An investigation of health system capacity to provide medical male circumcision for HIV prevention in high burden settings in Papua New Guinea

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Declaration

This thesis is composed of my original work, and contains no materials previously published or written by another person.

I have clearly stated, described and acknowledged the contributions of the co-authors of the manuscripts under the Statement of Contribution in this thesis.

In addition, I have acknowledged contribution of others to my overall thesis, statistical analysis, technical assistance in thesis structure and formatting, editorial advice and any other original research work used or reported in my thesis.

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 (JCU), immediately made available for research and study in accordance with the *Copyright Act 1968 (Cth)*.

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i. Jointly authored works contained in the thesis: Manuscripts.

Co-authors have given their permission for these manuscripts to be included in this thesis:

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Chapter Four	**Tommbe, R.,** Vallely, A., Larkins, S., MacLaren, D. What are the health service lessons for Papua New Guinea from the small changes for readability in providing voluntary medical male circumcision in Africa? *BMC Health Service Research*. (Forthcoming).	**RT:** Conceived of and design the literature review. Carried out database searching, reviewing the literature, data extraction and analysis, quality assessment of manuscript and drafted and edited the manuscript. **DM**: Carried out database searching, provided support for the literature review process. Revised the manuscript for important intellectual content and reviewed the final manuscript. **SL:** Provided support for the layout of the manuscript. Edited and revised the manuscript for important intellectual content and reviewed the final manuscript. **AV**: Edited and revised the manuscript for important intellectual content and reviewed the final manuscript.	Associate Professor David MacLaren, James Cook University. Professor Sarah Larkins, James Cook University. Professor Andrew Vallely, University of New South Wales.
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Abstract

Background

Human immunodeficiency virus (HIV) is a global public health problem. Reducing the transmission of HIV requires a range of prevention and treatment interventions. Medical Male Circumcision (MMC) is a proven and well-established HIV prevention strategy in settings with low circumcision, high prevalence of HIV and transmission primarily via heterosexual intercourse. A successful MMC for HIV prevention program depends on an effective and efficient health system. In the South Pacific nation of Papua New Guinea (PNG), there are a diverse range of social and cultural foreskin cutting practices. Almost all foreskin cutting occurs outside the formal health system. Some men request MMC in local health care facilities, but there is no formal MMC for HIV prevention program through the country's formal health system. The hyper-diverse social, cultural and geographic characteristics of PNG, linked with limited human and financial resources, mean the country's formal health system has major challenges in providing even basic services in many areas of the country. Given the country is considering MMC for HIV prevention in high HIV prevalence settings, this series of studies examines the capacity and operational feasibility of providing formal MMC for HIV service in high HIV burden settings in PNG.

Study Design

This multi-method study comprised four distinct components, undertaken to investigate the capacity and operational feasibility of the health system to deliver MMC for HIV prevention in PNG. The study design and the methods of each of the study components are describe in the diagram in Figure 1.

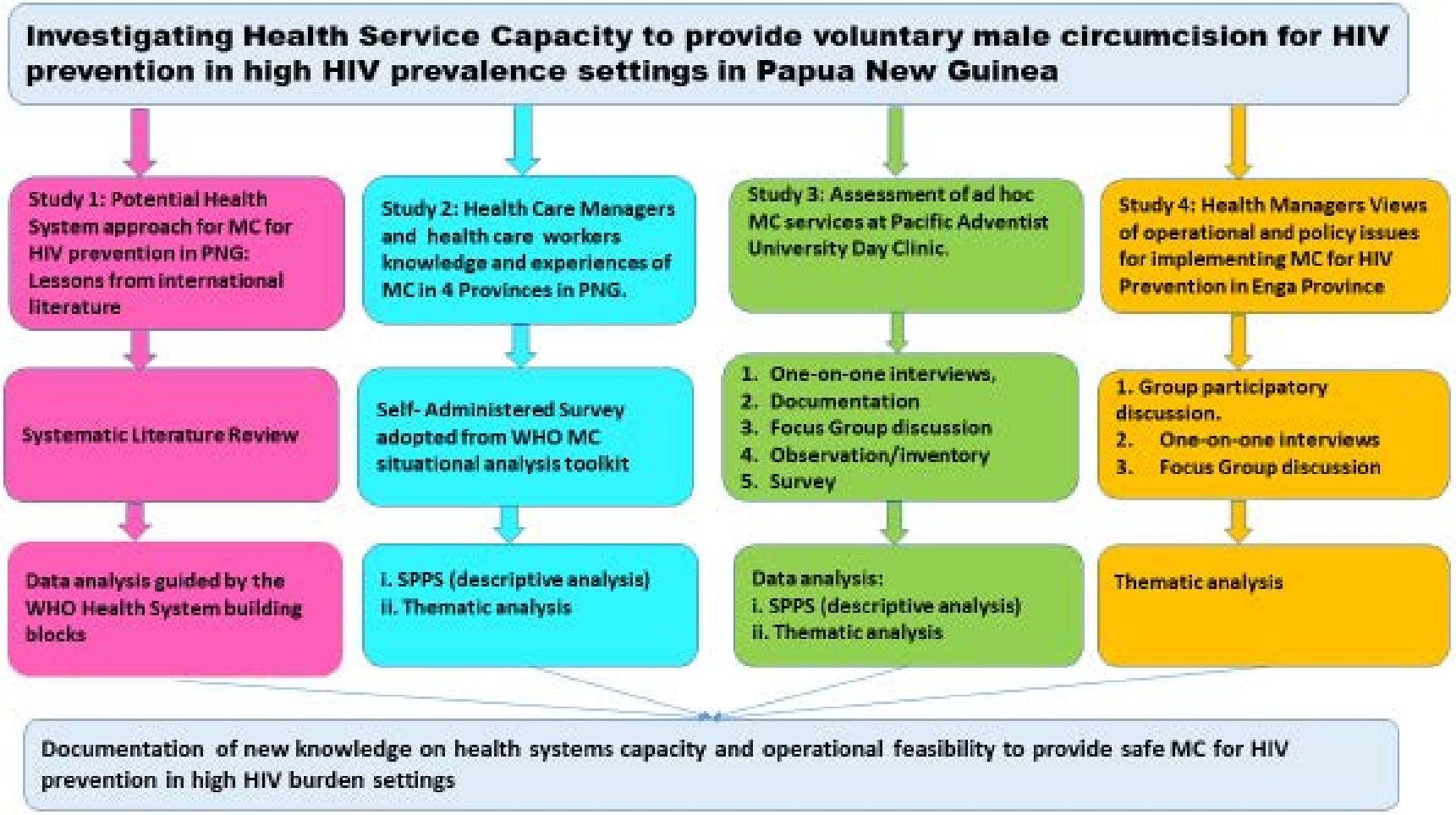

Figure: Study design and methods showing four component of the study

Results

Component one: Eighty-seven articles were included in the final review. Health systems in the Sub-Saharan region have needed to adapt to implement MMC for HIV prevention programs and take specific steps to improve their health systems. Adult MMC is now a formal HIV preventive measure fully integrated into the formal health system in 14 priority Sub-Saharan countries, with over 18.5 million men circumcised between 2010 and 2017. The incorporation of MMC into a country's health system has been challenging across Sub-Saharan Africa. Key lessons for PNG include: (i) local government needs to take ownership of the MMC program and fully involve the stakeholders in both decision making and implementation for an effective MMC program; (ii) financing for an MMC program can be sought from international donor funds and the health care partners, with consideration given to generating income to sustain the long term funding of MMC program; (iii) health systems can maximise a limited health care workforce through 'task shifting' and 'task sharing' approaches in providing MMC service; (iv) health leaders need to give careful consideration to delivering socio-culturally appropriate MMC services; (v) existing health information systems need to be strengthened; and (vi) monitoring and evaluation systems are essential to sustain and direct ongoing MMC for HIV prevention programs.

Component two: 133 Health care workers across all 17 health facilities reported performing MMC and other forms of foreskin cutting (dorsal slits) both inside the health care facilities during work hours and outside the health care facilities, often on weekends or after-hours. The MMC and other forms of foreskin cutting performed by health care workers were at the request of male clients. In some locations MMC was requested for cultural reasons or performed during traditional village ceremonies, and as such was not regulated or a formal part of the health system. Some community health workers performed MMC although the

procedure was outside their formal scope of practice. A quarter (26%) of male registered nursing officers and just under half (41%) of male community health workers reported performing MMC although it was outside their scope of practice. Almost three-quarters of health care workers (71%) stated they were willing and able to offer MMC services if this was formally introduced by the National Health Department. Health care facility managers highlighted a need for well-equipped health facilities with human resources, instruments, drugs, and space to provide MMC. Some health care workers expressed concern about how best to incorporate cultural foreskin cutting in the health care system, given the rituals and large expenses involved in the ceremony. HCW reported that it was common for young male clients to present at the health care facility with infection and/or bleeding as a result of peer-to-peer foreskin cutting that occurred in villages and communities. More than 90% of the health care facility managers were supportive of providing formal MMC for HIV prevention in their facilities. However, they acknowledged limitations in terms of policy, specialised skilled staff, MMC related medicines and equipment supplies.

Component three: Pacific Adventist University (PAU) is located in Port Moresby with students from across PNG and other Pacific countries. The university delivers periodic, ad hoc MMC services at the university's on-campus clinic for staff, students and the surrounding community. The ad-hoc MMC clinic is not a part of a formal HIV prevention program but has been periodically offered since the late 1990s to provide an alternative to the widespread informal foreskin cutting among and between male students of the university that has resulted in many adverse events of bleeding and infection. The clinic is governed and funded by the university, and staffed by four full-time female nursing officers. The equipment and medicines are supplied by the government. The minimum package for HIV prevention is available at the clinic, which includes condoms, syndromic management of sexually

transmitted diseases, voluntary counselling and testing. The clinic has a certified female voluntary counselling and testing counsellor. The environment is adequate for carrying out MMC services including space, lighting, privacy, and running water. Most infection prevention supplies are available. The sterilizer was not functioning and there was no incinerator for clinical waste. Equipment was being sterilized at the Port Moresby General Hospital and clinical waste incinerated at a nearby clinic. Consistent with the fact that there is no national program for MMC for HIV prevention, there are no written policies on MMC related procedures by the government and no specialized training for staff in MMC services. There is limited knowledge about the benefit of MMC for HIV prevention among regular clinic staff. Essential medicines, necessary equipment and supplies for surgery are limited in stock and need to be pre-ordered before the ad hoc MMC service. Culturally appropriate service is provided in terms of cultural celebrations and gender segregated privacy during periodic MMC programs. However, a major gap at the clinic is that there are no males employed as routine health care workers. Almost all clients (90%) accessing the MMC services are satisfied with the service. Almost all study participants recommended a men's health clinic for sexual health information, care and support.

Component four: Enga Provincial Health Authority (EPHA) managers and provincial policy makers emphasized that because Enga Province has the highest HIV prevalence in the country, all HIV prevention measures need to be carefully considered. Despite foreskin cutting not being a cultural practice and limited information and knowledge about MMC for HIV prevention by some health workers, provincial health policy makers and health managers wish to actively pursue MMC as a part of the comprehensive HIV prevention measures. Recommendations included that a two stage approach be considered. Stage one would integrate MMC into HIV prevention measures at the existing stand-alone

STI/HIVAIDS clinics in the province. Stage two would expand into other health service settings when the health system gaps are identified and improved. First and middle level managers recommended that Enga Provincial Health Authority develop an MMC for HIV prevention policy and implement it within their context. Top level managers reported policy development and the governance of the program were the responsibility of the National Health Department but they were willing to support the governance of the MMC service. Appropriate cultural and religious considerations are essential in this setting.

Discussion and implications

The experiences in Sub-Saharan Africa show that success in implementing adult MMC for HIV prevention services is possible in resource-limited settings but dependent on good governance, established funding mechanisms, quality health service delivery, adequate workforce and medicine and equipment supplies, and having proper monitoring and evaluation in place. The PNG health system has many ongoing challenges and all of the issues highlighted from Sub-Saharan Africa need to be considered for the PNG context. This means, all the health system factors related to MMC services will require strengthening prior to implementing MMC services for a safe and quality outcome.

In PNG, many health care workers HCWs perform unregulated MMC procedures even though they are aware it is out of their formal scope of practice. The risk associated with unregulated penile cutting by unaccredited HCWs poses a significant threat to current sexual health programs in PNG. The national or provincial health department in PNG needs to provide clear direction about training and certification for HCWs who are involved in the provision of unregulated MMC surgeries. In particular, training in universal infection control

measures is essential in a comprehensive training package to ensure competence in safe surgical procedures and subsequent care.

Given the support from health care managers and health care workers, the health authorities in PNG need to carefully consider how MMC for HIV prevention is to be incorporated in high prevalence settings. It is crucial for policy makers and planners to acknowledge the lack of specialized MMC training and provide adequate resources for MMC services. These challenges needed to be addressed by a broad coalition of health planners and stakeholders prior to introducing formal MMC services into health care facilities.

The PAU study has demonstrated the capacity to provide an 'as needed' MMC program in an established facility and acts as an example for other facilities throughout PNG. Although this was not a formal MMC for HIV prevention program, most WHO standards were achieved because of attaining basic professional standards within the normal operation of the health center. The recruitment of male staff and establishment of a specific male health clinic that can provide culturally appropriate care for men's health issues is urgently needed at PAU and in other settings considering providing periodic or ongoing MMC services. In addition performing traditional foreskin cutting in a health care facility and integrating traditional rituals and ceremonies is a contentious idea that emerged in this study. Further research needs to be done on ways to provide culturally appropriate services that involve community leaders and other stakeholders with a vision to provide safe and culturally appropriate MMC services for men in high HIV burden settings across PNG.

Implementing MMC for HIV prevention in stand-alone STI/HIV/AIDS clinics in high HIV burden settings such as Enga Province may provide an opportunity to inform how MMC

could then be integrated into a comprehensive HIV package for Enga and other high burden provinces. National Department of Health and National AIDS Council leaders need to carefully and considerately engage with Enga Provincial Health Authority and managers from other high HIV burden provinces to guide culturally appropriate MMC services that are ultimately integrated with other HIV prevention services across PNG.

Conclusion

Overall, this study has demonstrated variable capacity and operational feasibility of the health system to deliver MMC for HIV prevention in high HIV prevalence settings in PNG. Countries with limited resources and challenges to their health systems similar to PNG have demonstrated that MMC for HIV prevention can be successfully implemented. Technical aspects of the health system need to be strengthened together with sustainable funding, program leadership and the role of non-government and development partners will be essential. Ensuring MMC policy and guidance is consistent with existing comprehensive HIV prevention packages will provide opportunities to strengthen key areas of the health system.

