that it is not skill mix that influences performance, but behavioural factors. Even though most participants knew what 'the right thing to do' was when it came to IP&C practices, many reverted to moral disengagement and justified their behaviours by blaming others for IP&C inaction.

Blame surfaced as repetitive dialogue across many interviews. The PA blamed the central supply store for not supplying the ABHR to the hospital. The nurse educators and cleaners blamed the ward nurses for managing the linen incorrectly, and many participants blamed the hospital management for inadequate waste management facilities. While it could be argued that positioning blame on others is a form of moral disengagement (Sigelman, Rider, & De George-Walker, 2016), the complexity of the kinship relations in the Melanesian culture does not allow for open two-way conversation between relatives. Kinship relations and obligations, which include the general rules of respect, obligation, mutual exchange and social property, govern much of the cultural construction of Solomon Islanders (Jourdan, 2017). AAH is staffed by many related family members, so while many participants justified their reasons for not practising IP&C by blaming others, calling them to account is problematic because of their kinship relations.

Behaviour can also be linked to situational factors, meaning what is done in the context of a specific situation may not always be reflective of a person's internalised values and standards (Sigelman et al., 2016). Sigelman et al. (2016) argue that despite the presence of contextual influences, a person with strong moral self-regulation will maintain their internal values and still do the right thing; however, this was rarely seen in this study. To cope with workloads at high volume times, the standard of IP&C practice dropped despite knowing that it was wrong. The standard of instrument soaking in the operating theatres decreased when the theatres were busy. The short timeframe between patients meant that the disinfectant was not changed throughout the day. In addition, staff from the

wards also placed their instruments in the same soaking dish as the theatre instruments. The participants knew that this was wrong as they understood the requirements for instrument disinfection time and also disinfectant 'life'; however, the ability to maintain their internal values and undertake correct practice was overshadowed by workload and a lack of communication. Unlike Marjardi and McLaws (2010), who describe a similar situation but cited a lack of understanding of disinfection processes as a causative factor for not following guidelines, this study delves deeper and demonstrates that the understanding was there, but it was the other pressing factors and/or access to other ontological and epistemological systems that justified not following IP&C guidelines.

Substandard practices are easier to accept when it is believed that a positive outcome will prevail with the protection from God (Marjardi & McLaws, 2010). Accepting the non-working TB fume cabinet and thus substandard IP&C during sputum testing was reconciled by the MLT because of his own Christian faith. Not uncommonly in societies where traditional faiths have not been totally replaced by Western education, including university education, a person will revert to traditional assumptions when a conflict between the two arises (Ahrens, 2011). The use of faith has been well documented in chronic disease spaces (Grossoehme, Ragsdale, Snow, & Seid, 2012) and provides robust validation for the MLT's actions.

Interestingly though, a recent study contradicts this notion, citing religious identification as resulting in higher fear levels of contracting disease and the adoption of increased preventative measures (Franz & Dhanani, 2021), but this study specifically focused on COVID-19 and thus included a number of variables that make it incomparable to the broader literature.

Spirituality is not the only non-quantifiable influence on IP&C practice at AAH; societal culture is also significant. The effect that societal norms have on preventing sound IP&C practice was expressed by the PA. The PA expressed that she was obliged to provide her 'housemates' with medications for diarrhoea, despite knowing that the medications were destined for patients, not staff. She was also frustrated that the staff knew that poor food hygiene could cause diarrhoea, yet they continued the practice. The *wantok* system in Melanesian culture is an obligatory relationship between people, characterised by a common language, kinship group, area of origin, or social or religious group (Nanau, 2011). The *wantok* system has been the basis of social interactions in villages for thousands of years. Traditional social rules and expectations may evolve over time, but these rules and expectations have not been replaced by Western education, colonial hospitals or the 'professional IP&C standards' that accompany them. The *wantok* system is a network of cooperation, caring and reciprocal support; thus, if the PA were not to provide her

housemates with the medications they demanded, the fundamental values that underpin the *wantok* system would be opposed. The demand for medications and obligatory response would not be limited to diarrhoeal medications but to all medications including antibiotics. From a Western IP&C perspective, this potentially sets the hospital up for 'substandard' antibiotic stewardship and the possibility of increased local antibiotic resistance.

The more commonly cited barriers to correct IP&C practice, including non-supportive infrastructure and inconsistent consumable resource supply (Hancart-Petitet et al., 2011), are also experienced by AAH. The lack of suitable hospital infrastructure to support waste management, and poor role modelling by the hospital, featured strongly across all participant groups and, for multiple reasons, was a particular concern for the participant whose role it was to tend the grounds and manage the rubbish. The participant knew about the risk of disease transmission to himself from picking up and dumping rubbish but did not understand the exact mechanism. The contents of the rubbish being dumped were unknown to the participant, and with about one-quarter of hospital waste being hazardous (Mattoo et al., 2019), not having specific knowledge about the contents affected the way he handled and transported the biomedical waste. Not knowing the contents of the rubbish can also have hazardous environmental impacts. Logistical and cultural factors meant the rubbish at AAH was dumped into the nearby mangroves. The potential mix of toxic hospital waste with non-toxic community waste could increase the overall toxicity of the dumped rubbish in the surrounding environment, the very same environment that supplies the villagers with fish, crabs and shellfish. AAH has an obligation and duty to care for the wellbeing of the community and the environment when managing their waste (Mattoo et al., 2019), and the adverse effect for the community of dumping the rubbish into the sea was well recognised by the maintenance staff.

A paucity of vital consumable resources that support IP&C practice was noted by many participants. A reliance on incorrect respiratory PPE, together with inadequate supply of recommended masks, was argued as a reason why the MLT did not practise appropriate prevention when handling sputum specimens, and this is representative of the situation in many PICs (Marme, 2018). As described by Quaresima et al. (2020), many hospitals in LMICs are supplied by a central medical store that delivers to regions and districts, and the Solomon Islands is no different. Any interruption to the supply chain can affect distribution of provisions, placing regional and district hospitals at risk (Quaresima et al., 2020), and results in medical equipment that is unusable or inappropriate (Crompton et al., 2018). This was illustrated nicely by the PA when questioned about the lack of ABHR. The cultural norm of mass funeral gatherings in the Solomon Islands influenced the central medical store's

ability to pack and send essential hospital supplies, such as ABHR, on the once-a-month supply ship, interrupting the supply chain and potentially placing the staff of AAH and patients at risk.

Inconsistent or unavailable supply of consumable resources also creates a reliance on external donors. However, while the intent is good, external donor funding can also be unreliable and is recognised as affecting IP&C programs (Quaresima et al., 2020), including consistency of supply and quality of goods (Crompton et al., 2018). The absence of liquid soap in dispensers in the clinical areas at AAH was a prime example. The initial dispensers and soap were donated by an SDA hospital in Australia when the Australian Chief Executive Officer managed the hospital; however, the supply stopped when the Chief Executive Officer left. The product is unavailable through the central medical store, and as the available alternative soap was not used in the clinical areas, hand hygiene was not practised appropriately. The mismatch between the donated goods and the sustainability of supply is cavernous, placing the hospital system at a disadvantage.

6.4.3 Theme 2c—Practicing and NOT Knowing

Practicing and *not* knowing centres around the participants' descriptions of 'doing the right thing' when practising IP&C, but not knowing why. It was mainly the cleaners and maintenance men, participants that do not have biomedical education, who featured in this theme. Despite their status as 'ancillary staff', discussions of their photographs revealed that they had a good understanding of sickness transmission but not exactly how. A photo of a dirty bathroom floor taken by the cleaners explained that they did know that diarrhoea on the floor and walls could be the cause of sickness transmission. However, when questioned about cleaning the toilets and their cleaning routine, they disclosed a lack of communication between nurses and cleaners, role ambiguity, and importantly a lack of correct IP&C reasoning as to why their cleaning routine was undertaken in the order it was. The sequence of cleaning the wards prior to the bathrooms was done so the wards were clean before the doctors did their ward rounds, not because a bathroom is considered 'dirty' and thus should be cleaned after the wards, which is the acceptable IP&C norm. Hygiene practices for aesthetic purposes, rather than informed approaches, have been reported in other LMICs and are linked to a lack of education and training, which is directly related to social and hierarchical status (Hancart-Petitet et al., 2011).

The lack of inclusivity of ancillary staff in the overall IP&C program at the hospital was noted by both ancillary staff and trained HCWs. Ancillary staff play a fundamental role in IP&C, yet including them in IP&C educational activities and program implementation is undervalued. 'Learning on the job' seems to be common in LMICs, which inherently leads

to misinformed practice (Marjardi & McLaws, 2010). A cross-sectional study on HCW IP&C knowledge and practice in north-west Ethiopia did not survey ancillary staff (Desta et al., 2018); nor did a similar study undertaken in Yemen (Gawad, 2017) indicating that the significant role played by ancillary staff in IP&C is not realised. This is recognised by Hancart-Petitet et al. (2011), who agree that despite being key to hospital hygiene, cleaners are at the bottom of the hospital hierarchy and receive insufficient training; the authors describe training being given 'orally' during the first few days on the job. This was reflected in the findings of this study in that the cleaners at AAH learned their job from previous incumbents or through 'on the job' training from a superior.

6.4.4 Theme 2d—NOT Practicing and NOT Knowing

People who do not practise IP&C because they do not have the knowledge can be divided into leadership and governance, and cultural, differences. Participants spoke about poor IP&C practices by others as being due to a lack of knowledge or understanding. The nurse educators spoke of the level of prioritisation that IP&C receives by the hospital administrators but admitted it was probably due to a lack of awareness. Participants cited unclear communication and messaging, poor role modelling by the hospital, and insufficient education of staff resulting in a lack of IP&C knowledge as reasons why IP&C was not practised. However, the main reason cited for IP&C in the hospital not being practised because of a lack of knowledge was differences in the cultural understanding of Western building infrastructure and beliefs about sickness transmission.

Prioritising resources and training for IP&C is necessary for hospital leaders (Barker et al., 2017), particularly in resource-constrained environments, as without a management strategy or leadership influence, IP&C has limited effectiveness or impact (Mamishi, Pourakbari, Teymuri, Babamahmoodi, & Mahmoudi, 2014). Accountability by hospital leaders for the service it provides was concerning for many participants, and this was carefully articulated under the guise of communication, awareness and financial constraints. The nurse educators felt that the hospital leaders were unaware of the 'everyday' workings at the ward level, and without a designated IP&C nurse, supervision of policy was lacking. This absence of awareness by leaders was seen as influencing IP&C practices. Improving awareness of IP&C issues also requires improved communication, and inadequate communication between levels of staff, due to hierarchical and cultural factors, also affected leaders' knowledge. Changing the culture of an organisation requires good leadership. Effecting cultural change for better IP&C is challenging given limited healthcare budgets and competing priorities for healthcare services (Huskins & Soule, 1998), so for the staff and community of AAH, to *know* and *practise* sound IP&C, the involvement and support of the hospital leadership team is required.

A lack of education for HCWs and unclear communication to the community also featured strongly as a reason why IP&C practices were not known. Evidence shows that despite their short-term effectiveness, the success of educational activities is limited unless reiterated frequently (Ataee, Ataee, Mehrabi Tavana, & Salesi, 2017). Inadequate formal and informal IP&C education (Marjardi & McLaws, 2010) that is not informed by transcultural approaches (Jones, Whitfield, Thomas, Gower, & Michael, 2014) are well-known barriers for effective IP&C program implementation. The health sphere is dominated by the English language, and the impact that language differences have on communication between HCWs and patients impedes health literacy (Vass et al., 2011). Language barriers in multi-lingual societies are a documented constraint when providing education in healthcare (Joshi et al., 2015), and the junior nurses corroborated this by admitting that when discussing a dirty toilet, some patients only spoke Kwaio and some nurses only spoke English or Pijin, thus hindering patient education around the toilet's use. When discussing signage to remind patients not to spit, the PA acknowledged that any current educational posters in the OPD are written in English, and with many patients only being able to read Pijin, or not read at all, these posters are of little use. Translating health information from one language to another can also be complicated because of the different conceptual meanings of health, and for cultures that communicate heavily through the spoken word, other forms of communication lack depth of meaning (Massey et al., 2015).

Health education messages written in English, placed in the busiest area of the hospital, reveal a lack of understanding/care by the hospital hierarchy towards their community. The theocratic and Western hospital management structure leans towards a lack of 'duty of care' towards its constituents, but with better understanding, health promotional posters could be translated into Pijin or Kwaio at a minimum. Heavily 'westernised' communication in LMICs is not the only reason why staff and patients do not know and therefore do not practise sound IP&C; unfamiliar infrastructure also contributes.

The built environment of AAH reflects a traditional colonial hospital, and the Western infrastructure, such as flushing toilets and designated rubbish bins, is foreign to many patients, particularly those that come from the mountain villages, making health literacy around Western systems lacking. Expected behaviours, such as flushing a toilet and placing rubbish in a plastic rubbish bin, are not realised by patients, leading to what could be deemed as non-compliance (Vass et al., 2011). Multiple participants identified that rubbish was the source of sickness transmission. Flies that landed on the rubbish and then landed on food, plates and even eyes of patients, producing 'worms', all caused sickness. The reason why there was so much rubbish *not* in rubbish bins was cited as a lack of resources (not enough bins) and human behaviour (carelessness); however, the maintenance

workers, an MLT and a family member further explained that people from the villages do not understand that rubbish can cause sickness transmission. The practice of burning and burying waste, and feeding food scraps to pigs or using as compost, means all rubbish in the villages is segregated and either has a purpose or is disposed of, mitigating the problem of flies and associated disease transmission. The MLT and maintenance worker described the rubbish situation as poor role modelling by the hospital as when rubbish is seen strewn around the hospital grounds, patients and family members assume that this is the proper place to put the rubbish.

The perception that patients and family members did not know about disease transmission and therefore did not practise good hygiene was also explained by the junior nurses, which demonstrated little insight in the junior nurses' understanding of the patients' knowledge systems. The common practice of wearing shoes, mainly a Western construct, was largely absent within the hospital grounds, and this was explained by the junior nurses as the reason why sickness was transmitted. The junior nurses, adamant that patients must wear '*slipper'* to prevent sickness transmission from the ground, explained that patients do not have good knowledge about sickness transmission, and that if they did, they would definitely wear shoes. The dichotomy between their local upbringing and biomedical education was challenging for the junior nurses when faced with the counter argument around the cultural norm of walking 'bare footed', and the lack of ownership of shoes. Without an understanding and acknowledgement of local cultural beliefs, customs and knowledge systems, IP&C messages provided to patients could be confusing and inappropriate (Quaresima et al., 2020).

6.5 Summary of Themes

The stories that inform the above four domains validate, yet in many ways challenge, the common rhetoric in the literature around IP&C barriers in LMICs. At AAH, IP&C and hospital hygiene knowledge gained through formal or informal education may or may not necessarily align with the germ theory of disease, yet IP&C and hygiene principles are still practised. Discussion around not practising IP&C shows that AAH does experience similar barriers to most LMICs; however, the dialogue also indicates that there are many other explanations as to why people do not undertake IP&C practice even though they have the knowledge to do so. It is these deep-seated, contextually relevant reasons described throughout this study that set this study apart from others.

6.6 How Does This Study Align With Existing Literature?

The background literature review for this study revealed that the implementation of sustainable evidence-based IP&C programs in resource-limited countries is fraught with barriers that are not experienced by Western nations. Common challenges include a lack of physical and financial resources, poor hospital infrastructure, low staff salaries, geographical isolation, and extremes of climate (Sparke et al., 2020). In addition, sociocultural influences, political instability, high costs of treatment, and antibiotic prescription habits make implementing robust IP&C programs in LMICs difficult (Raza et al., 2004). This study illustrates that AAH experiences barriers that prevent sound IP&C practice, similar to what is described in the literature, and on the surface, it would seem that the causes of inadequate IP&C practice at AAH echo the literature.

In this study, the domains of knowing and not practicing (subtheme 2b), and not practicing and not knowing (subtheme 2d), describe situations of human behaviour and power imbalance, a lack of knowledge by HCWs, and a lack of understanding by hospital management to explain why IP&C was not practised. Impediments including non-supportive infrastructure, consumable resource supply issues and financial constraints also contributed to reasons why IP&C was not practised at AAH despite knowing what should be done. Therefore, for AAH, the issues are very present and need to be addressed, and are similar challenges experienced globally.