This study has demonstrated that the PNG health system does have experience in delivering MMC – albeit often provided by health care workers operating outside their formal scope of practice or in ad-hoc programs. This study has documented that male clients are overwhelmingly satisfied with the MMC services at one ad-hoc service and that the service was able to meet many of the WHO quality standards despite not being a part of a formal program. When considering the incorporation of MMC for HIV in high HIV burden settings, it is important for the National Department of Health, National AIDS Council, Provincial Health Authorities and local health facilities to base their planning on solid evidence about

the current capacity and operational feasibility for this work. This thesis provides contemporary evidence from local, provincial, national and international studies and will directly inform MMC for HIV prevention policy and planning in high HIV burden settings in PNG.

Table of Contents

List of Figures

List of Tables

Index of Acronyms

ABC	Abstain, Be faithful and Condom use
AIDS	Acquired Immune Deficiency Syndrome
ART	Antiretroviral therapy
CHW	Community Health Worker
CMD	James Cook University College of Medicine and Dentistry
DFAT	Australian Department of Foreign Affairs and Trade
DWU	Divine Word University
DWUREC	Divine Word University Research and Ethics Committee
EP	Enga Province
EPHA	Enga Provincial Health Authority
ESP	East Sepik Province
FBO	Faith based organization
FGD	Focus group discussion
HCW	Health Care Worker
HEO	Health Extension Officer
HIV	Human Immunodeficiency Virus
IMR	Institute of Medical Research Papua New Guinea
IVDU	Intravenous drug users
JCU	James Cook University
LMICs	low- and middle-income countries
MC	Male circumcision
MMC	Medical male circumcision
MO	Medical Officer
MOMASE	Morobe, Madang and East and West Sepik provinces
MREC	Medical Research and Ethics Committee Papua New Guinea
MSM	Men who have sex with men
NAC	National AIDS Council Papua New Guinea
NACRAC	National AIDS Council and Research Committee
NACS	National AIDS Secretariat Papua New Guinea
NCD	National Capital District
NDOH	National Department of Health Papua New Guinea

NGI	New Guinea Islands region
NGO	Non-government organization
NHMRC	National Health and Medical Research Council
NHSP	National Health Planning System
PAU	Pacific Adventist University
PAUREC	Pacific Adventist University Research and Ethics Committee
PEP	Post exposure prophylaxis
PJV	Porgera Joint Venture
PHA	Provincial Health Authority
PNG	Papua New Guinea
PNGIMR	Papua New Guinea Institute for Medical Research
PrEP	Pre-exposure prophylaxis
RNO	Registered Nursing Officer
SDA	Seventh-day Adventist
STI	Sexually transmitted infection
UNAIDS	United Nations Program on HIV and AIDS
UNSW	University of New South Wales
VCT	Voluntary counselling and testing
VMMC	Voluntary medical male circumcision
WHP	Western Highlands Province
WHO	World Health Organisation

Chapter 1. Why a study of health system capacity for medical male circumcision for HIV prevention is needed in Papua New Guinea?

1.1 Introduction

Health systems in Low and Middle Income Countries (LMICs), including Papua New Guinea (PNG) face many challenges as they seek to provide health services for their nations. Health systems in these countries need to be constantly reviewed and strengthened to improve health care programs and deliver effective service delivery. The health system in PNG seeks to provide services for a population of almost nine million people across 20 provinces, speaking more than 800 languages. Subsequently the PNG health system faces many challenges that include: i) a decentralized system where governance of service delivery is divided between the national and provincial level, causing confusion in the roles of the health managers and workforce in implementing services; ii) critical shortages of health workforce; iii) continuous shortages of essential medicines and supplies and; iv) weak surveillance, monitoring and evaluation systems to coordinate the reporting of service delivery (National Department of Health Papua New Guinea, 2010). These challenges are common amongst both state-owned and faith-based health systems (Catling *et al*., 2015; National Department of Health Papua New Guinea, 2010).

PNG has a high burden of infectious diseases and emerging burden of non-communicable diseases, most of which are preventable (National Department of Health Papua New Guinea, 2010). Human Immunodeficiency Virus (HIV) is one of the many infectious diseases in PNG. PNG is reported to have the largest HIV epidemic in the Pacific

region with a national HIV prevalence of 0.9%. However there is a wide variation in geographical distribution of the epidemic in the four regions in PNG as shown on the map.

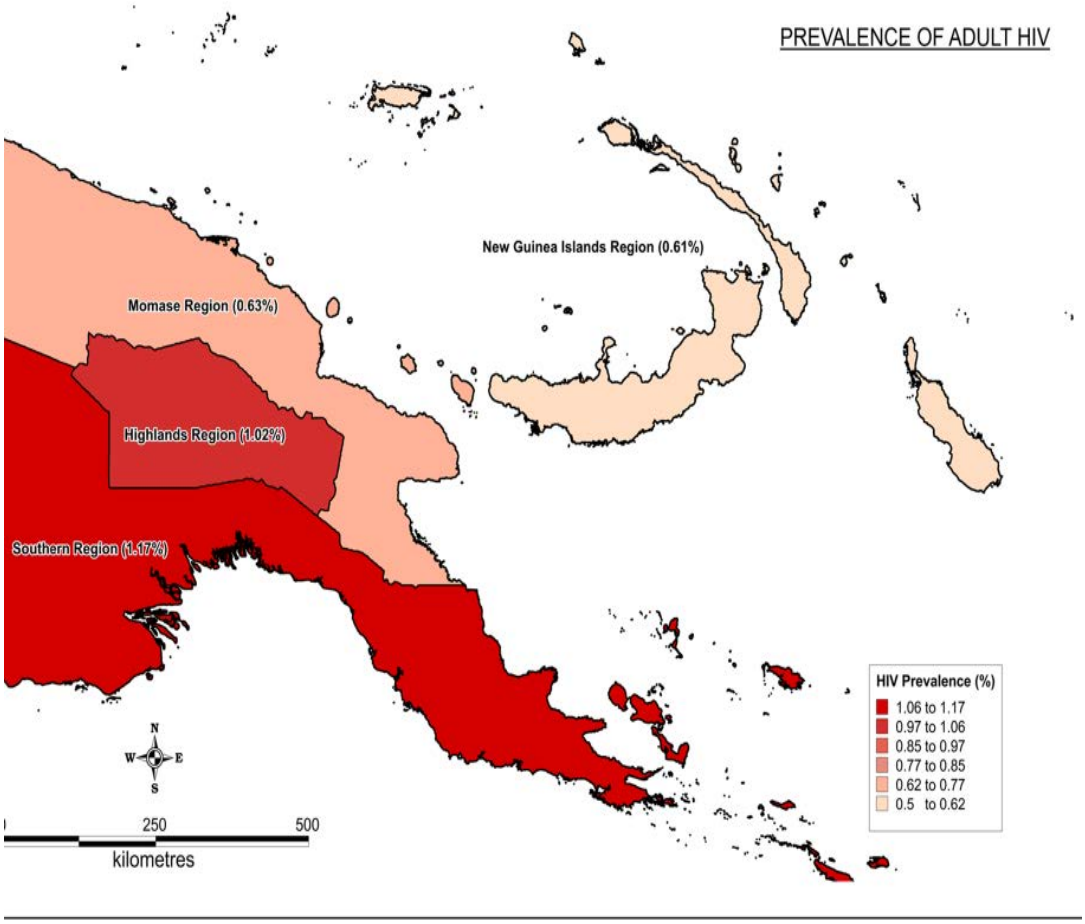

Figure 1.1 HIV distributions in four regions in PNG

Source: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4680167/

In 2017 the Highlands region had the highest HIV prevalence of 1.1%, Southern region 0.74%, Morobe, Madang and Sepik provinces, known as MOMASE region 0.74% and New Guinea Islands region 0.42% (National AIDS Council of Papua New Guinea, 2018). Within the Highlands regions, Enga province has the highest HIV prevalence of 1.77%, followed by JIWAKA province (1.49%) and WHP (1.32%). The National Capital District has the second highest HIV prevalence in PNG of 1.64% (National AIDS Council of Papua New

Guinea, 2018; Centers for Disease Control and Prevention, 2019). In 2018, this equated to approximately 48,000 people living with HIV, with approximately 29,000 of these on antiretroviral therapy (ART). There are approximately 2100 new HIV cases reported annually and almost 500 Acquired Immune Deficiency Syndrome (AIDS) related deaths every year (HIV AIDS Asia Pacific Research Statistical Data Information Resources AIDS Data Hub, 2018). Approximately 914 (8.1%) of the 11,215 tuberculosis patients tested in 2015 had a co-infection with HIV (UNAIDS, 2018). The National AIDS Council of PNG supports an existing comprehensive HIV prevention, treatment and care package, which is well integrated with other sexual health programs managed through the National Department of Health and Provincial Health Authorities.

HIV has had a major impact on the nation's health and wellbeing following the start of the epidemic in PNG in 1987. The numbers of testing sites have increased from 60 VCT sites in 2009 to 120 VCT sites in 2017 (HIV AIDS Asia Pacific Research Statistical Data Information Resources AIDS Data Hub, 2018; UNAIDS, 2018). The PNG health system has difficulty with supporting people on life-long antiretroviral treatment, especially among key populations such as sex workers, men who have sex with men (MSM), and those living in remote communities (HIV AIDS Asia Pacific Research Statistical Data Information Resources AIDS Data Hub, 2018). Funding constraints have affected awareness, evaluation and monitoring activities by the National AIDS Secretariat (NACS). The National Department of Health (NDOH) response to co-infection with diseases such as tuberculosis, malaria and cancer has also been affected by a reduction in funding in 2016 (HIV AIDS Asia Pacific Research Statistical Data Information Resources AIDS Data Hub, 2018). Nevertheless HIV prevention, treatment and care remain key health priorities in PNG.

HIV prevention in PNG started with the simplistic ABC approach: (**A**bstain, **B**e faithful/reduce the number of one's sexual partners, use a **C**ondom); and was expanded to include voluntary counselling and testing (VCT) services; antiretroviral to prevent parent-to-child HIV; post-exposure prophylaxis; use of ART for treatment leading to reduced viral load; and treatment of certain sexually transmitted diseases such as syphilis (UNAIDS, 2010). These measures have been used across PNG for more than two decades. Health care professionals now work closely with high risk communities including sex workers, highway drivers and MSM, however these measures are often concentrated in the main centres. This may result in unnecessary new infections across PNG's regions and provinces (Kelly-Hanku *et al*., 2018). Pre-exposure prophylaxis, self-testing for HIV, and medical male circumcision for HIV prevention strategies have not been formally introduced in PNG's health system (T. Lupiwa, personal communication, October 18, 2020).

Medical Male Circumcision (MMC) is now recommended by the World Health Organisation (WHO) and UNAIDS to be integrated with the existing HIV prevention package in communities with heterosexual transmission, high HIV burden and low existing male circumcision (World Health Organisation . (2007b). These recommendations were based on three large studies that documented that circumcised men have a 60% reduction in risk of acquiring HIV compared with uncircumcised men (Auvert *et al*., 2005; Bailey *et al*., 2007). MMC is now a well-established component of comprehensive HIV prevention strategies in many Sub-Saharan African countries with these characteristics (Gostin & Hankins, 2008; Gray, Wawer, & Kigozi, 2013; Auvert *et al*., 2005; Bailey *et al*., 2007).

Male circumcision and other forms of foreskin cutting are highly variable across the regions of PNG. Dorsal longitudinal foreskin cuts (known as straight cut or dorsal slit) are

much more common than ‘round cuts’ (which removes the foreskin and is akin to circumcision; MacLaren *et al*., 2013). Foreskin cutting is traditionally practiced in some parts of MOMASE and the New Guinea Islands region. Foreskin cutting is less common in the Southern and Highlands regions (MacLaren *et al*., 2013). An ecological study in PNG showed that the regional prevalence of HIV infection appears to be closely correlated with regional distribution of MMC and dorsal longitudinal foreskin cuts (MacLaren *et al*., 2015). Other studies of the acceptability and feasibility of MC for HIV prevention in PNG report that the majority of men would be willing to be circumcised if there was a health benefit (MacLaren *et al*., 2013). MMC for HIV prevention is not an approach appropriate across the entire country because of the variable HIV prevalence and different rates of existing foreskin cutting (including circumcision) in different regions. However, MMC does need to be considered in provinces and regions with the highest HIV burden (Gray *et al*., 2014; National AIDS Council of Papua New Guinea, 2018).

As stated, medical male circumcision as a HIV prevention measure has not been formally introduced in PNG’s health systems (Tynan *et al*., 2012). To date, there are no published studies on the direct operational feasibility of implementing MC for HIV prevention in PNG health facilities, yet clearly there is a pressing need for such research. This thesis helps address this gap, to inform the policy makers with direct evidence about health system capacity in providing MMC for HIV prevention in high HIV prevalence settings in PNG.

1.2 Setting the study scene

In this chapter, I provide a brief overview of the study, and briefly describe the background of the contemporary challenges of HIV prevention globally and in the PNG

context. The rationale for the research and the aims of the study are provided. I outline my cultural background and describe the development of my standpoint as a female health professional, educator, and a researcher in PNG. I also discuss the style and structure of the thesis.

1.3 Standpoint: Challenging taboos- why is a woman from the Papua New Guinea Highlands studying male circumcision?

In the following section, I introduce my standpoint. I discuss who I am as a female health researcher from Papua New Guinea (PNG) and how I locate this PhD study within the broader field of male circumcision for HIV prevention.

Family, cultural and religious view

I am an Engan by birth. Enga Province is one of the seven highlands provinces in PNG and is a patrilineal society. We share one local language (Enga *tok-ples*) in the entire province. Enga Province is situated towards the north of PNG as shown with the red-shaded area on the map (Figure 1.2). It shares provincial borders with Southern Highlands Province, Ela Province, Western Highlands Province and East Sepik Province.

Figure 1.2 Map of Papua New Guinea showing Enga Province

Source:https://en.wikipedia.org/wiki/Enga_Province#/media/File:Enga_in_Papua_New_Guinea.svg

Both my parents are from Enga Province but from different tribes, clans and villages. Both were born into chiefly families. My grandfathers were chiefs in their respective clans, which allowed them to marry more than one wife, a norm in these cultures. Traditionally, chiefs married more than one wife so as to maintain their status in the community. The wives would give birth to more children: male children would become fighting warriors to defend their clans from their enemies; female children would marry sons of chiefs from the other clans and, through the bride price ceremony, would enable resources such as pigs and cash to be generated to support their father.

Marrying more women also made it easier for a chief to raise more pigs used to support peace and reconciliation among conflicting tribes and for many other traditional events such as the bride price ceremony. Both my parents were born in a polygamous relationship from which they have many half brothers and sisters. Growing up among a big

family was an advantage for both my parents' families in securing large land mass and wealth in their respective tribes. As a grandchild of two chiefs, I have strong respect by the members in both communities. I come from a patrilineal society, which means the family land and inheritance is passed down to male children. However, in my context, I am also entitled to a piece of land that has been passed down to both my parents; should I wish to live in either of their villages, I will be given land by my parents or my brothers.

Enga Province is the only province in PNG that has one language and similar cultural practices across the entire province. Engan's do things in a collective manner where people share each other's burden and joy. For example, in a bride price ceremony or compensation for peace reconciliation, the entire tribe and clan will contribute cash and goods to assist their fellow tribesman, clansman or family to sort out issues and/or provide for celebration. Also, when one member of the tribe or clan dies, all the activities in the community come to a halt for days or even weeks in mourning for the deceased. This is a show of respect. In addition, when one is in need of school fees, hospital fees, or faces other financial challenges, the family and community contribute to support the person in need. We are expected to look after our visitors with food and accommodation until they leave the village. Generosity was the main motto that was passed down from our ancestors. I, as an Engan woman, am obliged to pass on the cultural norms, taboos, beliefs and language to my children and grandchildren and also uphold them wherever I am in the world. I am also expected to show generosity to people outside of my family, clans and tribes.

While I have a strong cultural background, I was also raised by devout Christian parents who instilled in me strong Christian beliefs and values in my early life. These beliefs and values have played an important role in shaping my upbringing and how I perceive the

world. My parents were both young when the first white missionaries arrived in their villages and both accepted the Christian faith, including a church wedding. Through the Christian faith I was taught to love God and to love and respect fellow human beings. Both my culture and my Christian background have a strong focus on my relationship with fellow humans.

My dad was a teenager during the first contact of white people with my people in PNG. It was the missionaries who educated him to the sixth grade. At the end of year six, he was considered to be an adult by the missionaries and they decided to provide him with basic health care skills that will enable him to assist white missionary doctors to provide medical services to the native people in PNG. He would walk for days and even weeks to reach villages so that he could administer medical assistance to the many that were sick from communicable diseases, including yaws, leprosy and respiratory diseases. Because of my dad's work as a medical missionary, our family would travel different places out of Enga. It was in Togoba, in the Western Highlands Province (WHP), where my dad supervised a church-operated leprosy colony, that I and my two younger brothers were born. My two elder sisters were born in Enga Province, and Madang Province, respectively.

Growing up as a child in Togoba, I learnt to speak three different languages. These were Enga *tok ples*, *Tok Pisin* and Melpa *tok ples*. Enga *tok ples* and *Tok Pisin* were the common languages spoken by my family at home. I also had an opportunity to learn the Melpa language of WHP while playing with village children in Togoba. Many times I followed my dad to the health care facilities and observed how he would dress the leper's sores, feed them and deliver health education and pray with them. The first 10 years of life growing up in WHP, and later during junior high school in this province, made WHP more like a second home or another ethnic group to which I belonged. Having been raised from a

strong cultural and Christian background and also growing up in an environment where my dad's job was part of my upbringing, I now realize how I developed an inner strength that motivated me to choose my professional pathway after completing high school.

Developing my professional view

I graduated with a General Nurse Certificate in 1990 from the Sopas Adventist College of Nursing in Enga Province and was registered as a general nurse in the same year. For seven years I worked as a nurse clinician at the Sopas Adventist Hospital in the general outpatients ward, surgical wards, medical wards, obstetrics and gynecology wards, and later spent much time with the maternal and child health clinic. I developed my interest in children's care and wellbeing, which led me to attain a post-graduate diploma in pediatrics nursing at the University of Papua New Guinea. I then upgraded my nursing certificate to a post registration Bachelor in Nursing at Monash University in Australia. In 1997, I was asked to do clinical bedside teaching for the nursing students at Sopas College of Nursing - later the College requested me to become a full-time teaching staff member. My clinical role changed to a teaching role. I started as a full time nursing tutor in 1998, transitioning to my current role as a senior nursing lecturer at the Pacific Adventist University (PAU). While teaching, I attained a post-graduate Diploma in Tertiary Teaching through PAU and a Master's Degree in Health Service Management at Flinders University, Australia. With the support of my family and work supervisors, I have developed a strong career pathway in nursing education. My family members and work institution have been very supportive through the long journey in my professional career pathway. I am also indebted to the Australian taxpayers through the PNG aid programs that have funded two of my post-graduate study programs in Australia. To further my journey in my professional career, James Cook University (JCU) has

contributed significantly in awarding me the PhD scholarship, which has given me the opportunity to enhance my teaching and research capacity.

On reflection, I see myself as a role model for all my family and tribal members, including my paternal, maternal and my husband's families and tribal groups. The achievements I have attained and the position I acquire in my professional world are not only seen as personal achievements but are seen as bringing family and community recognition, meaning the family and tribal community recognize these achievements and profession and embrace them as their own.

My journey from teaching to research

In 2009, with two male colleagues from PAU, Dr. Lester Ross and Mr. Lester Asugeni, I was invited to attend a research meeting with a small group of researchers from James Cook University; namely, my PhD study supervisor Associate Professor David MacLaren, one of my study mentors Dr. Michelle Redman-MacLaren, Professor John McBride and Associate Professor Alan Clough. Professor McBride and the team discussed the possibility of conducting an acceptability and feasibility study about MMC for HIV prevention in PNG. The recommendation from the two-day meeting was to initially conduct a pilot MMC study prior to a larger acceptability and feasibility study. Little did I know, I was to go on to coordinate the MMC pilot study at PAU.

Initially, the coordination of the MMC pilot study was not an easy role for me to accept. I was battling several social, cultural and academic challenges prior to accepting the role. First, I was a woman and my culture strongly prohibits women discussing men's sexual organs in public places - it would be seen as an insult to me and to those who were listening

to me. Second, my affiliation as a member of the Seventh Day Adventist (SDA) faith made me think twice about taking on the coordination role. The sexual organs were understood in the religious context as private body parts and not to be discussed outside of the marriage circle. It was seen as a bad thing, and would paint a bad picture of me, an Engan woman and a strong church member of the SDA faith, to take on the role of leading research focusing on men's sexual organs. Even though I was a health care professional and had dealt with male patients in the past, I felt that these two aspects, my cultural and religious traits were overwhelmingly conspiring against me taking on this role. Finally, I had no research experience and this was the first research activity I would embark upon.

These obstacles instilled fear and confusion in me as I considered taking on this new role. However, with the support of the PAU and JCU research team and the capacity building workshops conducted in research methods, data collection and analysis, I gained strength within myself to accept the new role and this marked the beginning of my research career pathway. Continual mentoring and support through research collaboration activities with Associate Professor MacLaren and Dr Redman-MacLaren motivated me to pursue a higher degree in research. I was accepted to do my PhD studies in 2016 and was also awarded an internal JCU scholarship.

Building my research capacity

My role as a senior nursing lecturer at PAU has exposed me to collaborative research with universities abroad, particularly JCU and University of New South Wales (UNSW) in Australia, and most of this has been HIV and sexual health related research. My involvement in these research activities has driven me to undertake my PhD project.

Since 2009, despite my initial apprehension, I have been involved in an extensive amount of HIV research. In 2009-2010, I was the chief investigator for the pilot study on MMC for HIV prevention study conducted to explore PAU student attitudes and beliefs in MMC for HIV prevention. This project was funded by the National AIDS Council (NAC) of PNG. I took the lead role in submitting the ethics application, developing research designs and assisted in data collection. I also took a lead role in submitting feedback to NAC and wrote a process paper on the study (Tommbe, Asugeni, MacLaren, Redman MacLaren, & Mafile'o, 2012). All of these were achieved with the help of the research team from JCU and PAU.

In 2010-2012, I was coordinating three study sites for the large acceptability and feasibility study on HIV prevention in PNG. This project was a collaboration between JCU, PAU, Divine Word University (DWU), Porgera Joint Venture (PJV) and New Britain Palm Oil Limited (NBPOL), and was funded by the National Health and Medical Research Council (NHMRC) of Australia. In this coordinating role, I contributed to the research design, especially with drafting the research tool, negotiated time and schedules with village and institution leaders at the study sites, assisted in writing ethics applications, and assisted in data collection and analysis. I co-authored three papers published for this study (MacLaren *et al*., 2013; MacLaren *et al*., 2015; Tommbe *et al*., 2013).

In 2012, I was invited by the PNG Institute for Medical Research (PNGIMR) under the leadership of Professor Andrew Vallely (UNSW) and Associate Professor MacLaren to set up a research project in the sexually transmitted infection (STI) clinics in Enga Province. The project was a cross-sectional study to investigate the correlation of male foreskin status and the HIV status of men accessing STI clinics across several highlands provinces including STI clinics in Enga. My involvement in this study was to establish networking and negotiate

with the provincial health care leaders and facility health care managers on how best the study would proceed to achieve its study aim.

In 2013-2014 I was assisting Dr. Redman-MacLaren in collecting data for her doctoral studies on the implications of MC for women in PNG, including for HIV prevention. This work was conducted in Oro Province and Port Moresby, NCD. I co-authored two publications in this study, and attended a number of conference presentations (Redman-MacLaren *et al*., 2014; Redman-MacLaren *et al*., 2013). In 2015, I was involved in a pilot study that examined the donated foreskins that had dorsal splits or cuts. This collaborative study between PAU, JCU, and UNSW aimed to investigate whether the longitudinal cuts provided a mechanism for protection from HIV transmission.

Between 2013 and 2015, I was involved in another HIV-related research project in partnership with JCU researchers on the response of the SDA churches to HIV AIDS in PNG. This project was funded by NACS. I co-supervised Master of Philosophy students and later became a co-investigator on this project when the person in that position, Matupit Darius, died from an illness.

HIV and me: Contributing new knowledge

HIV has exerted a big impact in my life. Seeing babies, young and old, both close and distant family members dying from AIDS has always reminded me to assist those affected by HIV wherever I can. In my professional role, I have contributed to teaching students on the provision of bedside care for AIDS patients and also imparted knowledge on the presentation of HIV. Outside of my work hours, I have volunteered to provide awareness on HIV and other sexual health issues on the university campus, in churches and villages. I also facilitate

sessions on stigma and discrimination so that HIV positive people can live in a harmonious relationships free from stigma and harassment in the villages.

Through my ambition to assist more in the areas of HIV prevention in my professional role, I have been involved in this series of HIV research work in PNG with numerous reports and publications to provide evidence based policies to direct our health care leaders about how best to respond to the HIV epidemic. My contribution in the past has led me to this place of generating new knowledge through my PhD. This knowledge will provide information to leading policy makers in PNG about the needs of the health care facilities to provide male circumcision for HIV prevention in high HIV prevalence settings, including my home province of Enga.

1.4 Study aim and objectives

This study's aim is to explore the health system capacity and operational feasibility to provide safe, voluntary medical male circumcision for HIV prevention in high HIV burden settings in Papua New Guinea.

Objectives of this study are to:

1. Explore and describe the provision of MMC for HIV prevention globally to identify health system approaches applicable for MMC provision for HIV prevention in PNG.
2. Investigate the experiences and views of health facility managers and frontline health care workers about existing MMC and other foreskin cutting practices in four provinces in PNG.

3. Describe and assess the implementation of periodic, ad hoc MMC services at the Pacific Adventist University day clinic using the WHO Male Circumcision Service Quality Assessment Toolkit.

4. Document and assess the views of provincial health managers on operational and policy issues relevant for implementing MMC for HIV prevention in health facilities in Enga province (the province with the highest burden of HIV in PNG).

1.5 Thesis structure

The structure of the thesis is shown in sequence in the chart below (Figure 2). There are ten chapters in this thesis. Following this introductory chapter, in Chapter Two, I discuss the context of the study, in-depth background information on HIV and MMC, and then health system experiences in MMC provision around the globe and in PNG settings. In Chapter Three, I describe the methodology of the study; I discuss the overall study design and the data collection methods and analysis process used in the four study components. In Chapters Four to Seven, I present the results of the four components of the study. These chapters are presented as a series of manuscripts ready for publication. In Chapter Eight, I discuss and integrate the findings from the four components of the study. All relationships, implications, and recommendations that can be made in addressing the study aim and objectives will be discussed. Finally, in Chapter Nine, I share my reflection of the PhD journey.

Figure 1.3 Thesis structure

1.6 Summary of Chapter One

In this chapter I have introduced in brief the issue of HIV in PNG and the role of MMC as a strategy to address this issue. I have discussed my own background and how my upbringing and past professional and research experiences have led me to the point of doing this PhD. I then introduced the research aim and the objectives and the structure of the thesis.

In Chapter Two I discuss in more detail the study background. This chapter includes the discussion of HIV, male circumcision and the health system in both global and national contexts.

Chapter 2. Medical male circumcision for HIV prevention: Papua New Guinea in a global context

In this chapter I discuss the (i) global context of HIV, (ii) how medical male circumcision fits within HIV prevention strategies, and (iii) key health system considerations for national and provincial implantation of MMC programs for HIV prevention. This chapter will provide key information about Papua New Guinea as a country, the HIV epidemic in PNG and the PNG health system as context for this PhD study. The chapter then summarizes research that has investigated male circumcision in PNG over the past 10 years, and how this PhD study responds to the need for evidence on the capacity and operational feasibility of the PNG health system to provide MMC for HIV prevention.

2.1 HIV: Global Context

Human Immunodeficiency Virus (HIV) is a virus that is transmitted from person to person via bodily fluids (Nasirian *et al.*, 2020). HIV can be transmitted through exchange of sexual fluids, contaminated blood transfusion, or contaminated needles used by intravenous drug users (Nasirian *et al.*, 2020). AIDS is a syndrome that appears in the late stages of HIV infection when the CD4[1] counts drops below 200 cells per cubic millimeter from a normal range of 500 to 1,400 cells per cubic millimeter (Simon, Ho, & Abdool Karim, 2006). White blood cells called the "T cells" or T lymphocytes help the body to fight against any invading microorganisms such as virus or bacteria. The T cells are weakened and eventually get destroyed by the HIV virus. The immune function test (CD4 test) is done to measure the T

[1] CD4 is a glycoprotein found on the surface of immune cells (Simon *et al.*, 2006).

cell counts in a HIV positive client to determine their immune status against the HIV virus and stage of disease (Simon *et al*., 2006).