Human behaviour as a reason for not undertaking correct IP&C practice featured broadly in participant interviews, correlating with much of the literature addressing IP&C in LMICs. In this study, personal and professional responsibility emerged as a contributing factor to non-compliance with IP&C measures, but also emerged as opportunities for improvement. Compliance with adhering to IP&C practices is often used to describe behaviour as compliance relates to attitude, which in turn affects behaviour (McGaw et al., 2012). Non-compliance in IP&C is related to organisation of staff and resources, the workplace environment including managerial and inter-professional relationships, the nursing care context, and individual nurse characteristics (McCauley, Kirwan, & Matthews, 2021). Careless and lazy co-workers, shifting the onus of accountability, non-supportive scheduling of essential work such as linen laundering, and power imbalances due to hierarchical position were all cited as aspects of human behaviour impeding IP&C practice at AAH.

Hospital hierarchies, particularly in culturally diverse settings, have also been cited as contributing to an increase in HAIs. Culturally based professional and social hierarchies, particularly in countries where ancillary staff are generally considered of lower social status

because of their lower level of education and social standing, have often been mentioned as contributing to inadequate IP&C practice (Hancart-Petitet et al., 2011). The experiences of the maintenance men, the cleaners and the junior nurses when describing their inability to effect change, particularly when they knew there was an IP&C breach, all supported the concern about the negative impact that professional hierarchies have on practice change (van Gulik et al., 2021). Not uncommonly, those at the bottom of the hospital hierarchy miss out on educational opportunities (Hancart-Petitet et al., 2011), and this was endorsed by participants at AAH citing a lack of education as a contributor to inadequate IP&C practice.

Endorsement and allocation of resources to build infection control knowledge and skills is imperative in resource-constrained environments (Barker et al., 2017). Participants in this study suggested that improving IP&C at AAH required more education for staff and the community in many areas including rubbish management, wearing of shoes to prevent sickness transmission, and the risks associated with spitting, recognising the need for and benefit of education and awareness. The WHO also endorses education and training as a core component of any health facility IP&C program (Maki & Zervos, 2021). With many studies describing educational paradigms as a means to improve IP&C implementation in LMICs, knowledge could be said to be key in improving practice. However, at AAH, many felt there was minimal support from hospital management in doing this and recognised that ancillary staff were excluded in IP&C educational activities.

Support for IP&C programs by hospital management is vital for their implementation success, and formally recognising the role of IP&C and staff responsibility for such is recommended in the literature (van Gulik et al., 2021). It was felt by some participants that accountability for and acknowledgement of IP&C policy was missing at AAH, and this was cited as an influencing factor for not practising IP&C. Governance of IP&C at AAH was eroded when the IP&C nurse moved to the neighbouring PIC of Vanuatu and, at the time of this study, had not been replaced, a factor that was not lost on participants. Accountability for local IP&C policy is only possible through a multidisciplinary IP&C committee, with membership from all facets of the hospital and community, and importantly an IP&C nurse (Harries et al., 2010). The MLT stated that the problem of rubbish around the hospital building and hospital grounds was due to poor role modelling by hospital leadership. The general lack of awareness of the everyday workings at the ward level within the hospital, as cited by the nurse educators, and inappropriate health promotional messaging in the OPD, mentioned by the PA, were also perceived as a management structure lacking in IP&C governance, attesting to the literature.

Poorly maintained infrastructure can also be indicative of a lack of commitment for IP&C by hospital leadership. As in many LMICs, infrastructure at AAH does not support the

requirements of the health service, and the broken TB fume cabinet poignantly illustrated this. At AAH, the MLT reverted to his underlying Christian beliefs to reconcile the fact that the fume cabinet is not working and TB infection may be the outcome. The situation at AAH reflects the situation in many LMICs where the maintenance of mechanical ventilation systems for pathology and diagnostic services is costly, and laboratory conditions and safety procedures are inadequate, resulting in sub-optimal performance and practice (Harries et al., 2010). Interestingly, the WHO recognises more broadly that engineering and personal controls are insufficient in LMICs, and recommends the prioritisation of solid administrative controls to help prevent the spread of airborne diseases in these settings (Maki & Zervos, 2021).

Consumable resource supply issues at AAH were best illustrated by the lack of soap and ABHR, thus impeding hand hygiene opportunities. This is consistent with the literature where insufficient numbers of sinks, difficult access to hygiene products and behavioural aspects all contribute to hand hygiene non-compliance (Alp, Leblebicioglu, Doganay, & Voss, 2011). The practice of hand hygiene was often discussed by participants describing 'moments' when staff would undertake hand hygiene; however, the PA explained that there was no soap because it was not sent to Atoifi by the central store as ordered. Thus, with little or no soap and little ABHR available, it was clear that despite saying they did or would do it, hand hygiene was not actually done. This is not an infrequent finding in LMICs where the knowledge and rhetoric is there but, because of inadequate resources, does not translate into common practice (Sethi et al., 2012).

It is well recognised in the literature that to establish successful IP&C programs, which include effective IP&C infrastructure, financial support is required (Alp & Damani, 2015). Financial constraints at AAH were described through a need for improved infrastructure, such as purchasing more rubbish bins and hand towels and repairing the broken TB fume cabinet. Participants who expressed the need for improvements in infrastructure all admitted that the hospital did not have enough money. Providing supportive infrastructure and increasing the supply of consumable resources through increased funding will only work, however, if good governance exists and hospital leadership recognise the importance of a robust IP&C program.

It is clear that IP&C practice at AAH is markedly affected by the same trials facing other LMICs, but there is much more to this story. If one were to leave the story here, then solutions to IP&C practice improvement at AAH would also echo the literature. Strategies such as improving educational opportunities, more robust governance activities, utilising a 'systems' approach, and responding to consumer expectations could be adopted by AAH to improve their IP&C practice (Sparke et al., 2020) and they may partially work. However,

the strength of this study is in its resolute message—without consideration of contextually significant social, cultural (including workplace) and spiritual influences on how people believe and respond to disease transmission, and how this influences IP&C practice, there will always only be limited solutions.

6.7 Why Is This Study Different?

As alluded to throughout this thesis, many studies describe the IP&C knowledge–practice link as scientific and assume that all countries will adopt the science and be able to support, both physically and philosophically, the essential tenets. However, these studies are unable to explain the underpinnings behind the barriers and enablers for practice. Markos et al. (2021) assessed IP&C process knowledge and associated practice compliance in a hospital in Ethiopia, and while the authors quantified the difference between those with and without a positive link between knowledge and practice, they could only make assumptions about the discrepancies between the two. Similarly, a cross-sectional survey by Desta et al. (2018) also described IP&C knowledge–practice links; however, as with Markos et al. (2021), the authors could only postulate about the link between knowledge and practice through statistical associations, not through participant experiences.

What sets this study apart from the others is the stories told of the contextually specific influences of a strong societal culture, a workplace culture made complex by kinship rules, a theocratic governance structure, and a mix of Christian and ancestral spiritual beliefs, which all affect IP&C practice at AAH. The complex web of these influences that affect HCW IP&C knowledge and practice is not currently described in the literature. The existing literature is not wrong, however—it is just not enough. The ability of Photovoice to evoke a deeper engagement with issues that are central to people's lives (Bisung, Elliott, Abudho, Schuster-Wallace, & Karanja, 2015) enabled participants to describe deeper situational factors that heavily influence their IP&C practice.

Giving participants the opportunity to reveal their own experiences, knowledge and practice through Photovoice (Badanta, Acevedo-Aguilera, Lucchetti, & de Diego-Cordero, 2021) has enabled participants to 'tell a story' about what they know and how they know it, and why they practise sound IP&C. Importantly, Photovoice has allowed participants who do not have biomedical education, and who do not speak the dominant language, an opportunity to articulate this, something that is missing in much of the literature. Non-health professionals, such as cleaners, laundry staff and maintenance staff, are vital in maintaining hospital infrastructure and hygiene and are essential for a working IP&C program, yet are often missed in research surveys. Oluwagbemiga, Akinsete, Ana and Ogunseye (2021) only

surveyed doctors, nurses and health assistants when investigating knowledge, attitude and self-reported practice of infection control in a hospital in Nigeria, and Desta et al. (2018) also excluded ancillary staff in a similar Ethiopian-based study. Interestingly, none of the studies that surveyed only trained health professionals, and excluded ancillary staff, cited this as a limitation, indicating the perceived low level of importance of this group of workers.