The HIV virus was first detected among young homosexual men in the United States in 1981. The gay men were contracting unusual opportunistic infections and also malignancies, which led to thorough investigation resulting in the detection of HIV (Smith & Whiteside, 2010). Later in 1983, women and children increasingly presented with similar symptoms to those of gay men, which informed the world that HIV was not only an infection amongst the gay community but a disease that could spread to the general public via sex and mother to child transmission (Smith & Whiteside, 2010). Around the same time, it became apparent that HIV was also spreading among injecting drug users in the metropolitan area of New York City, Eastern Europe, South East Asia and Latin America. HIV was also present among large numbers of people in Sub-Saharan African countries who had contracted HIV via heterosexual sex (Wang *et al*.; 2015).

Globally, HIV has affected millions of lives since the beginning of the epidemic in 1980s. Around 76.1 million people have become infected and 35 million people have died from AIDS related diseases and 38 million were living with HIV in 2019 (World Health Organisation; 2019). In 2019, there were 1.7 million new HIV infections and 690,000 HIV related deaths (World Health Organisation; 2019). Sub-Saharan Africa accounted for almost 76% of the global number of HIV infections with 23.5 million, followed by Asia and the Pacific with 4.7 million, Western and Central Europe and North America with 2 million, Latin America and the Caribbean with 1.8 million. The least affected regions were Eastern Europe and Central Asia with 1 million and middle Eastern and North Africa with 190,000 HIV infected people (UNAIDS, 2016a).

In 2015, the United Nations General Assembly committed to end the AIDS epidemic as a public health threat in support of the 2030 agenda for Sustainable Development (World Health Organisation , 2016a). The strategies described the responsibilities of the WHO and how individual countries will respond to HIV on the path towards ending AIDS. The emphasis of the strategy is the mechanism by which each country will strengthen their capacity to provide existing treatment, prevention, care and support programs. This includes: ensuring essential HIV services are integrated into national health financing arrangements; addressing all AIDS-related deaths, including those from co-infections like Hepatitis B and C, and tuberculosis; increasing HIV testing so people know their status and those that need treatment have access; implementing anti-discrimination laws in all settings; and most importantly, to undertake innovative research to find solutions to HIV prevention and treatment to reduce new infections among adults and newborns (World Health Organisation , 2016a).

Antiretroviral treatments (ART) were first introduced in 1997. Challenges are experienced in accessing antiretroviral treatment more in the LMICs than in high income countries. The treatment was expensive and was only available in countries in North America and in Europe where people can afford it (Avert, 2017). In early 2000, UNAIDS negotiated with the pharmaceutical companies to reduce the prices of antiretroviral drugs for the LMICs to gain access to the treatment (Avert, 2017). Around the same time the Global Fund was established with the aid of UNAIDS to support LMICs to address HIV through prevention, treatment, care and support. This included buying medications for people living with HIV in these countries (Avert, 2017). In 2019, 67% (25.4 million) of the HIV positive people around the globe had received antiretroviral treatment (WHO, 2020). Although more than half of the global HIV positive people have been accessing ART, some low- to- middle income

countries are still having challenges in accessing treatment (HIV AIDS Asia Pacific Research Statistical Data Information Resources AIDS Data Hub, 2018).

2.2 HIV Prevention

A comprehensive HIV prevention program was established globally to reduce the HIV epidemic. The comprehensive HIV prevention package involves both behavioural and biomedical strategies. The behavioural strategies aimed to increase knowledge about how to protect people from HIV infection lead to improved attitudes towards safer sex practices; safer injection of drugs; and consideration for blood transfusion and handling of fluids (Coates *et al.*, 2008). Biomedical tools involve the use of medical interventions (Mayer *et al.*, 2010). The common global biomedical strategies for HIV prevention programs used in majority of countries as described by UNAIDS are: male and female condoms; the use of clean needles and syringes amongst drug users and in hospital procedures; voluntary medical male circumcision (VMMC); use of antiretroviral medicine not only as treatment to prevent death but as a prevention measure. This includes ART as pre- exposure prophylaxis (PrEP) and post exposure prophylaxis (PEP) to reduce the risk of HIV amongst high risk HIV negative people; and is administered to HIV positive pregnant women to prevent mother-to-child transmission(Gordon & Mwale, 2006; Dehne K *et al.*, 2016; UNAIDS, 2010). Furthermore, use of ART for treatment of people living with HIV reduces viral load and prevents onward transmission (UNAIDS, 2010).

While availability of the comprehensive HIV prevention program and the massive scale-up of HIV treatment have together decreased new HIV infections in some countries, other countries have experienced an increase in new HIV cases or shown no improvement (UNAIDS, 2016a).

Challenges are experienced by individual countries in implementing the complete HIV intervention program. The most common challenges across the globe seem to be a lack of political commitment, under resource health system, minimal provision of sexual and reproductive health needs for young people, lack of risk reduction measures for key populations. In addition, opposing religious beliefs especially in terms of condom distribution, the use of ART in some countries, and financial constraints in some countries may all delay the formal implementation of voluntary male circumcision, PrEP, and extension of VCT to HIV self-testing procedures (UNAIDS, 2016a). In 2016, UNAIDS provided global and country level support and guidance for effective HIV prevention measures, including a combination of condom use, PrEP, PEP, VMMC, and harm reduction for people at risk, especially women and key populations (UNAIDS, 2014). UNAIDS also established an updated global prevention coalition and a 2020 strategic tool to guide the HIV prevention program. The aim of the coalition is to create an avenue for country leaders, HIV program developers and implementers, stakeholders, and civil societies to strengthen their commitment to the HIV prevention program towards ending AIDS by 2030 (UNAIDS, 2014, 2019; World Health Organisation , 2016a).

2.3 Medical Male Circumcision for HIV prevention: Global Context

Medical male circumcision (MMC) is one of the biomedical intervention success stories in HIV prevention over the past decade (Auvert *et al*., 2009; Auvert *et al*., 2005; Bailey *et al*., 2007). Medical Male Circumcision is described as the surgical removal of the foreskin of the penis (Siegfried, Muller, Deeks, & Volmink, 2009). Although male circumcision for HIV prevention has only been implemented over the past two decades, male circumcision has been a social and cultural practice for millennia. Cultural groups across the globe perform male circumcision for religious reasons and/or as a traditional practice. Some

men request circumcision for personal hygiene and/or to relieve medical conditions (MacLaren *et al*., 2013; Manineng *et al*., 2017; Siegfried *et al*., 2009).

Ecological studies[2] provided evidence of that MC had a significant effect on the prevalence of HIV in heterosexual men (Grey *et al* ., 2007; Siegfried *et al*., 2009). This was later confirmed by three randomised controlled trial studies[3] in Africa. The study shows MC significantly reduce the risk of acquiring HIV by approximately 60% in uninfected heterosexual men (Auvert *et al*., 2005; Bailey *et al*., 2007; Grey *et al* ., 2007). Although MC reduces acquisition of HIV among heterosexual man, the biological mechanism for this protection is not completely understood.

There are possible biological mechanisms through which the presence of a foreskin can increase the risk of contracting Sexually Transmitted Infections (STI), especially HIV. Firstly, any abrasion or minute tear in the inner surface of the foreskin can become the possible entry point of HIV. The foreskin retracts over the shaft during sex and makes it easier for the virus to enter through the opening. The inner surface of the foreskin is thin compared to the outer surface of the foreskin which is more keratinised and makes it difficult for the virus to enter (Weiss *et al*., 2010). Secondly, the microbiome attracts target cells called the 'Langerhans cells' to the genital mucosa and these cells are found in the inner mucosal surface of the foreskin. Hence, the inner surface of the foreskin is thought to be a perfect environment for the HIV virus to reside and replicate (Weiss *et al*., 2010). Thirdly,

[2] "An ecological study is an observational study defined by the level at which data are analysed, mostly at the population or group level. Ecological studies are often used to measure prevalence and incidence of diseases" (Levin, 2006).

[3] The randomised control trial is a trial in which subjects are randomly assigned to one of the two groups: one (the experimental group) receiving the intervention that is being tested, and the other (the comparison group or control) receiving an alternative (conventional) treatment. The two groups are then followed up to see if there are any differences between them in outcome (KendalI, 2003).

men with large foreskin surface areas have twice the HIV incidence rate than those with small foreskin surface. It is thought that the larger the surface area, the more virus it attracts to reside and replicate (Weiss *et al*., 2003).

When men undergo circumcision, the entry point for the virus is removed and there are no secretions and microbiomes under the foreskin to attract the target cell to the mucosa (Weiss *et al*., 2003; Jayathunge *et al*., 2014).

The WHO and UNAIDS recommended Voluntary medical male circumcision (MMC) become part of a comprehensive package of HIV prevention measures among heterosexual communities in high HIV prevalence and low MC prevalence settings (World Health Organisation , 2007b). It is important to consider that MMC alone does not provide complete protection against HIV infection. Therefore it was recommended by WHO and UNAIDS that MMC should to be integrated into comprehensive HIV prevention packages (UNAIDS, 2011; World Health Organisation & UNAIDS, 2010).

Almost 18.5 million cumulative VMMCs have been performed between 2008 and 2017 in the 14 priority countries (UNAIDS, 2018b; World Health Organisation , 2018b). In addition to the 18.5 million VMMC, The United Nations' 2016 Political Declaration on HIV and AIDS set a new VMMC target to reach 25 million young men in the 14 priority countries by 2020 (UNAIDS, 2018b). WHO and UNAIDS also devised a subsequent VMMC strategic target of reaching 90% of men aged from 10 to 29 years in the same priority countries by 2021 (World Health Organisation & UNAIDS, 2016).

Challenges for priority countries in reaching 2021 VMMC targets include: perceptions of low HIV risk; lack of support from parents or community; preference for traditional circumcision over medical VMMC, which was culturally significant in some countries; and fear of pain when undergoing VMMC (UNAIDS, 2016b). Recommendations were made to accelerate the provision of VMMC services, including through the provision of: increased local funding for sustaining the VMMC program; increased use of non-surgical circumcision devices such as Shang Ring[4]; VMMC as part of a core package of health services for men and boys, using approaches that suit various age groups and locations; and addressing myths and misconception about circumcision (UNAIDS, 2016b). While the priority countries are scaling up, other countries who are experiencing an increased burden of HIV may need to consider incorporating MMC into the existing HIV prevention package.

2.4 Medical Male Circumcision for HIV Prevention: Health System Considerations

The 'health system' is a network of organisations that provides health services to a designated population and is willing to be held responsible for the clinical and the economic outcome of the population it serves (World Health Organization, 2007a). WHO proposes that a health system comprise six important building blocks. These include: leadership and governance; financing; service delivery; health workforce; medical, vaccine and equipment supplies; and information (World Health Organisation, 2007a).

[4] Device with two rings where one is placed on the outside of the foreskin and locks against an inner ring when snapped together around the foreskin, it is intact for a few days to a week and is then removed (Masson *et al*., 2010).

An effective health system has functional building blocks that ensure that every new program such as MMC is added to other ongoing programs so people can access safe, affordable and quality services. Because of the fragile health systems in developing countries, WHO and UNAIDS recommend that the 14 priority countries in Sub-Saharan Africa and Ethiopia strengthen their health systems to increase access to safe MMC services (World Health Organisation & UNAIDS, 2007).

Leadership and governance support is required to implement an MMC program. Strong support and ownership from government and community leaders, stakeholders and VMMC advocates are important drivers of success for many VMMC programs in Africa. Countries with good support from leaders and strong and vibrant governance were seen to be performing better than those with poor government and community support (Dickson *et al*., 2011; Mwandi *et al*., 2011; Mwanga *et al*., 2011; Odoch *et al*., 2015).

Financial resources are required to implement a MMC program. Economic studies conducted across Sub- Saharan Africa show that VMMC programs are cost-effective compared to other HIV prevention strategies (Menon *et al*., 2014; Uthman, Popoola, Uthman, & Aremu, 2010; Uthman, Uthman, Popoola, Yahaya, & Aremu, 2011). However, continuous national budget constraints mean that few countries could fund a complete MMC program. Most VMMC programs across Sub-Saharan Africa are funded by international donor agencies such as The President's Emergency Plans for AIDS Relief (PEPFAR) and The Bill and Melinda Gates Foundation (Hargreave, 2010; UNAIDS, 2013a). Alternatively, some Sub-Saharan African countries initiated ways to generate funds to sustain their ongoing HIV programs and VMMC programs in preparation for a smooth transition when donor funds end (Pillay, 2012).

Skilled and adequate human resources are required to implement a successful MMC program. VMMC experiences in Sub-Saharan Africa reported inadequate and less skilled health care workers to perform MMC (Curran *et al*., 2011). Despite these challenges, strategies were implemented to maximise the limited health workforce. For example, task shifting[5] and task sharing[6] approaches have increased the VMMC output (Curran *et al*., 2011). These strategies work well in some Sub-Saharan African countries. However, in countries where task shifting was not permitted, low numbers of doctors available to perform VMMC proved a challenge. (Curran *et al*., 2011; Perry *et al*., 2014).

Adequate medicine and equipment supplies are required to implement MMC program. A functional logistics, supply chain, and procurement system is required to provide constant medicine and equipment supplies to implement a successful MMC program (Ledikwe *et al*., 2014). Most LMICs have ongoing issues in providing basic medicines, vaccines and equipment supplies because of the challenges with the supply chain and the procurement system. This places a burden on service delivery of the health program. Some countries in Sub-Saharan Africa have on-going challenges with the supply chain and procurement of VMMC related supplies and have identified ways to meet this challenge (Edgil *et al*., 2011). It is important to strengthen the supply chain and the procurement system, to ensure proper channels and guidance to provide the necessary medicine and equipment to implement the MMC service.

[5] Task shifting refers to the "delegation of surgical steps to a trained non-physician clinician such as a nurse or clinical officer—can greatly expand the size of the workforce available to provide surgical services" (Page 2; Curran *et al*., 2011).

[6] In Task sharing some steps and procedures are delegated to a non-physician clinician such as a nurse, while the highest-level skill steps remains to the physician" (p.2, Curran *et al*., 2011).

An information system is required for a successful VMMC program. The information system is important to guide evidence-based decisions on how to allocate limited resources and also to re-strategize ways to improve the VMMC service. Information systems were highly challenged in most settings in Sub-Saharan African countries. However, some countries were adopting various WHO recommended tools to assess, record and report against the VMMC program (Sgaier, Reed, Thomas, & Njeuhmeli, 2014). Upskilling of health workers for accurate recording of documents and procedures was also reported in these countries (Phili, Abdool-Karim, & Ngesa, 2014).

MMC service delivery requires strong health systems building blocks to provide an efficient MMC program. It is important that each of the other five components of the systems building blocks are strengthened to aid the service delivery component of the health system. Providing VMMC services in Sub-Saharan Africa requires strong leadership with established relationships with stakeholders from different health agencies; adequate funding; adequate and skilled workforce; adequate medicine and equipment supplies; proper reporting, monitoring and evaluation system; appropriate education and awareness program; and adaptation of the program to be socio-culturally appropriate (Dickson *et al*., 2011; Menon *et al*., 2014; Perry *et al*., 2014; Edgil *et al*., 2011; Phili, Abdool-Karim, & Ngesa, 2014). However, the challenges and improvements of the service delivery component of providing VMMC programs differ in each of the priority countries in Sub-Saharan Africa (Ledikwe, J. H *et al*., 2014)

Practical experiences of introducing VMMC in the 14 priority countries in Sub-Saharan Africa can inform many other developing countries around the globe about the challenges for health systems in implementing VMMC for HIV prevention. It is evident that

the effective implementation of MMC depends on the presence of a high quality and strong health system. Chapter Four of this thesis is a systematic review of the literature on the delivery of MMC by health services in Africa and the implications for the delivery of MMC services by the health system in PNG.

2.5 Papua New Guinea: Country Background

Figure 2.1 Map of Papua New Guinea provinces

Source: https://geology.com/world/papua-new-guinea-map.gif

Papua New Guinea (PNG) is a low- and middle-income country located in the Asia Pacific Region. It is the largest island country in Oceania with a land mass of 463,000 square kilometers. It shares its border with Indonesia, Solomon Islands and Australia (Australian Government Department of Foreign Affairs and Trade, 2020a). There are approximately 841 languages and many dialects, with a total population of 8.3 million. PNG is divided into four

regions: Highlands; Southern; MOMASE; & NGI, and is comprised of 22 provinces with two recent additional highlands provinces (Hela and Jiwaka) (Figure 3).

PNG is one of the most culturally diverse countries in the world. The country has more than 800 languages and over 1000 different cultures. Despite the diversity in languages, Tok Pisin serves as the lingua franca and English is the language used in education, business and government. Papua New Guineans live off their own traditional lands being passed from one generation to the next generation. At the same time, the connections between people and their land are very significant and central to their identity. (Australian Government Department of Foreign Affairs and Trade, 2020a).

In PNG, 85% of the population live in the rural villages, largely dependent on subsistence and small cash crop farming. While 15% live in the urban areas of PNG in pursuit of employment, education, business and services that are not provided in the rural areas in PNG (Australian Government Department of Foreign Affairs and Trade, 2020a).

PNG was first colonized by Germany and Britain in the 1800s, then later under the administration of the Australian government, and became an independent constitutional monarchy in 1975 (Australian Government Department of Foreign Affairs and Trade, 2020a). (Australian Government Department of Foreign Affairs and Trade, 2020a). The country's geography is very diverse. It consists of high mountain ranges, deep valleys and swiftly flowing rivers, with tropical forest, swampy inlets in the coastal areas and deep blue oceans surrounding the 600 plus Islands. Many villages are accessible only by sea, air and foot making it difficult to access basic services. However, in the past two decades roads and bridges have been constructed to bring services in the mainland and some of the island provinces of PNG.

Even though PNG is rich in natural resources (minerals, forestry, fishing and agriculture), the country continues to confront development challenges to provide services for its growing population. Especially, people in the rural areas and urban poor population[7]

Education and health services are mostly provided by the government and the Faith Based Organisations (FBO) - churches in the rural areas of PNG. These services are subsidized by the government (National Department of Health Papua New Guinea, 2010). Agricultural produce has been a major commodity both in the mainland and island provinces for cash to sustain the livelihood of the people. Although there are few challenges in accessing basic services in some remote villages, the PNG government has committed to build road infrastructure so services can be delivered in these locations, and or the people in these catchment can access better services in the provincial and districts towns (Ascroft, Sweeney, Samei, Semos, & Morgan, 2011).

2.6 HIV in Papua New Guinea

PNG has the highest number of people living with HIV in the Pacific and accounts for 95% of all HIV cases in the Oceania region (World Health Organisation, 2019). In 2017, approximately 48,000 people were living with HIV compared to 34,000 in 2009 (HIV AIDS Asia Pacific Research Statistical Data Information Resources AIDS Data Hub, 2018). Prior to introducing antiretroviral treatment, an estimated 1,300 people died from AIDS yearly with a cumulative total of 11,520 deaths, leaving behind 5,610 orphans. After the introduction of antiretroviral treatment in 2009, there were around 1,100 AIDS related deaths yearly and

[7] People living in the settlements of the city with no fortnight salary or garden to sustain their livelihood.

1,200 new HIV-related orphans in 2017, with 2,800 new cases of HIV reported annually (HIV AIDS Asia Pacific Research Statistical Data Information Resources AIDS Data Hub, 2018)

PNG has a national HIV prevalence of approximately 0.9% (National AIDS Council of Papua New Guinea, 2018). The highest HIV burden is Enga province (1.77%) in the highlands region and the lowest is New Ireland Province with 0.37%.

The HIV epidemic is concentrated in some Highlands provinces, the NCD and among key populations across the country: men having sex with men; female sex workers; partners of female sex workers; people in polygamous relationships or with multiple sexual partners; and highway truck drivers exchanging cash and goods/services (National AIDS Council of Papua New Guinea, 2018).

HIV in PNG is mostly transmitted heterosexually through unprotected vaginal and anal sex between men and women (91.1%), mother-to-child transmission (3.6%), unprotected anal sex among MSM (2.6%), body piercing or tattooing (2.0%), and occupational exposure (0.6%; National AIDS Council of Papua New Guinea, 2018). In addition, PNG's diversity of cultures have different sexual values, norms, beliefs, and practices that all influence HIV transmission. In many cultures in PNG's highlands provinces, polygamy is a traditional cultural practice. This poses increased risk for HIV transmission because, by definition, a man will have multiple sexual partners. The exchange of sex for cash and services; penile modification and inserts; low condom use; high level of sexual violence and rape are common in PNG and increase the risk of HIV transmission (MacLaren *et al.*, 2013; National AIDS Council of Papua New Guinea, 2010; Vallely *et al.*, 2010; 2014; 2015). The excessive

use of alcohol and marijuana is also associated with sexual violence and unprotected sex. Intravenous drug use is not common in PNG, and as such not an important factor for HIV transmission. However, recent reported cases of intravenous drug use indicate that it is possibly under-reported, which needs to be closely monitored for accurate reporting of HIV transmission in PNG (National AIDS Council of Papua New Guinea, 2018).

Overall, the HIV epidemic in PNG has slightly improved, with a decrease in AIDS-related deaths of 2,800 in 2009 to 1,200 in 2017. Also new cases per year have fallen from 2800 in 2009 to 1,200 in 2017. HIV reporting and monitoring has been effectively established from rural and urban centres to monitor the epidemic (HIV AIDS Asia Pacific Research Statistical Data Information Resources AIDS Data Hub, 2018). It is important for PNG to work closely with the high risk population to address the new cases (HIV AIDS Asia Pacific Research Statistical Data Information Resources AIDS Data Hub, 2018).

2.7 HIV Prevention in Papua New Guinea

The PNG National AIDS Council (NAC) endorsed its first National HIV Prevention Strategy (NHPS) in 2009. The National HIV Prevention Strategy formed the basis for prevention in the National Health Planning System (National AIDS Council of Papua New Guinea, 2010). The main goal of the National HIV Prevention Strategy is to reduce the transmission of HIV and STIs in PNG using a combination of prevention approaches recommended by UNAIDS (National AIDS Council of Papua New Guinea, 2010). The three priorities for the strategy to achieve the goal are: prevention, treatment, and care and support.

Under these three priorities, combined prevention strategies have been established to respond to HIV in PNG, including: i) caring for antenatal women to prevent parent-to-child transmission ; ii) maintaining guidelines for universal precautions (gloves, mask, sterilisation of instruments) in the health care facility by the health care workers; iii) providing awareness on precautionary measures in injecting practices, penile modification and other emerging transmission routes among the most at risk population; iv) establishing effective management of STIs and HIV treatment for positive people (ARV and STI treatment); and v) addressing social and cultural issues that disempower women and children and prevent them from accessing services (VCT, condom use, free antenatal check-ups) and providing resources that could protect them from HIV (National AIDS Council of Papua New Guinea).

The updated prevention strategy from 2018-2022 has included HIV self- testing, VMMC, and pre-exposure prophylaxis for high risk people who are HIV negative (National AIDS Council of Papua New Guinea, 2018). These strategies further provide support mechanisms for high risk populations including sex workers (men and women), migrant workers, enclave workers, prisoners and mobile men with money. For example, land owners, politicians, businessmen. Partners of those at-risk populations are also vulnerable to HIV and are included in the prevention intervention. The prevention strategies further address alcohol and drugs (marijuana and home brew) that are commonly used throughout PNG and affect individual decision making in relation to sexual behaviour and their ability to protect themselves and others from HIV (National AIDS Council of Papua New Guinea, 2018).

As reported by the National AIDS Council, Papua New Guinea has made significant progress in mainstreaming HIV prevention in the key sectors of law and justice and education. In addition, it is reported that increased numbers of condoms have been distributed

by non-government organisations (NGOs) and there are an increased number of testing sites and HIV tests (National AIDS Council of Papua New Guinea, 2018). There has also been a change in HIV service delivery through civil society, particularly in terms of the care, support and treatment provided by faith based organisations and NGOs (National AIDS Council of Papua New Guinea, 2018). Despite its presence in strategy, PNG has not formally introduced VMMC, pre- exposure prophylaxis (PrEP); and self- testing for HIV due to shortages of funds (T. Lupiwa, personnel communication, October 18, 2020).

Although PNG has established HIV prevention strategies and ongoing HIV prevention activities in the provinces and urban settings, there are challenges in funding these programs (National AIDS Council of Papua New Guinea, 2018). PNG needs to move beyond HIV awareness to implementing a full range of evidenced-informed interventions. For example, the best evidence for effective preventive interventions to address HIV among people from high risk geographical settings and those at-risk populations in PNG is still needed.

2.8 Male circumcision in Papua New Guinea: 10 Years of Research Evidence

Over the past decade, extensive research has been undertaken to investigate male circumcision for HIV prevention in PNG (MacLaren *et al*., 2013; Tommbe *et al*., 2013); Tommbe *et al*., 2013; Vallely *et al*., 2015; Redman-MacLaren *et al*., 2015; Gray *et al*., 2014; Tynan *et al*., 2014). This section of the chapter briefly discusses the various MC for HIV prevention studies conducted in PNG in the last decade. The key findings of these studies are also provided in Table 2.1.

MC is a cultural practice in some parts of PNG (Manineng, 2017). Men from these cultures have introduced MC practices to other men from non-cutting areas at schools and work places. Since then MC has become a common practice among young men across the country (MacLaren *et al*., 2013). Several MC studies show diverse reasons and styles of existing foreskin cutting among men in different traditional and contemporary settings in PNG (Hill *et al*., 2012; MacLaren *et al*., 2013). The reasons given for foreskin cutting included traditional ceremonies, religious reasons, contemporary initiation into peer group, enhancement of sexual pleasure, improved genital hygiene, and masculinity purposes (Kelly *et al*, 2012; MacLaren *et al*., 2013; Tommbe *et al*., 2013).

The different types of foreskin cutting and penile modification include: traditional foreskin cutting practices; medical circumcision; contemporary penile cutting; and penile inserts (Kelly. *et al,* 2012; MacLaren *et al*., 2013). The most common form of foreskin cutting in PNG is the dorsal split, where the foreskin is cut from the centre of the prepuce of the penis leaving skin hanging on both sides of the penis. These cuttings are performed by traditional male elders, peers, nurses and community health care workers in the rural areas (MacLaren *et al*., 2013).

Acceptability of MC for HIV prevention is high among adult men from both traditionally non-cutting and cutting regions of PNG. There is also overwhelming support from communities and community leaders (MacLaren *et al*., 2013). However, women's views differ: some married women strongly support MMC for their male children because of their religious beliefs and for hygiene reasons, while there is a show of hesitation from their spouse/partner for fear of MMC promoting promiscuous behaviours; some said it was against

the religious faith, while others said it was a new practice in some cultures and it was culturally inappropriate (Kelly *et al*., 2013; Redman-MacLaren, 2015).

There is a correlation between MMC and HIV prevalence in PNG. An ecological study showed a strong association between the regional distribution of HIV prevalence and MMC (including the dorsal split). Foreskin cutting practicing regions (MOMASE and NGI) have low HIV prevalence, while regions that do not practice foreskin cutting (Southern and Highlands) have high HIV prevalence (MacLaren *et al*., 2015; National AIDS Council of Papua New Guinea, 2010). Another cross-sectional study on men accessing STI clinics in several highlands provinces shows that men who have been circumcised (both full and partial removal of foreskin) were more likely to be HIV negative, while men with foreskin intact were more likely to be HIV positive (Vallely *et al*., 2015).

MMC is performed in PNG's health facilities although it is not formally established. Two separate studies revealed that some health facilities were performing MMC on demand, despite no policy at the national level (Tynan *et al*., 2014; Tynan *et al*., 2013). These studies also revealed that nurses and community health workers in rural PNG are conducting unauthorised MMC as part of a concept of service, community relations, expectations and perceived responsibilities for additional duties (Tynan *et al*., 2014; Tynan *et al*., 2013). Most of the foreskin cuttings were performed by front line health care workers who were not accredited to perform MMC. The foreskin cuttings were performed outside the health facilities by the health care workers as a voluntary service to the community, for which customary gifts were given as a show of appreciation. The most common forms of foreskin cuttings done by the front line health care workers were dorsal splits and partial removal of the foreskin (Tynan *et al*., 2014; Tynan *et al*., 2013).

It is not feasible to implement MMC at the national level for HIV prevention. A mathematical modelling study cautioned health authorities in PNG against implementing a nation-wide MMC program due to the moderate national HIV prevalence rate of 0.9% and also PNG's existing complex forms of foreskin cutting practices (Gray *et al*., 2014). The dorsal split cuttings require further evidence to confirm protective effects. The study also suggested MMC be implemented in regions of high HIV prevalence and low MMC practice, including NCD (1.64%) and the Highlands region (1.1%) with high HIV prevalence respectively (Gray *et al*., 2014; National AIDS Council of Papua New Guinea, 2018) .