IP&C practices were revealed through Photovoice from multiple understandings, and one photo held multiple meanings, which only enriched the data. A photograph taken by the cleaners about a broken toilet not only told the story of how sickness was passed on, but also exposed the IP&C challenges it represented. A lack of physical resources to fix infrastructure, a lack of governance by the hospital to follow maintenance requests through, and a lack of knowledge by the local villagers on how to use a Western toilet were all discussed as contributing barriers to providing optimal IP&C practice. On the surface, 'The potato and the rats' told a story about staff contracting diarrhoea from unrefrigerated cooked potatoes. However, scratching through the layers revealed the essential and important story, which was really about the inability of the PA to refuse to give out medications demanded by her colleagues because of cultural obligations, resulting in a shortage of medications for patients. Thus, from an IP&C perspective, the practice of using non-prescribed medications raises the potential for antibiotic mismanagement and increased antibiotic resistance.

Using Photovoice as a data collection method has shown that the causes of IP&C non-compliance at AAH are not as straightforward as what they appear. Yes, there are financial constraints, and yes, there are resource and governance issues, but the answer is not as simple as providing the hospital with money or extra resources; nor is it as simple as appointing a new IP&C nurse. What Photovoice has shown is that the solutions are complex, and to improve IP&C practice at AAH, overlaying a Western IP&C model by itself will not work.

6.8 What Does This Mean for Improving Infection Prevention and Control?

The answer to improving IP&C at AAH and overcoming the challenges discussed in the literature review is not straightforward, and while it would be nice to offer a straightforward strategy, doing this would show not only ignorance regarding culturally and spiritually diverse communities globally, but disrespect for this research. The PAR process invites participants and co-researchers to solve their own problems, and accordingly, three 'telling' photographs have been chosen that describe the reality of life at AAH.

When eliciting opportunities to improve IP&C practices, participants broadly described three notions. The first was tangible or 'concrete' requirements, such as improved

infrastructure and improved human, financial and consumable resources, and this represented *what* needs to change to enhance IP&C practices at AAH. The second notion represented the more intangible requirements representing *how* things can change to enhance IP&C practices at AAH, such as greater personal and professional responsibility, including a sense of moral engagement, making others accountable for their actions, and working together to improve processes. A more robust IP&C leadership and governance structure made up the third and also represented the *how*. Improved processes and policy; better leadership and role modelling; increased education of staff (as well as inclusivity of *all* staff); education for the patients, guardians, community and family members; and more effective and appropriate communication were all discussed. While these notions or themes naturally surfaced from the data, a solution cannot be singled out to one theme alone. Most suggested improvements initially appeared monothematic; however, further analysis showed that they are complex and are inherently linked to at least two, if not all three, themes, and within these linkages, are complex relationships. Interestingly, this was picked up by some participants. Many participants spoke about the tangible and intangible solutions as being separate entities, not linking the 'what' and 'how', but some participants were able to weave the two and provide practical and pragmatic solutions to solve some specific contextual issues.

6.8.1 Same Hand Towel, More Hands, More Infection

The hand towel (Chapter 5; Part A, Figure 3) represented more than just a shortage of resources to the senior nurses, nurse educators and MLT; it represented unsupportive infrastructure and a need for greater professional accountability and better governance. Unsupportive infrastructure has been well documented as influencing IP&C practices in LMICs (Marme, 2018), particularly around hand hygiene compliance (Allegranzi & Pittet, 2009; Alp et al., 2011). The hand towel hanging on dusty window louvers had not been replaced for a long time, so the towel could act as not only a fomite for potential hand-to-hand transmission, but also a source of environmental germs. Improvement around infrastructure included a proper towel rail and proper hand basin, more towels (so they could be changed more frequently), and alternatives such as paper hand towels or air hand dryers. In a resource-rich healthcare environment, these would be sensible and perhaps obvious solutions. However, as articulated throughout this thesis, challenges in obtaining consumable resources, and challenges with infrastructure such as an unreliable power supply, make these suggestions untenable. Some participants linked *what* and *how* and acknowledged that leadership and governance approaches could mitigate the need for a change in infrastructure. Altering the laundering schedule so hand towels could be washed more frequently, and better communication between the leaders of the hospital and staff to

bring attention to the issue, were offered as other possibilities. Appointing a new infection control officer was also recommended so staff could be educated on the importance of hand hygiene. However, from an 'outsider' perspective, I observed that the reason the towel was not changed is that no-one washed their hands, and therefore, no-one saw the need to change the towel. Indifference in attitudes towards self-protection influences compliance with hand hygiene (Oluwagbemiga et al., 2021), and it was only the senior nurses who made this connection and put forward the most telling solution, a change of mind set.

Changing mind set is not easy, however. Hand cleansing patterns are behavioural and are probably established early in life (Allegranzi et al., 2009; Alp et al., 2011), and are also heavily influenced by culture and religion (Ataee et al., 2017). Given the cultural practices of hygiene (after going to the toilet) as described by the PA, the unavailability of soap and ABHR, the unfamiliarity with Western hospital infrastructure, and the variety of belief systems around sickness causation and transmission, it could be assumed that the behavioural practice of hand hygiene, as understood from a biomedical realm, is not inherent in the Solomon Islands culture. Changing habits, even in perfect circumstances, is not necessarily going to work. The acceptance of substandard practice has been termed 'deprivation mentality'. The continual scarcity of resources becomes habitual, so even when circumstances change, old habits remain (Marjardi & McLaws, 2010). This notion has been disputed, however. It has been argued that HCWs who receive supplies of soap have higher odds of practising prevention activities (Desta et al., 2018). Nonetheless, maintaining patient safety is largely recognised as being driven by behaviour rather than knowledge, training or supply availability (Barker et al., 2017; Bedoya et al., 2017). If hand hygiene practice is not inherent, and staff are used to 'doing without', no amount of infrastructural improvement, work routine changes and increased resources will ultimately lead to a more frequent towel change because staff will still not wash their hands.

6.8.2 The Story of the Rubbish

Rubbish (Figure 11) as a cause of sickness transmission was multifactorial. Flies transmit germs from rubbish into the kitchen; the smell of rotting rubbish makes people sick; water collecting in empty cans creates a breeding ground for malaria-ridden mosquitos, and when the rubbish is burned, the smoke breaks ancestral law for the people of the mountains, thus delaying their presentation to hospital until they are very sick. Management of hospital waste is not just a problem for AAH, but is a global problem, and more so in LMICs where proper disposal norms are not followed (Joshi et al., 2015). The generation of hospital waste has mushroomed in recent years because of increasing populations and health facilities (Mbongwe, Mmereki, & Magashula, 2008), and the increased use of disposable medical consumables, yet resource-limited countries are constrained when managing hospital

waste (Ali, Wang, Chaudhry, & Geng, 2017). Approximately 10–25% waste generated by hospitals is considered hazardous and should be treated and disposed of as such; however, poor practices can result in the mixing of hazardous waste with general waste, exacerbating the problem of correct disposal and increasing the potential environmental and occupational health risks (Ali et al., 2017).

In resource-limited settings, managing waste is not considered a core part of health facilities' IP&C governance (Mbongwe et al., 2008), and at AAH, this was no different. Poor role modelling by the hospital around waste management was cited by many participants, and solutions included increased staffing to manage the rubbish, education of the hospital leaders on the effect rubbish has on patients and family members, cleaning up the rubbish piles, and improving infrastructure.

Improving infrastructure included more bins and new bins with lids and finding a new site to build a rubbish pit; however, it was acknowledged that the hospital had no money for this. Emptying the rubbish more frequently was suggested by a number of participants, which on the surface appears straightforward, but once again, the complexity of their circumstances makes this suggestion convoluted. If the barge arrives on rubbish day, the priority for the maintenance men, including the groundsman, is to empty the barge, so collecting the rubbish is delayed. The rubbish bins are heavy by this stage and are unable to be wheeled along the path to the pit, so the tractor is needed to carry the bins. This is problematic as the groundsman, whose role it is to empty the bins, cannot drive the tractor and therefore relies on his co-workers, and further to this, the track to the pit is not wide enough for the tractor. Confounding these difficulties is that there is little flat ground to dig a new pit, except by the road to the airstrip, which is unacceptable for the people of the mountains. The rubbish may contain female bodily fluids; therefore, to walk in the vicinity of the rubbish breaks ancestral rules, which may result in sickness or hardship for the people of the mountains. Therefore, the people from the mountains must provide a sacrificial offering to their ancestors, often in the form of a pig, yet pigs are expensive. Ultimately, the rubbish ends up in the mangroves, creating an environmental health risk.