I am involved in an ongoing NHMRC funded histopathological study exploring the foreskin for possible protective mechanisms for dorsal foreskin cutting in HIV prevention. If a plausible mechanism is demonstrated, then options for men to choose between dorsal splits or full MC can be provided

Table 2.1 Summary of the male circumcision studies in PNG for the past 10 years

Bibliographic details	**Type of study**	**Key results**
Manineng, MacLaren, & Baigry *et al*., 2017. Re-establishing safer medical-circumcision integrated initiation ceremonies for HIV prevention in a rural setting in Papua New Guinea. A multi-method acceptability study	Multi Method Acceptability study	▪ The acceptability of integrating cultural foreskin cutting with medical intervention is high amongst the community leaders ▪ Support for re-establishing cultural male initiation ceremony ▪ Concerns raised between introduced religious beliefs and cultural beliefs ▪ Consideration for cultural beliefs in penile bleeding that symbolises the initiation of the transition of a male from childhood to adulthood. ▪ Limited funding to integrate cultural initiation program with the medical male circumcision program funding.
Redman-MacLaren, Mills, & Tommbe *et al*., 2017.* Implications of male circumcision for women in Papua New Guinea: a transformational grounded theory study	Grounded study	▪ Women know a lot about MC and penile modification and the impact on them, their families and the wider community. ▪ Their power of choice to act on the sexual health knowledge depends on social, economic and cultural factors. ▪ Women have to weigh out their safety to make decisions about the information they have, especially with their husbands.
Vallely, MacLaren, & David *et al*., 2015. * Dorsal longitudinal foreskin cut is associated with reduced risk of HIV, syphilis and genital herpes in men: Results of a prospective study among men attending voluntary confidential	Prospective study among men attending VCT clinics in the highlands of PNG	▪ Men with full foreskin intact were at high risk to contract HIV, Herpes simplex type -2 (HSV-2) and Syphilis. While men with a dorsal longitudinal foreskin cut were at lower risk of HIV, HSV-2 and syphilis. ▪ There is some means of protection from HIV and the earlier mentioned STI for man who have dorsal slits.

* I am a co-author to this publication: Implications of male circumcision for women in Papua New Guinea: a transformational grounded theory study.

* I am a co-author to this publication: Dorsal longitudinal foreskin cut is associated with reduced risk of HIV, syphilis and genital herpes in men: Results of a prospective study among men attending voluntary confidential HIV counselling and testing services in Papua New Guinea.

HIV counselling and testing services in Papua New Guinea		
Jayathunge, McBride, & MacLaren *et al*., 2015. Men in Papua New Guinea accurately report their circumcision status.	Retrospective non-interventional study	▪ This study reports that self-reporting of male circumcision status in PNG is highly reliable when compared with the investigator assessment.
MacLaren, McBride, & Kelly, & Gerard *et al*., 2015.* HIV prevalence is strongly associated with geographical variations in male circumcision and foreskin cutting in Papua New Guinea: an ecological study.	Ecological study	▪ MC prevalence in PNG strongly associate with the HIV prevalence. ▪ Regions with existing MC practices shows low HIV prevalence than regions with no MC practice have high prevalence of HIV
Jayathunge, McBride, & MacLaren *et al*., 2014. Male circumcision and HIV transmission: what do we know?	Literature review	▪ The literature review in this study provides evidence that the inner foreskin surface is likely the main entry point of the HIV virus. However, whether the excision of the inner foreskin accounts for all protection is yet to be established. ▪ The protection mechanism can vary from the thickness of the keratin layers and the density of the target cells for HIV between the outer and inner foreskin surface. Or may be due to the drying of secretion after sex, or loss of microbiome that attract.
Richard, Vallely, & Wilson *et al*., 2014. Impact of Male Circumcision on the HIV Epidemic in Papua New Guinea: A Country with Extensive Foreskin Cutting Practices	Mathematical modelling study	▪ Medical male circumcision may have less impact for HIV prevention intervention if PNG's dorsal slits style of foreskin cutting shows greater protective efficacy against HIV acquisition. ▪ This study further highlights that condom usage together with the dorsal slits (depends on efficacy) will increase the HIV prevention rate by 10 percentage (18,400 infection) over time period.

*** I am a co-author to this publication: HIV prevalence is strongly associated with geographical variations in male circumcision and foreskin cutting in Papua New Guinea: an ecological study.**

Tynan, Vallely, & Kelly *et al*., 2014. Building social currency with foreskin cuts: A coping mechanism of Papua New Guinea health workers and the implications for new programs	Qualitative study (focus group and in-depth interviews)	▪ Front line health care workers in rural PNG have been performing foreskin cutting as a coping mechanisms. This is to satisfy their moral, professional and cultural obligation. ▪ Although economic gains are not explicitly derived, evidence exists that they meet other community and socio cultural responsibilities forming a social currency within local traditional economies" p 902.
Vallely, Ryan, & Allen *et al*., 2014. High prevalence and incidence of HIV, sexually transmissible infections and penile foreskin cutting among sexual health clinic attendees in Papua New Guinea.	A longitudinal clinical study	▪ Reports from the sexual health client's shows high incidence and prevalence of STI, HIV and penile cutting among clients who access the STI/HIVAIDS clinic. ▪ Study recommended for confirmation of the finding with large scale feasibility study.
Kelly, Kupul, & Aeno *et al*., 2013. Why Women Object to Male Circumcision to Prevent HIV in a Moderate-Prevalence Setting.	Qualitative study (Focus group and in-depth interviews)	Very few woman supported MC for HIV and other STI's and for health benefit. However majority of the women objected MC for HIV prevention because: ▪ perceived that MC would result in sexual risk compensation ▪ male circumcision goes against some Christian faith ▪ Male circumcision was culturally inappropriate in some cultures.
Tynan, Hill, & Kelly *et al*., 2013. Listening to diverse community voices: The tensions of responding to community expectations in developing a male circumcision program for HIV prevention in Papua New Guinea.	Multi-method qualitative study	▪ Consideration given to involve community participatory when developing male circumcision program. ▪ Male circumcision programs need to be culturally safe, and is specific to their local needs to avoid tensions rising between biomedical knowledge and any medical legal requirements. ▪ Important to ensure male circumcision is accessible to the community when implemented.
Tynan, Vallely, & Kelly *et al*., 2013. , Sociocultural and individual determinants for motivation of sexual and reproductive health workers in Papua New Guinea and their implications for male circumcision as an HIV prevention strategy.	Multi-method qualitative study	▪ This study reports that it is important to involve the community's expectation and influences when delivering MC for HIV prevention. Especially, the communities that have MC as the traditional practice. ▪ The motivational influence for health workers who serve in the community is vital. Involving health workers and communities expectation may lead to a successful MC program.

MacLaren, Tommbe, & Mafile'o *et al*., 2013. *Foreskin cutting beliefs and practices and the acceptability of male circumcision for HIV prevention in Papua New Guinea.	Cross-sectional multi-centre study	▪ More than half of the study participants have dorsal slits and full removal of the foreskin. ▪ High MC acceptability rate ▪ Multiple range of foreskin cutting practice in PNG ▪ Diverse reasons for foreskin cuttings in PNG ▪ Most dorsal foreskin cuttings were done outside the health facilities while full removal of the foreskin were done at the clinic by a health worker.
Tommbe, MacLaren, & Redman-MacLaren *et al*., 2013.* Researching male circumcision for HIV prevention in Papua New Guinea: a process that incorporates science, faith and culture.	Mixed qualitative and quantitative study method	Despite the cultural taboo and secrecy of religious practices in PNG, this study reports: ▪ It is possible to conduct sensitive sexual health research at a faith-based university in PNG. ▪ Both genders openly discuss sensitive sexual health issues in separate groups which were culturally appropriate. ▪ Participants affiliated with the faith based freely discussed male circumcision for HIV prevention with less hesitation. ▪ The cultural and religious tension were appropriately addressed through cultural ties and pre-existing relationship with the student leaders. Furthermore gendered sensitivity and constant communication between the researchers reinforced trust between the researchers, student leaders and the participants.
Redman-MacLaren, Mills, & Tommbe al., 2012.* Women and HIV in a moderate prevalence setting: An integrative review.	Integrative literature review	▪ The gendered literature review specifically for women shows specific needs for women in HIV in areas of economic, social and cultural factors, knowledge about HIV, and religious beliefs about HIV. ▪ Literature about women and HIV in PNG focuses on women who sell sex and young girls or mothers.

* I am a co-author to this publication: Foreskin cutting beliefs and practices and the acceptability of male circumcision for HIV prevention in Papua New Guinea

* I am the first author to this publication: Researching male circumcision for HIV prevention in Papua New Guinea: a process that incorporates science, faith and culture.

* I am a co-author to this this publication: Women and HIV in a moderate prevalence setting: An integrative review.

		▪ Women are often perceived as victims or are responsible to transmit HIV virus in the communities.
Hill, Tynan, & Law *et al*., 2012, A typology of penile cutting in Papua New Guinea: results of a modified Delphi study among sexual health specialists.	Delphi study	▪ There were three broad categories of foreskin cutting in PNG identified in study. This include: male circumcision; longitudinal incision or dorsal slits of the foreskin; and foreskin cutting that did not alter the foreskin penis. Recommendations were made to further examine the protective mechanism of the longitudinal incision for HIV prevention in PNG.
Kelly, Kupul, & Richard *et al*., 2012. More than just a cut: A qualitative study of penile practices and their relationship to masculinity, sexuality and contagion and their implications for HIV prevention in Papua New Guinea.	Qualitative study	▪ This study shows PNG has diverse practices of foreskin cutting and penile modification. These practices are categories as follows: traditional penile cutting; medical circumcision; contemporary penile cutting; penile inserts; and the urethral bloodletting practices. ▪ The foreskin cutting and practices are associated with masculinity and sexuality. The study recommended that consideration be given to the existing practices should MC be formalised in PNG's health system.
Kelly, Kupul, & Fitzgerald *et al*., 2012. Now we are in a different time; various bad diseases have come." understanding men's acceptability of male circumcision for HIV prevention in a moderate prevalence setting".	Multi-method qualitative study	▪ Majority of the men supported male circumcision for HIV prevention. ▪ Most men said male circumcision was good for their health, hygiene, and enhances sexual pleasure. ▪ Few participants were against male circumcision because it was culturally and religiously inappropriate.
Tynan, Vallely, & Kelly *et al*., 2012. Vasectomy as a proxy: extrapolating health system lessons to male circumcision as an HIV prevention strategy in Papua New Guinea.	Mixed method qualitative approach	▪ The vasectomy program suggest that health system requires strengthening prior to implementing male circumcision for HIV prevention program. ▪ Health system challenges in vasectomy program include financing of the program, retaining of staff and training of staff to perform vasectomy, inconsistence support from government ▪ The study suggest good leadership and communication between all stake holders of the program as well as the provincial and national government is important for male circumcision program.

Vallely, Maclaren, & Kaleva *et al*., 2011. [***] MC for HIV prevention in PNG: A summary of research evidence and recommendations for public health following a national policy forum.	Recommendations for National Policy Forum on MC for HIV prevention in PNG	Three key recommendations from the national forum were : ▪ National Department of Health and National AIDS Council to form a joint committee on MC policy. ▪ Establish an integrated harm reduction program ▪ Future policy on wide-scale roll-out of MC for HIV prevention in PNG informed by a combination of data from (a) MC intervention programs and (b) research results on the potential protective effect of other forms of foreskin cutting in PNG.
Vallely, Page, & Dias *et al*., 2010. The prevalence of sexually transmitted infections in Papua New Guinea: A systematic review and meta-analysis.	Systematic Review and Meta-Analysis	▪ There was high prevalence of STIs (syphilis, trichonomous, chlamydia, & gonorrhoea,) in all study settings. ▪ The high prevalence of STI were mostly among female sex workers. ▪ Variability in STI prevalence between geographical settings and sexual risk groups. ▪ The study recommended a revised STI and HIV surveillance system to ensure culturally appropriate behavioural and biomedical STI/HIV prevention programs are reported.

[***] I am a co-author to this publication: MC for HIV prevention in PNG: A summary of research evidence and recommendations for public health following a national policy forum

2.9 Historical Foundation of this PhD

A 'National HIV Policy Forum on Male Circumcision for HIV Prevention in PNG' was held in 2011. This forum was hosted by the PNG National AIDS Council, National Health Department of PNG, and the PNG Sexual Health Society. The forum was co-hosted by the PNG Institute for Medical Research (PNGIMR), NHMRC-funded MC study, and AusAID funded study. One of the key recommendations was to conduct more MC intervention studies to address evidence gaps highlighted during the forum. The studies were to provide policy information for possible implementation of MC for HIV prevention in PNG. Some of the gaps identified were: 1) the potential protective effect of other forms of foreskin cutting in PNG; 2) implications for women of MC; 3) cultural implications of MC; and 4) PNG's health system capacity in providing MC in high HIV prevalence settings. While other individuals and partnered researchers embarked on the first three study gaps, my study investigated the capacity of PNG's health system to provide MC in high HIV burden settings in PNG.

2.10 The health system in Papua New Guinea

Understanding the health system in PNG is necessary to comprehend the work that follows. In this section I will outline the structure of the PNG health system, followed by a description of the health workforce, funding and service delivery.

Papua New Guinea has a decentralised health system that governs and delivers health services in the country. In 2007, the health system in PNG shifted from centralised governance to a decentralised model. In other words, certain governing powers of the health system from the national level were shifted to the provincial level government. A provincial Health Authority Act was passed in Parliament in 2007 (National Department of Health Papua New Guinea, 2010). The Provincial Health Authority Act does not change the

accountabilities and responsibilities of the two levels of the government but enhances the ability of the government to directly finance the priority areas for health service delivery (National Department of Health Papua New Guinea, 2010). This act enables the transfer of financial powers from the national government to the provincial government. It also transfers the management of state hospital services and rural health services to provincial health authorities (National Health Plan, 2010; Australian Government Department of Foreign Affairs and Trade, 2011; National Department of Health Papua New Guinea, 2010).

PNG's health system has a hierarchal structure of seven levels of health care facilities. These are: national specialised referral hospital, regional hospital, provincial hospitals, district hospitals, health centre, sub health centre/ urban day clinic, and community aid posts (World Bank, 2017). Table 2.2 provides a summary of the different level of health care facilities, the number of the facilities, the population it serves, and the current minimum average health care workforce in each of the levels of structure.

Table 2.2 Characteristics of health care facilities

Level of Health Care Facilities	Number of Facilities	Population	Minimum average staff			
			Doctors	Health Extension officers	Registered Nurses	Community Health Workers
Specialsed Hospital	One	All country 8 million	30	5	200	120
Regional Hospital	Seven	-	25	5	200	120
Provincial Hospital	19		20	10	80	90
District Hospital	89	70,000	One	Three	Nine	22
Health Centre	677	-	-	-	Two	Five
Sub Health Centre	-	Rural: 2000-5000 Urban: 10,000	-	-	One	Three
Community Post	2,600	-	-	-	-	Two

Source: (World Health Organisation, 2019).

PNG is facing a health worker shortage. Although the government has invested in training human resources for health, still the country lacks adequate health care workers, and the existing workforce is unevenly distributed (National Department of Health Papua New Guinea, 2010). For example, the overall health workforce is inequitably distributed between rural and urban areas, with a large number tending to work in urban areas (World Bank, 2017). Also, by WHO standards, PNG's health workforce is insufficient compared to its population. The current National Health Plan Report for 2011-2020 highlights a nurse/midwife ratio to its population of 5.3: 10,000 people. While doctor to the population is 1:10,000 (World Health Organisation, 2019).

PNG's health system has a public-private partnership approach in delivering health care programs to the community. The health system in PNG is mostly governed and operated

by the government sector. PNG also has health care partners that deliver services. These include: church health agencies or faith based organisations (FBO), non-government health organisations (NGOs), and private health agencies including for- profit enterprise-based services or employment-related health care programs. The profit-oriented private facilities are mostly located in the Nation's Capital District and the regional centres. On the other hand, the employment- related private agencies mostly serve the employees and the communities in the mining and agricultural towns (National Department of Health Papua New Guinea, 2010).

In contrast to private providers, FBOs are an integral part of PNG's health system. The government subsidises over 80% of the service cost for FBOs. In return, the FBOs provide almost 50% of the rural and remote health care services in PNG (National Department of Health Papua New Guinea, 2010). Private, faith-based organisations and non-government organisations have been at the forefront of delivering health care services in the country, primarily those in rural settings. All the faith-based health care facilities have been historically funded by the PNG government (National Department of Health Papua New Guinea, 2010).

PNG's health system is mostly funded by the national treasury budget. The government of PNG financially support the health system from general taxation and with support from external donors such as Australian AID; Global Fund to Fight AIDS, Tuberculosis, and Malaria; and Bill and Belinda Gates Foundation (World Bank, 2017). In theory, all public health and primary health care programs are subsidised by the government and are free of charge to all PNG citizens. However, in most cases health care workers in these facilities charge user- fees for services because the health function grants do not reach the facility level in a reasonable time frame (World Bank, 2017).

Service delivery of the health care programs depends on the governing agencies funding the health workforce and other multi-sectoral approaches. Faith based organisations provide quality health service programs in the rural and remote health facilities. Funding delays from the government mostly affect the government services and when prolonged, they may also affect the FBOs. Health care service delivery is at times challenged by multi-sectoral issues that are beyond the health systems' control. For example, road conditions, electricity, and water shortages at the health care facility level (National Department of Health Papua New Guinea, 2010). Given the recent health system changes, the service delivery is likely to be monitored at closer proximity by the provincial health authorities. This might assist in ensuring that high quality health services are accessible to communities.

2.11 What is the Health System Capacity and Operational Feasibility to Provide Medical Male Circumcision in Papua New Guinea?

Male circumcision for HIV prevention is a potential HIV prevention program that could in theory be implemented through PNG's formal health system. The question is, whether PNG's health system has the capacity to provide MC in high HIV burden settings in PNG, and thus whether it is feasible to do so. Previous studies of MC for HIV prevention in PNG have found no formal MMC service despite the high acceptability among men, and that front line health care workers are performing MC (dorsal splits) beyond their scope of practice (MacLaren *et al*., 2013).

A mathematical modelling study in PNG predicted that male circumcision can have a positive impact on reducing HIV transmission (Gray *et al*., 2014). Therefore, health system and facility readiness is essential to incorporate MMC into a comprehensive HIV prevention strategy in selected high prevalence settings in PNG. Although there is no formal national

MMC program in PNG, it is important to assess the services that are incorporating MMC into routine practice or providing ad hoc MMC clinics. It is also important to seek health care workers and managers views and experience of MMC. The data can provide information about the governance and policies, health care workers, and whether sufficient equipment, medicine and supplies, adequate infection control measures, and appropriate space, monitoring and evaluation, logistics are available (World Health Organization & UNAIDS, 2008).

This PhD study helps fill the gap, by investigating the capacity for implementing MMC for HIV prevention in health care facilities, and exploring the relevant views, process and policies among health care workers and managers in high HIV prevalence settings in PNG.

2.12 Summary of Chapter Two

In this chapter, I have discussed the global HIV history, trends and the behavioural and biomedical prevention measures in place. I have discussed in detail the role of MMC for HIV prevention and the global health systems approach in implementing MMC for HIV prevention. This chapter continued to discuss the HIV status in PNG, the prevention measures in place, MC for HIV prevention studies conducted in the past decade and how this study came about. It concluded by providing an overview of PNG's health system and a briefly highlighting the way forward for PNG's health system in providing MMC for HIV prevention in high HIV burden settings.

The next chapter discusses the overall methodology of the study and the different methods used in the four study components.

Chapter 3. Study Methodology

Chapter Three describes and discusses the overall research design and methods used in this PhD study. The chapter provides details on the specific methods used in each of the four study components, describing specific instruments used in data collection, processes involved in data collection and the analysis process in each of the four study components. In addition, the chapter describes the ethical issues for the study and the ethics approval processes. The chapter further describes the dissemination of the study results beyond the PhD thesis.

3.1 Study design

This PhD aims to answer the overall research question: "What is the health system capacity to provide medical male circumcision for HIV prevention in high HIV prevalence settings in Papua New Guinea". To answer this question this PhD is structured with four study components; the overarching methodology and rationale for choosing each of these components are outlined later in the chapter:

1. Global systematic literature review.
2. Health service provider's views and experiences
3. Evaluation of Pacific Adventist University's male circumcision service.
4. Views and experiences of Enga's health care managers.

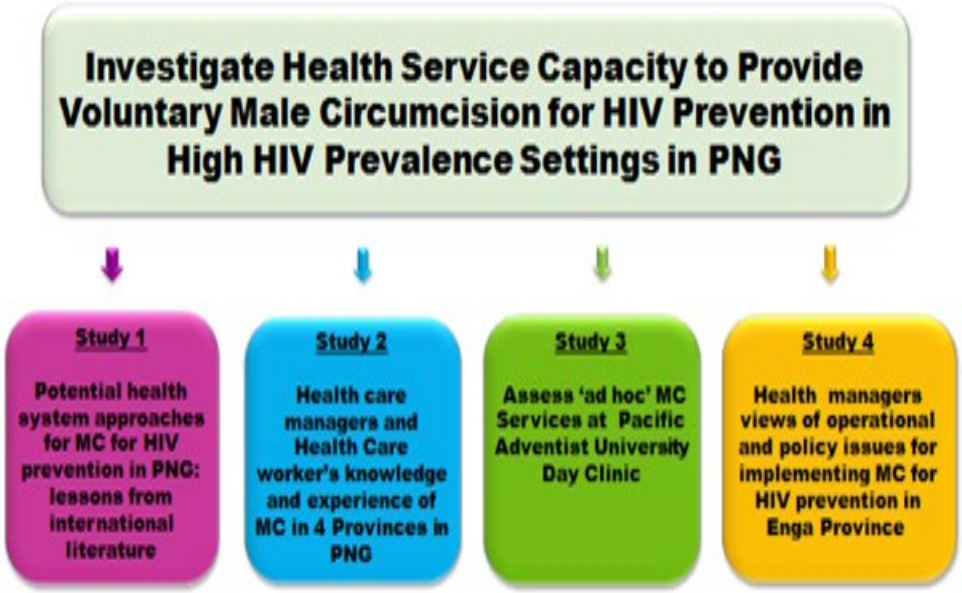

Figure 3.1 Main question and four study components

3.2 Methodology

Research methodology is the overall approach to research underpinned by a paradigm or theoretical framework (Mackenzie & Knipe, 2006). The main theoretical framework or theoretical paradigm underpinning this study is interpretivist/constructivist paradigm. This paradigm in research seeks to understand the world of human experiences (Creswell, 2017). The interpretivist/constructivist paradigm is based on the participant's views of the topic being studied. This interpretivist/constructivist paradigm is foundational to this study because it does not begin with a pre-conceived theory but works to "generate or inductively develop a theory or pattern of meanings" (Mackenzie & Knipe, 2006, p. 5). This study therefore seeks to understand the participant's worldview and experiences of implementing MMC for HIV prevention in high HIV burden setting in PNG. The data that emerges from the research

methods have been analysed to generate a pattern of meaning that informs a more in depth and context specific understanding of the research topic studied in this PhD.

Rajasekar, Philominathan and Chinnathambi (2013) described research methodology as “a systematic way to solve a problem”, or “a science of studying how research is to be carried out” (p. 5). Research methodology is therefore a set of “procedures by which researchers go about their work of describing, explaining and predicting phenomena” (Rajasekar *et al*., 2013, p. 5). I used these definitions to systematically design my PhD research to ensure the study findings addressed my study aims and objectives. I therefore needed to appropriately choose what data to collect, where to collect it (study sites), who to collect from (study participants), how to collect (methods of data collection and data collection tools), and how to analyse these data to generate the pattern of meaning that will relate to my topic under study.

There were three main methodologies available for me for this PhD: (i) qualitative, (ii) quantitative, and (iii) mixed methods (Creswell, 2009; Johnson & Onwuegbuzie, 2004; Rajasekar *et al*., 2013).

(i) Quantitative methods collect numerical data and often require the use of statistical tools for data analysis. This process allows the measurements of variables and relationships to be established and can be represented using tables and graphs (Carr, 1994).

(ii) Qualitative methods “collect data using conversational methods, where participants are asked open-ended questions and verbal responses are

collected. This approach helps a researcher understand what the participant's think, of how things work and why they think in a particular way" (Carr, 1994, p. 716).

(iii) Mixed method research designs integrate both qualitative and quantitative research methods. Data collected from mixed methods research are integrated, related, or mixed at some stage of the research process" (Creswell, 2009).

I chose a mixed methods approach to collect sufficient information on the current gaps in the health system response to MMC program for HIV prevention in high HIV burden settings in PNG. There are several key reasons why quantitative and qualitative research methods can be used together for this PhD study. Firstly, mixed methods can be helpful when results from one study approach are difficult to interpret, then the results from the other study approach can be used in interpreting the concept (Doorenbos, 2014). Mixed methods approaches can also "provide for cross-validation or triangulation, combining two or more data to study the same phenomena in order to gain a more complete understanding of that phenomenon or subject under study" (Yin, 1999, p. 1217).

Creswell describe six mixed method designs. (Creswell, 2009). In this study I used a concurrent triangulation design. The reason for choosing this mixed method design was, this study used multiple methods in four different studies. Most of the data collected from the four study components were around the same time and some were conducted in parallel to each other. Also, analysis and results of the data collected from the four components were integrated and interpreted to answer the overall research question. By using this mixed methods designs, I sought to compare and contrast the data collected from the four different

study components. More data available across the four different study components with various mixed methods approach, provided stronger evidence in place for the subject (Yin, 1999). This is illustrated by the concurrent triangulation design flow chart by Creswell (2009).

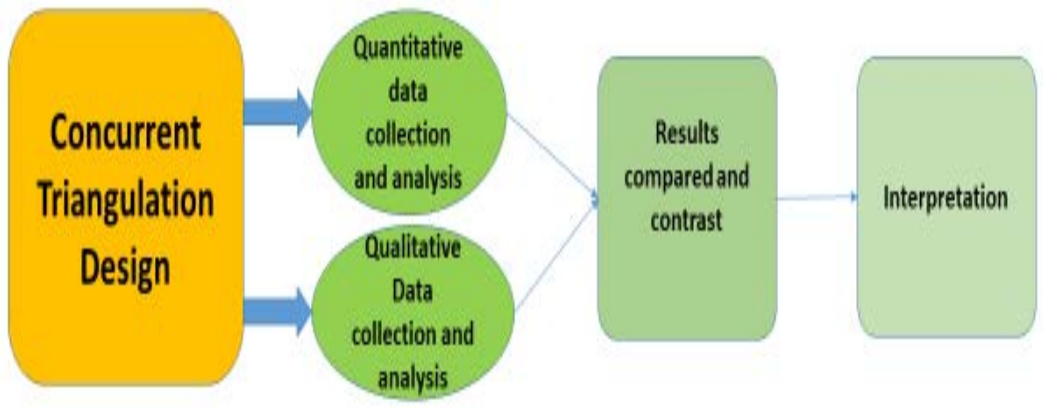

Figure 3.2 Mixed method concurrent triangulation of data collection

3.3 Methods

According to Rajasekar et.al (2013), research methods refer to “ways or techniques used to obtain new information or create better understanding of the research problem” and these include: surveys, interviews, experiments and many more that are guided by the main research design (p. 5). Each of the four study components used different methods, data collection tools and analytical frames. Research methods and data collection tools included document analysis, survey questionnaires, focus group discussions, individual interviews, observation, and inventory audit. Each study component is describe in detail below with

specific details on data collection methods, tools and analytical frames outlined for each component.

3.4 PhD structure and logic

Figure 3.3 summarises the structure and logic of the overall PhD study. In exploring how best to address my research question, four main avenues of enquiry became apparent. This chapter will now systematically provide more detail on each component and describe how the various data collection methods and the results were integrated to generate new knowledge in the area of health system capacity to provide male circumcision for HIV prevention in high HIV burden settings in PNG.