An MLT provided the most innovative and proactive solution, that of introducing 'rubbish days' and 'rubbish champions'. Implementing change through change champions is not a new concept. Jones et al. (2014) capacity-built nurses to act as change champions to promote and encourage IP&C improvement and change across hospitals in Tanzania. More recently, the concept of training 'lead change agents' was used not just to improve IP&C practices, but to influence other staff practices to lead change through a participatory approach (Zocher et al., 2019). Both authors do recognise, however, that the success of

'change champions' requires ongoing support, but if successful, the concept could provide an avenue for sustainability.

6.8.3 Spit on the Floor in Outpatients Department

Spit on the floor in the OPD (Figure 14) uncovers a multitude of factors, which makes providing a simple solution complicated. The door to the pharmacy opens out into the OPD corridor, and the PA was concerned for herself and the patients about the spit on the linoleum floor and its association with the spread of disease. The maintenance men and a cook were also concerned about spit on the floor and the spread of disease, particularly for crawling babies. Diseases of concern for the PA were influenza and hepatitis B, and for all participants, TB. The OPD, similar to an emergency department, is where patients first present when they are sick, or when being followed up for treatment for a pre-existing illness, previous surgery or wound care. Given the hesitancy of the mountain people to present to hospital until extremely ill because of their conflicting beliefs with the built environment, it could be assumed that the OPD has one of the highest risks for disease transmission, particularly TB. However, a cleaner was not allocated to this area.

While the conversation centred around IP&C strategies for improvement, it was stated that the floor of the OPD was the only place that the cleaners did not clean; the priority for the cleaners was not to clean the OPD, but to instead clean the offices of the hospital management. It was also disclosed that it was the nurses' role to mop the floor; however, it did not always happen because the nurses were often tired at the end of the day, so the PA felt it was her duty to mop.

This reinforces the hierarchical and theocratic structure of the hospital, and the compliance with positions of power, which overrides protocols and practice (Marjardi & McLaws, 2010), and also reiterates the lack of understanding by management of the importance of IP&C. While the PA recognised that a dedicated cleaner for the pharmacy and OPD would be a solution, she also said the hospital did not have the labour force for cleaning.

Spitting as a norm in the Solomon Islands was recognised by the PA, yet she still acknowledged that the practice was not good. Optimally, all participants agreed that patients should not spit; however, spitting is practised in many cultures for reasons related to their health (Flaskerud, 2013). Spitting for the sake of ridding oneself of disease has historical beginnings and is still practised today for the same reasons. In countries such as China, spitting is associated with phlegm and disease expectoration, and during major events such as the 2008 Olympics, officials had to curtail spitting and provide alternative solutions such as special spit bags (Flaskerud, 2013). Interestingly, a conversation with the

X-ray technician revealed an almost exact duplication of Flaskerud's discussion. When asked why people in the Solomon Islands spit, he said when people felt a cold coming on, or they smelled something rotten, they would spit to rid themselves of the disease or potential disease associated with the smell. Thus, telling people not to spit was in essence opposing their own beliefs about self-healing techniques.

Apart from telling people not to spit, solutions to the problem of spitting included rubbing the spit into the dirt with their feet (a common practice in the natural environment) or offering a spit bowl. Because of the linoleum floor covering, the first solution was impractical, and while the second solution had merit, it had potential cultural implications. For cultures where overt spitting has the purpose of clearing the lungs and sinuses and expectorating disease, unlike in many Western cultures, they do not carry handkerchiefs or tissues, and in fact many find the habit of carrying a spit-laden handkerchief in their hands disgusting and dirty (Flaskerud, 2013). Given the norm of spitting in the Solomon Islands, providing a spit bowl to prevent spit on the floor is likely to cause disgust among patients and therefore reduce compliance.

6.9 Summary

Solutions to improving IP&C practice at AAH are complex. On the one hand, I suspect that the solutions provided by participants were ones that they thought I wanted to hear. However, their reality was expressed from an 'insider' perspective. Most participants had never worked in other hospitals, and many had never received any formal IP&C training. This meant that many had not seen alternative ways of approaching IP&C issues or other models of contextually suitable answers. A transformation needs to occur, for both the hospital community and experienced IP&C practitioners. Transforming the way a hospital community thinks about developing and implementing IP&C practices that suit their own environment is required. For both parties, removing the westernised model of IP&C is not the answer, but building cultural and spiritual circumstances into the westernised model, and better understanding pragmatic and doable solutions within a particular setting, will progress IP&C program success.

6.10 A Model for Infection Prevention and Control in Low- and Middle-Income Countries for the Future

The complexity of influencing factors on IP&C in culturally, spiritually and linguistically diverse settings makes solely implementing a Western-based IP&C program not practicable in these settings. Even across these settings, a 'one-size-fits-all' approach will not work because of the different cultures and beliefs of different populations. What may work,

however, is an overall blueprint that provides the structural foundations that need to be considered for IP&C program development and implementation. This blueprint needs to reflect the existing understanding of biomedical principles and their application to IP&C practice within a particular setting. Specific societal and workplace culture and spiritual beliefs need to be integrated into the biomedical beliefs to not replace them, but to support their relevance. For AAH, this blueprint is succinctly illustrated in the following model (Figure 16). The four really important and contextually relevant factors that influence sickness transmission knowledge and beliefs, IP&C practice and opportunities for improvement emerged through the PAR process, and taking these into consideration helps interpret the model that could underpin successful IP&C programs in LMICs in the future.

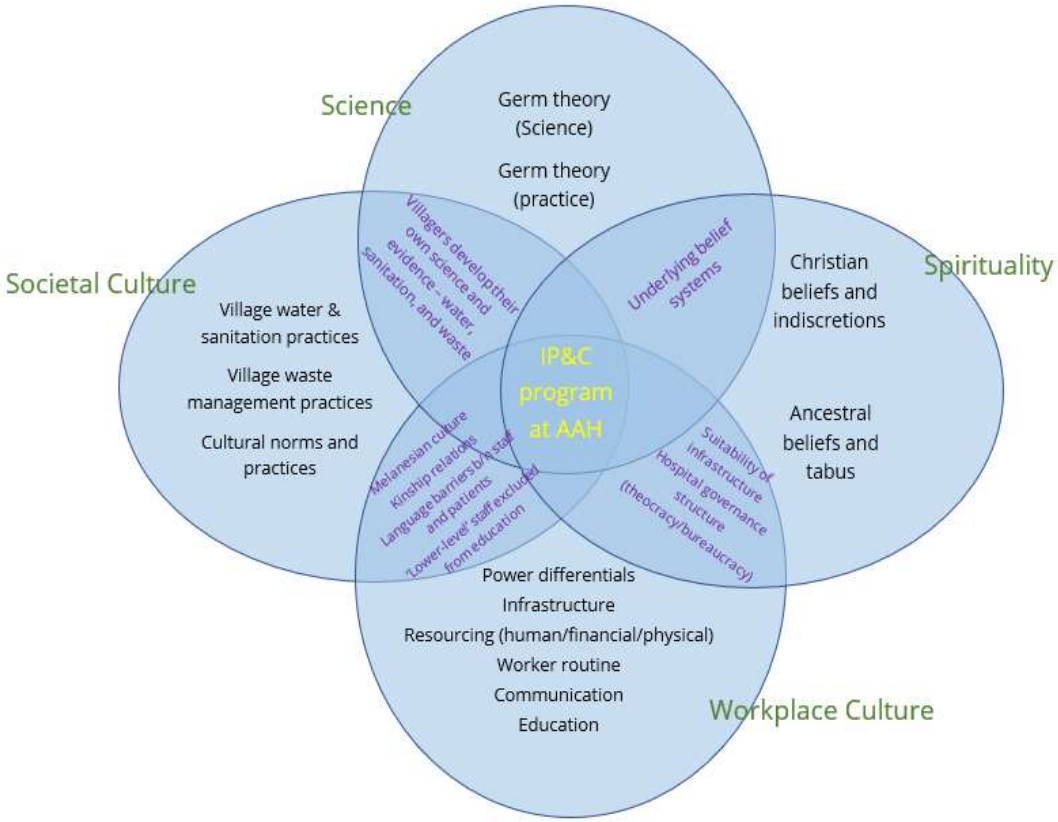

Figure 16: A model for IP&C program development for the future

6.11 Future Research Is Needed

Initially included in the design of this study was the co-design of interventions to improve IP&C and an assessment of their impact on practice. However, two factors changed the course of this study. First was the size of the study. Phase 1 and phase 2

produced a large amount of rich data, which was sufficient for this thesis. Second was the global COVID-19 pandemic. The abrupt halt on international travel meant that visiting AAH became impossible, and with unreliable internet connection and COVID-19 preparedness taking priority, developing co-designed interventions based on the findings was not plausible.

While the participants were given the opportunity to provide solutions to improve IP&C practice at AAH during the two phases of this study, some of the solutions demonstrated a lack of insight into their own reality. It can be difficult for an insider researcher (the co-researchers) to view their world from the outside; however, as an 'in-between' researcher, I can see both perspectives. Some solutions (such as wearing shoes to prevent disease transmission) were not plausible as most community members did not own shoes. Likewise, expecting people not to spit was unrealistic.

Developing and assessing co-designed interventions is the next step in this journey. Co-designing interventions informed not only by the science of IP&C, but also by the forces of workplace culture, society culture and spirituality, needs to be done to complete the PAR cycle. Once the cycle is complete at AAH, the model then needs to be implemented in another context because, as previously discussed, even within LMICs, this will not be a one-size-fits-all approach and will need to be adapted to suit different settings.

6.12 Ensuring Research Quality

The quality of qualitative research is founded in its epistemology, methodology and methods (Carter & Little, 2007). Additionally, the primary rule for the quality of action research is for the researcher to carefully consider their choices around methodology and methods, and the consequences (Bradbury & Reason, 2003). Good action research will:

- be both aimed at and grounded in the world of practice
- be explicitly and actively participative—research for, with and by people rather than on people
- draw on a wide range of knowing
- address questions that are of significance
- aim to leave some lasting capacity among those involved (Bradbury & Reason, 2003, p. 171).

While this thesis does not address all of the above points equally, careful consideration of the methodological process was taken into consideration to ensure that in some way, they were met.

When considering the methodology, as a researcher, I had to consider and change my epistemological position. As an IP&C 'expert' grounded in the science of the germ theory, I knew from the outset that investigating ways to improve IP&C practices in this culturally and spiritually diverse context was not going to work using a Western-based model; it would completely constrain the research (Carter & Little, 2007). As an initial outsider researcher, the only way there was any chance of success was for me to change my epistemological stance on how people perceived sickness causation and transmission, and be open to alternative worldviews.

The methodological framework was informed by the change in my own epistemology. Realising that a transformation in thought and practice was required for both myself as an IP&C expert and the staff of AAH, with the aim of generating new knowledge (Cordeiro et al., 2017), led to the choice of a transformative worldview, seen through a ToC lens, and this is described in Chapter 4. A PAR approach to the study was the natural choice. As a community-based action research methodology, PAR is inclusive because participants become co-researchers throughout the research process; therefore, research was undertaken *with*, rather than *on*, the community. Photovoice as a data collection method encouraged participants and co-researchers to voice their own epistemologies about disease causation and transmission and provided a richness of data (discussed in Chapter 5), which in turn validated my own change in 'ways of knowing'.

The quality of qualitative research does not only rely on epistemology, methodology and methods suiting the area of inquiry, but the research must be trustworthy—that is, it must demonstrate rigour. Components of rigour include validity, reliability and generalisability (Morse, 2015).

Validity, that is, the research being sound, just and well-founded and therefore credible (Polit & Beck, 2012), is demonstrated by persistent observation; thick, rich description; peer review or debriefing; clarifying of researcher bias; member checking; and triangulation (Morse, 2015). This thesis centres around the richness of the data that the Photovoice method produced. The quality of the data obtained across the entire data set showed a variation of responses determined by the participants and co-researchers individual epistemologies, and this made the analysis complex and unpredictable. As this was a PhD study, my advisors provided peer review and debriefing, particularly as one advisor is a veteran of East Kwaio research, and helped enable some semblance of order within the complex findings.

Despite the complex nature of the data collection process and subsequent analysis, member validation, or participant checking, and triangulation (Twining, Heller, Nussbaum,

& Tsai, 2017) were still possible. During phase 2 of the data collection, the participant photographs were presented back to the participants, along with their interview transcripts (Chapter 4), to verify the correctness of phase 1 interviews. Data triangulation (Chapter 5) was achieved though the analysis of interview transcripts against diary notes, but more importantly through different participants' perceptions of the same photo. Consistencies in stories or similar perceptions by different participants of the same photograph removed any potential interpretations or bias that I might have invented (Polit & Beck, 2012), thus reflecting the participants' voice, not mine, as a researcher.

6.13 Ethical Considerations

Many ethical considerations were made throughout this study. First was gaining ethical approval and support from the Solomon Islands Health Research and Ethics Review Board, James Cook University and AAH. Copies of these approvals are included as Appendixes A, B and C. The second was using photography as a data collection method. Participant and co-researcher consent was gained in writing prior to data collection; however, consent to be photographed by patients and other staff was not. Careful instruction addressing this was required prior to giving the cameras to participants, which is described in Chapter 4.

A criticism of Photovoice is around the returning of photos to participants, giving of the cameras, and more importantly enabling positive outcomes from the results. As discussed previously, this study originally included co-designing of solutions; however, the global COVID-19 pandemic made returning to Atoifi to discuss the results and co-design solutions impossible and inappropriate. Additionally, the amount and depth of the already collected data make the current study sizeable, and to add another layer would take considerable time, risking co-researchers' disconnect with the study.

When international borders open, photographs and cameras will be taken to Atoifi along with a copy of this thesis, and in-roads will be made to co-design contextually relevant and pragmatic solutions for their IP&C processes.

6.14 Limitations

This study has several limitations. My cultural identity of being a white Australian woman undertaking research in a post-colonial setting might have affected the responses and attitudes of participants. This raised my consciousness when the ladies who worked in the laundry chose not to participate. They felt they were often being studied, yet always with no practical outcomes. I mitigated this limitation to the best of my ability, and throughout this thesis, I discussed moments of trust-building, which enhanced the connection between

myself and the co-researchers, participants and community of Atoifi. Previously developed research links between my advisor, David MacLaren, and the staff and community of Atoifi also helped mitigate this limitation.

A second limitation was my expertise in IP&C in a Western context. There was the potential to only explore the biomedical premise of their practice and not move outside that realm. To do this would reduce the richness of the data produced and not fully explore the depth of the 'causes'. This was mitigated with careful advice from my supervisors. They eloquently told me that in this type of research methodology, IP&C is really only the 'vehicle', and it is the process of finding an outcome that is important. With this in mind, I used my expertise only to probe deeper with interview questions rather than to guide the interview.

Finally, and as mentioned in the above section, the results only reflect the experience of one group of people in one hospital in one country, and are therefore not reflective of the whole of the Solomon Islands; nor are they reflective of other PICs. Action research is inherently dynamic and therefore much harder to generalise than quantitative work (Bradbury & Reason, 2003); therefore, further utilisation of the model is needed to ascertain its applicability in other settings.

6.15 Chapter Summary

This chapter has discussed the forces of science, societal culture, workplace culture and spirituality, which influence sickness transmission beliefs and subsequent IP&C practice. These forces are not mutually exclusive as one force does not singularly affect one person's belief or practice; instead, they are overlapping and portray the complexity of the hospital, and of the overarching society. Using the photographs and forces as central discussion points provided the narrative of not only how sickness transmission is believed to occur, but also the complex, and scarcely documented barriers that inhibit Western-based IP&C practice at the hospital. This study proves that 'plonking' a Western-built IP&C program will not work in a culturally and spiritually diverse setting unless governments, healthcare settings and IP&C personnel change the way we think. For AAH, consideration of these forces into opportunities for improvement may be a way forward in reducing HAIs to an irreducible minimum. IP&C programs within hospitals need to consider this when implementing IP&C activities if there is going to be any chance of success.

Chapter 7 Conclusion and Recommendations

7.1 Chapter Outline

The concluding chapter of this thesis provides an overview of the doctoral thesis, from inception through to end. Key phases are highlighted, and importantly, my learnings are revealed , not just about my own axiology in relation to research, but also about the different epistemologies that underpin infection control practice in culturally, spiritually and linguistically diverse countries. Recommendations for IP&C in LMICs, based on the study findings, are presented, as well as a proposal to help inform others implementing IP&C programs in countries where culture and spirituality need to be understood alongside the Western basis for disease causation and transmission.

7.2 The Beginning—An Accidental PhD

This PhD study started accidentally, but opportunistically. I had not planned to undertake a PhD in a remote location in a foreign country, and despite my background in infection control, I had not necessarily planned to make infection control my study centrepiece. Realistically, in this research, it is not. It is merely a vehicle to understanding richness and diversity within our shared world. I took the opportunity to assist a remote hospital in the Solomon Islands improve their infection control standards, and realised not only that I could not do it myself, but why should I? I was an outsider with very little true understanding of what was needed, armed with a myopic biomedical model of IP&C implementation. Very little that I recommended could be successfully implemented. I could not have that resting on my conscience. It was at that point I knew the only way it could be done was for them to tell me what is practicable and doable, and I then could try and think of alternate solutions. This was not going to be a ‘one visit wonder’; this was going to take time, and work—so why not make it a PhD?

Western-based IP&C programs in LMICs continue to fail, and this is evidenced by perpetually high HAI rates in these countries. Disease burdens in these settings are attributed to changing climatic conditions, geographical distances from healthcare, poorly resourced health facilities and poorly governed health service structures, challenging political climates, and low socioeconomic situations. While solutions have been studied and proposed, most target the very barriers that contribute to poor health outcomes, but without realising that while improvements may be achieved in the short term, ultimately the barriers remain in place. Increasing education around IP&C, ensuring strong governance structures,

improving healthcare systems and involving consumers have all been touted as workable solutions; however, HAI rates remain high.

IP&C programs designed for Western health systems and based on the biomedical model of disease, or 'germ theory', fail to acknowledge that people from different cultures have different understandings and beliefs around what causes sickness, and how sickness transmits. Yet these programs are continually 'inserted' into culturally and spiritually diverse settings. No wonder they fail!

Literature is available that discusses the influence that non-Western culture has on components of IP&C; however, these are largely reviews or studies that target only one or two specific aspects of IP&C programming. To find workable and practical solutions to improving IP&C in culturally diverse and resource-limited settings, an in-depth study that involves participation of those that are directly affected and who know and understand their own context is required. There is little in the literature that fits this remit, and this is the first study of this type based in the Solomon Islands. My aim was to work with the staff and community of AAH to help them improve their IP&C practices, but by doing things their way, not the Western way.

Prior to commencement of the study, it was important that a discussion was had between myself and the DON as I needed to ask and gain her permission. It was the DON who initially requested assistance to improve IP&C at AAH, recognising that they did not have the expertise to do this themselves. It was also the DON who accepted my offer of assistance (prior to commencing the study) and enabled my first visit to AAH to audit their facility. I considered my worldview early in the process as this influenced the methodology and methods chosen, and it was important to relay this to the DON. I did not want to be another 'white' outsider researcher placing my stamp on their facility. For this study to have any success, I needed them to participate and tell me their story so I could try to understand their viewpoints and beliefs.

PAR was the natural choice for the methodological approach. PAR is a decolonising research methodology that uses qualitative inquiry and enables a way to move forward for co-researchers in the area of study. With a transformative worldview that is change oriented and seeks to advance social justice, seen through a 'theory of change' theoretical lens, I needed to first understand what the staff of AAH knew about the concept and practice of IP&C, and for them to articulate solutions. Advancement for IP&C at AAH could only occur if the staff are able to utilise the knowledge systems they have, and integrate the practices within the culture norms in which they live. Enforcing a Western biomedical model and

Western healthcare culture would only add to the social injustices and the colonising nature of global healthcare.

7.3 The Enlightening and Meandering Journey

Success relied on building trust and developing and maintaining relationships throughout the research process. The relative short timeframe for data collection (3 weeks for phase 1 and 2 weeks for phase 2) meant that trust had to be built quickly to ensure optimal use of my time, and to help mitigate the burden of participation. Visiting and auditing AAH prior to the commencement of the study provided opportunity to commence relationship-building, which was enhanced when a local East Kwaio woman, Dorothy, wanted to work with me as an employed RA for both phases of data collection. Not only is Dorothy well respected; she is an educated woman who understands, speaks, and can write in three languages. Dorothy's skillset enabled facilitation and translation of the interviews, and transcription of the audio recordings, accurately, and importantly maintained the true meaning of the words spoken. Our relationship developed from one founded in research to a friendship. Together, as we printed and laminated photos, she helped me further understand the culture of East Kwaio and the Solomon Islands. Dorothy formed a cultural 'bridge' between me as a 'white woman researcher', the staff and community of AAH, and also more broadly with the community. The relationship-building and increased depth of cultural knowledge helped me acknowledge a greater level of respect and reciprocity while maintaining a reflexive stance. Without this relationship and trust, the whole process of data collection, from first disseminating the cameras through to translating and transcribing interviews, would not have travelled as smoothly as it did.

The study ensued in two phases. Photovoice data collection followed by interviews formed the first phase, and Photo-elicitation the second. During the Photovoice phase, participants disclosed their beliefs around sickness causation and transmission, and identified IP&C practices in the hospital. During this phase, participants were also provided the opportunity to discuss ideas and areas for improvement. Phase 2 involved participants choosing and discussing photos taken by others. This process provided an additional depth as multiple perceptions of other participants' photos were revealed. Discussions during this phase centred around two questions: 'How does the photo depict sickness transmission?' and 'What are the solutions?'

Data generated through interviews from both phases, including interview transcripts, written interview notes, diary notes and photographs, were analysed using qualitative analysis software. Coding and analysis were made complex because of the multiple perspectives of sickness transmission beliefs and views on IP&C practices generated in the

course of discussion. What became obvious was that using Photovoice as a data collection method enabled a depth of discussion that I, with my biomedical IP&C worldview, could not foresee.

A biomedical educational background did not necessarily mean participants translated this knowledge into practice, particularly if a situation allowed their underlying spiritual belief systems to prevail. What also became apparent is despite a lack of biomedical education, most participants understood that 'something' caused sickness transmission. Therefore, hygiene principles were employed based on what they learned from others and, importantly, their social and cultural practices used in everyday life.

Developing trust through relationship-building allowed participants to discuss their feelings about their role in the hospital. This exposed the effect the hierarchical management structure had on participants' ability to act on IP&C breaches. Hierarchy combined with the theocratic governance structure, which in turn is combined with Melanesian culture, resulted in a workplace complexity that as an outsider, I could see, but because of their ontological perspective, most participants could not. This complex workplace culture directly influenced IP&C practice at AAH.

7.4 An Ending of a PhD Journey, but the Beginning of Many New Ones

At the beginning of this journey, my aim was to help staff at AAH improve their IP&C practices. Did I achieve this? The answer is yes, and no. PAR is a continuous feedback cycle, one where positive outcomes are a part of the process, not just the end result. Many positive outcomes for AAH occurred throughout the study period. Providing interview feedback to the Chief Executive Officer (a co-researcher) following the first round of data collection enabled open discussion about the problem of the rubbish and the disintegrating 44-gallon 'incinerator' drums. This discussion resulted in the sharing of WHO resources (incinerator building designs for resource-limited settings), which gave rise to a new incinerator and sharps pit. A second positive outcome occurred as a result of inviting my co-researchers and other AAH staff to my pre-completion seminar. Speaking to a staff member the following week, the staff member (not a participant or co-researcher in this study) told me that before watching my presentation, she had not realised there were so many issues at the hospital. More importantly, she explained that prior to my presentation, she did not 'see' that staff at the hospital were so influenced by their lived reality, and that my study opened her eyes. I had suspected this, but to hear it spoken by a senior staff member was 'music to my ears', and I knew the feedback cycle of PAR in my study was working.

While the PhD is over, this study is not, which is why the answer is also ‘no’. The spiritual beliefs and cultural practices held by the people who live in and around AAH heavily influence people’s beliefs, including staff, around sickness causation and transmission, and these may or may not align with germ theory. This sets the foundational reason why a biomedical model of IP&C will not work in this setting. This study revealed four domains that describe IP&C practice, including those that know about correct IP&C principles but may or may not observe the practice, and those that undertake correct practice but may or may not know why. The easy option would be to adopt ‘Western’ IP&C improvement models, described in much of the literature. However, the influencing and intersecting forces of science, spirituality, societal culture and workplace culture, which affect the four domains greatly, combined with the well-documented barriers that healthcare facilities in LMICs face, mean that a Western model will simply not work.

7.5 Recommendations for Action

PAR provided the foundation on which this study was built. Photovoice allowed all participants, regardless of their job, role, language, gender, education, and cultural and spiritual background, to voice how they understood sickness transmission and how they practised IP&C. It also afforded them the platform to offer solutions. The findings revealed a colourful and complex web that captured multiple worldviews, harmoniously balanced and reflective of the life in that community. This nexus was disassembled carefully and reconstructed into a model for the future.

7.6 Recommendations for Atoifi Adventist Hospital

To improve IP&C at AAH, programs need to be developed that incorporate international IP&C practice guidelines but are sympathetic and responsive to the four forces that influence the working environment. The science and practice of IP&C must be acknowledged, as must IP&C guidelines; however, it is how they are applied that needs to change in order to ensure success and sustainability.

To achieve the above goal, three processes need to occur. First, internationally recognised IP&C guidelines that are suited towards lesser-resourced settings need to be identified as the building blocks for an IP&C program at AAH. Second, a working group needs to be convened by the staff at AAH to dissect the guidelines to ascertain what is doable and practicable at AAH. There is little point adopting guidelines, or parts thereof, that ask for evidence of IP&C practices that are not doable at AAH, such as antibiotic stewardship, when there is no mechanism to plate, incubate and identify bacterial susceptibilities to antibiotics. Third, once guidelines and practices that are doable and

practicable are identified, a further working group that includes representatives from all staffing roles at the hospital should be convened. Importantly, this group must be inclusive of not just nurses, doctors and allied health staff, but also of ancillary staff such as cleaners, laundry staff, cooks and maintenance staff, all of whom play a pivotal role in hospital hygiene. The responsibility of this working group will be to adapt the guidelines, taking into consideration the influential forces that affect the health service, as articulated in the 'model for the future' and as identified from this study. Only then will IP&C at AAH move forward.

It is recommended that the *Guidelines on Core Components of Infection Prevention and Control Programmes at the National and Acute Health Facility Level* (WHO, 2016) are used to provide the structure for an IP&C program at AAH. These guidelines describe eight foundational components on which a solid IP&C program can be based; they describe *what* needs to be implemented. *How* these foundational components can be implemented are described in a supporting document, the *Core Competencies for Infection Prevention and Control Professionals* (WHO, 2020a). It is these two documents that can be reviewed and pulled apart, and into which specific 'ways of doing' can be inserted—ways that work for AAH and ways that still meet international standards.

I know from the findings of this study that staff will propose some solutions that are not practicable as their ontological perspective and lack of IP&C experience clouds their thinking about alternatives. It will therefore be my role to help them think about IP&C solutions in their own context while keeping the four influencing forces at the forefront, and asking, 'Can this be done?' Mapping this process for each core component will take time, but will create an alternative IP&C guideline for culturally, spiritually and linguistically diverse settings, which can then be tested, changed and re-tried, and then applied elsewhere.

7.7 Recommendations for Other Pacific Island Countries

Governments and health services in PICs, and culturally, spiritually and linguistically diverse settings more broadly, need to recognise that Western-designed IP&C programs will not work in their settings, unless their culture, language and spirituality is taken into consideration during their implementation. More importantly, Western governments and healthcare professionals need to desist with their unrealistic expectations of IP&C standards in PICs. Health service leaders in PICs need to take ownership of and recognise the importance of IP&C, and also must acknowledge that understanding the influences of their own context will provide a more realistic and practicable path in sustainably implementing internationally recognised IP&C guidelines. The model, as presented in this thesis for AAH, can be adapted to suit specific cultural contexts and provide the skeletal structure for which health services in PICs can modify IP&C guidelines to fit their own setting.

This recommendation provides the foundation for future research in PICs on IP&C program implementation and can only lead to improvement, if through nothing else but increased knowledge of the impacting nature of their individual societies and cultures on their IP&C programs and practice.

Epilogue

As stated previously, this PhD started accidentally but opportunistically, and I haven't regretted a moment of it. I have described this PhD as a journey, as many people do, but it's been an adventure. It's been an adventure for myself, physically, psychologically, and philosophically, and I hope it's also been an adventure of discovery for my advisors, my co-researchers and the participants.

I constructed this epilogue while walking my dog 'Birtles' at the beach near my house. It has been when walking Birtles both in the mornings and the afternoons where I seemed to have had my most profound thoughts and enlightening moments, so I voice recorded them on my phone. Now, when I go back to my phone and listen to the 15 voice memos I've recorded, I can thank Birtles for being a facilitator for some of my most revelationary moments.

Travelling to and from Atoifi has not been without its challenges. Flight delays, soggy airstrips and broken planes led to longer stays; accommodation changes at short notice; and alternative modes of transport. For one trip, this involved an hour-long boat ride to one of only three roads that traverse Malaita, and a 3-hour four-wheel-drive trip to reach the all-weather airstrip. A 4-hour journey in what could have been 20 minutes.

It's been an adventure learning research logistics. I had to think hard about what I needed and take all the required equipment: printer with extra ink cartridges, reams of paper, a laminator with extra laminating sheets, pens, scissors and Cellotape. None of this was available at or in the vicinity of AAH. Distributing the cameras and getting them back on time required persistence on my behalf and getting participants to the interview location at the arranged time was a challenge to my Western concepts of time and space.

But for me, it was the philosophical adventure that has been most important. As an atheist but aware of religious and spiritual differences in my world, I entered a community where Christianity is deeply embedded, yet equally balanced by people who believe in their ancestral spirits—a world where beliefs around sickness causation and transmission are nothing that I had ever personally experienced. Of course, my eyes and ears have always been open to stories of witchcraft, sorcery and ancestral worship; however, I thought these were things of the past. They are very real, very present and very influential.

Excitingly, the adventure is to continue when I return to Atoifi once borders re-open and international travel resumes. I am excited to share the findings of this project with the staff of AAH as I can see a future for the implementation of these findings. Perhaps I'm in that slightly euphoric phase of having finished writing, and believe that my results will

change the world. And while I know they won't change the world, if they change the way health systems in culturally, spiritually and linguistically diverse countries implement their IP&C programs, I'll know that this collaboration was not in vain.

I am not naive in understanding that in order to develop an 'alternative' IP&C implementation plan at AAH, it will take patience and time and it will morph and change as it should to reflect their world. Through a Western lens, life in Atoifi and many other diverse communities is not linear, is not organised like other hospitals, and is not necessarily based on biomedical principles. To work with the people of AAH to improve the IP&C program demands putting aside structured linear views of Western processes and immersing myself and trusting my colleagues enough to use their knowledge. At times they may guide me and at others I may guide them. That is the true art of collaboration and reciprocity. Personally important to me is to ensure I meet the needs of those who participated. The women who work in the laundry didn't want to participate as they said they never see any outcomes from 'being researched'. I want to show them that if we work together, if we view what can and can't be done from all angles, that their suggested solutions matter and were heard, together we can create change.

It feels strange writing this epilogue. While I said at the start that I have no regrets, there were still moments that were hard and you think you are never going to finish, but here I am. I'm very nearly at the end, a place I have not tried to think too much about, but it's only the end for this thesis, as I'm eager for it to be the start of a new and exciting phase for the staff and community of AAH and for a new era for IP&C.

Vanessa Leonie Sparke.

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Appendices

Appendix A—Solomon Islands Health Research and Ethics Review Board Approval

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Appendix B—Atoifi Adventist Hospital Letter of Support

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Appendix C—James Cook University Ethics Approval

This administrative form has been removed