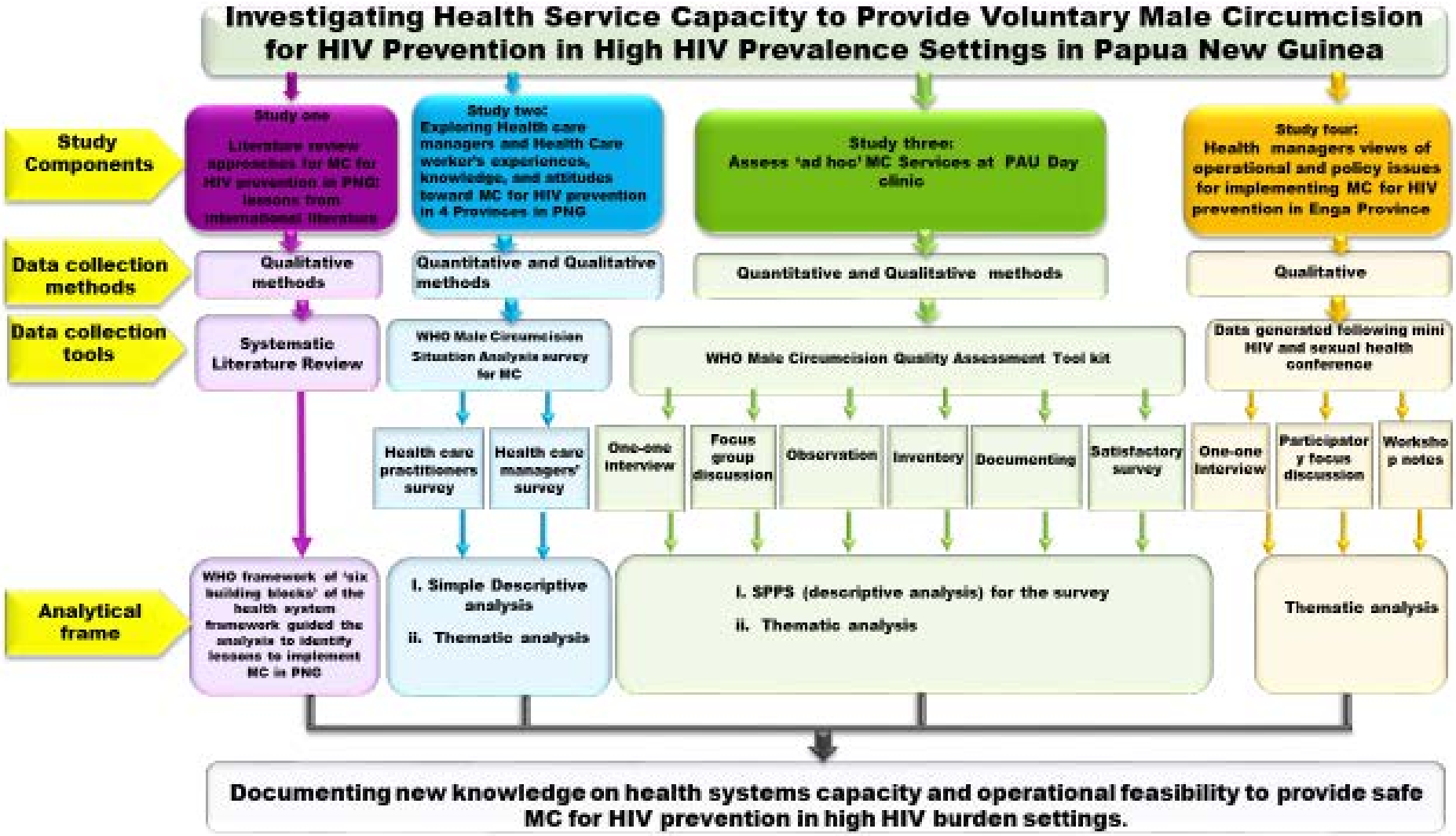

Figure 3.3 PhD structure and logic

3.5 Component 1: Systematic literature review

In study component one, I conducted a systematic literature review to inform me of existing studies and evidence of health systems provision of MMC for HIV prevention in developing countries. The aim of the literature review was to investigate what is known about the health system issues relating to MC provision for HIV prevention in Africa and elsewhere in the world to inform the PNG health system, should voluntary medical male circumcision for HIV prevention be implemented in high burden settings in PNG.

Study design

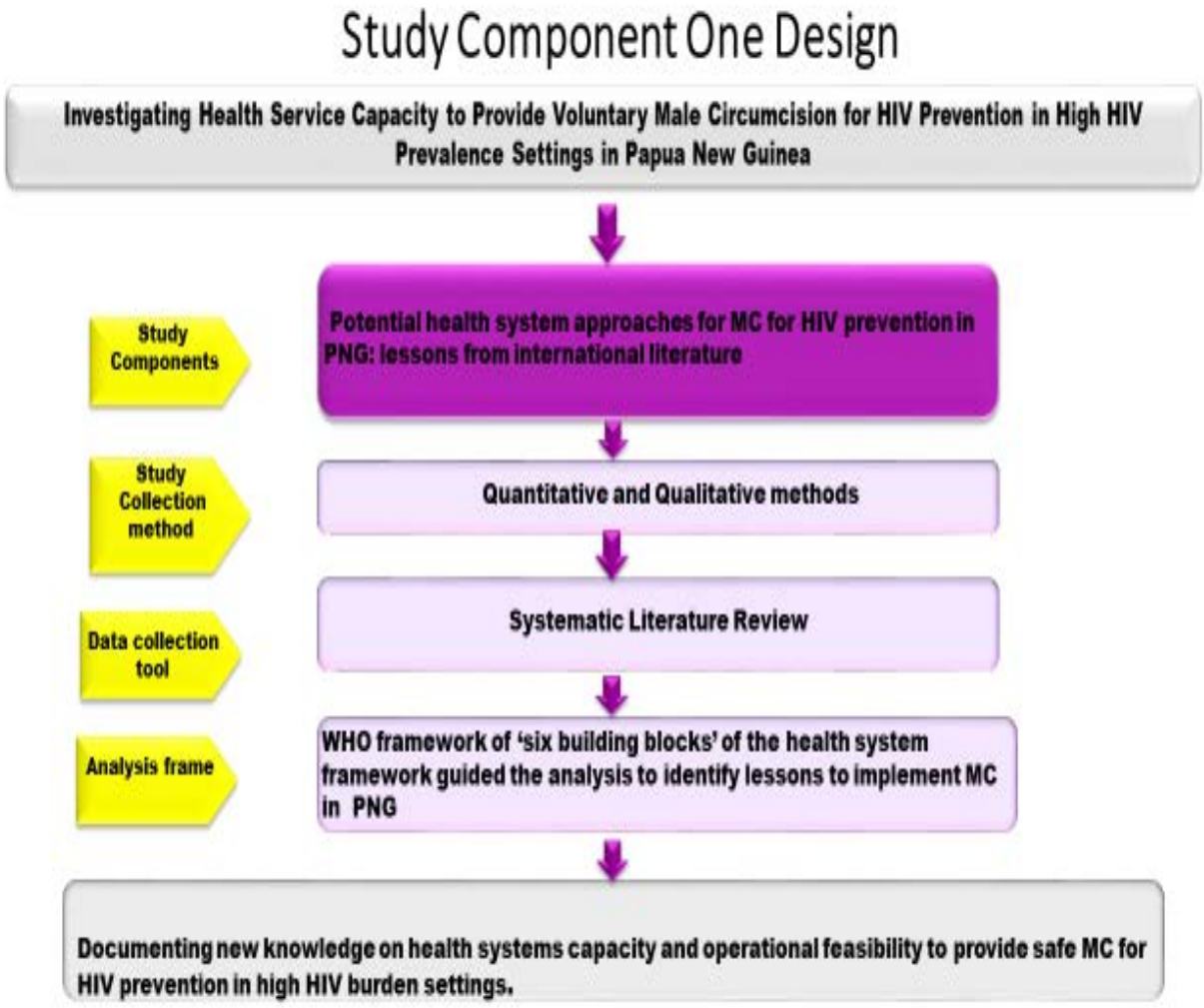

Figure 3.4 Component one structure and logic

Systematic literature review process and search criteria

The systematic review was performed following PRISMA guidelines to locate and appraise journal articles that reported on health system responses to VMMC for HIV prevention (Young & Solomon, 2009). I worked closely with my primary supervisor to ensure the eligible literature was selected and screened appropriately. Articles were identified from the following databases: PubMed; SAGE and Scopus. The articles selected were published from 2010 to 2020. The search was conducted throughout September, 2016 and was updated in May 2020. The search keywords included: male circumcision, HIV prevention, and health system or health service. The initial evaluation of the studies retrieved was undertaken by review of the title and the abstract. Inclusion criteria included original articles that reported on: i) male circumcision for HIV prevention; ii) health system or health service influences on VMMC programs; iii) were relevant to PNG context; and iv) published in English.

Eighty-seven full-text articles were screened and summarised in a table format according to the title, author, date of publication, source of articles, summary of the findings and relevance to PNG's health system context.

Analysis process

I used the World Health Organisation (WHO) Framework of Health Systems Building Blocks to apply a systems thinking approach to categorise and analyse articles identified in a form of narrative synthesis (World Health Organisation , 2007a). The building block framework was designed by WHO to promote a common understanding of what constitutes the key components necessary for health systems strengthening: leadership and governance; finance; service delivery; health workforce; access to medicine, vaccines and technologies;

and health information systems (World Health Organisation , 2007a). I chose the WHO framework of the health system building blocks and its arrangement to guide me in literature analysis because it supported my study aim. Thematic analysis by building block, and then a narrative synthesis was used. The six building blocks of the health system became the categories I used to analyse the texts reviewed in the selected literature. The emerging analysis was discussed with my primary advisor for verification. Implications for MMC services in PNG were highlighted against all six health system building blocks. A detailed desctription of the specific methods and results of study component one are in Chapter Four of this thesis.

3.6 Component 2: Health service provider views about male circumcision

In Study Component Two, I explored the views, experiences and attitudes of health care workers (HCWs) and health facility managers towards male circumcision for HIV prevention in PNG. This component of the study explored the views of HCWs and managers on their knowledge and skills about MMC for HIV prevention, qualifications and experience of staff to perform MMC and thoughts on formal MMC for HIV prevention programs. This component also explored whether health facilities had resources to provide MMC for HIV prevention.

Study design

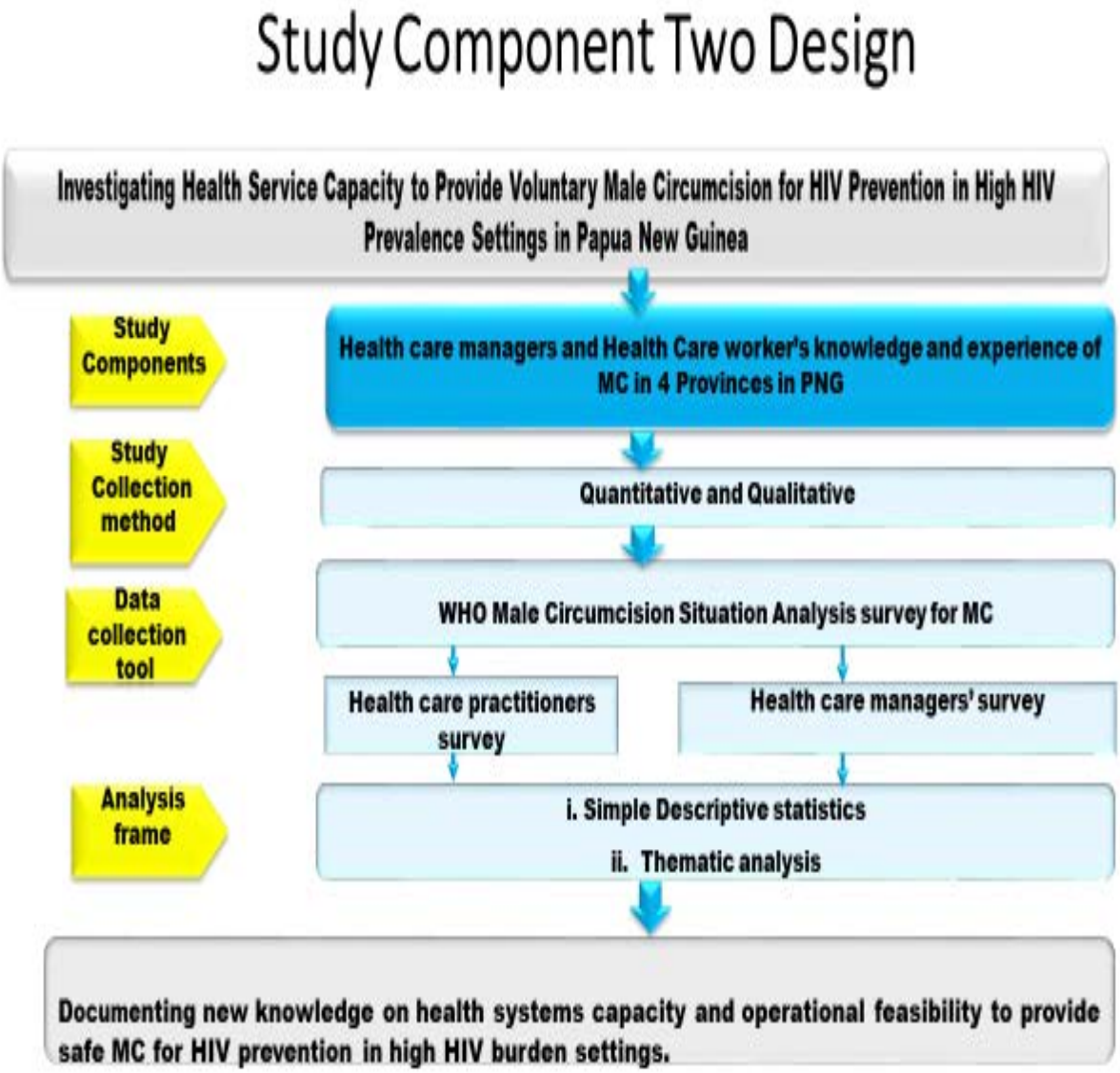

Figure 3.5 Component two structure and logic

Study setting

This PhD study component used pre-existing data from a large cross-sectional survey of the "Acceptability and feasibility of male circumcision for HIV prevention in PNG study" (MacLaren *et al*, 2013). Data were collected across four sites (Porgera gold mine; Igaturu oil palm plantation; Divine Word University; and Pacific Adventist University) in four provinces (Enga, National Capital District (NCD), Madang, and Oro) from 2010 to 2013. This

acceptability and feasibility study was a collaboration between James Cook University (JCU), Pacific Adventist University (PAU) and Divine Word University (DWU), funded by Australia's National Health and Medical Research Council (NHMRC). I was the PNG field coordinator of the study and was intimately involved in the study design, data collection, and data analysis across many sub-studies within the overall acceptability study. The headline results of the acceptability of MMC for HIV prevention were published in 2013 and showed that men overwhelmingly accepted MMC as a HIV prevention measure across PNG. As a part of this large study, data were collected on the experience of health managers and health workers in delivering MMC services, either formally within the health service or informally in a community setting. Data from this health system sub-study within this acceptability and feasibility study had not been analysed in detail and remain unpublished (MacLaren *et al.*, 2013). This provided an opportunity for me to analyse these data as an important component of my PhD to investigate the health system capacity to provide MMC for HIV prevention in PNG.

Selection of the study sites

Health care facilities involved were: in and around (i) Port Moresby, (ii) Popendetta, (iii) Porgera and (iv) Madang. Health facility managers were informed by researchers through email, phone calls and visits to negotiate the availability of health care workers to be involved. A total of 17 health care facilities responded and participated in the study.

Recruitment and sample size

Two groups were recruited within each health care facility: (i) facility managers; and (ii) health care workers (including nurses, doctors, health extension officers and community health workers). The manager of the health care facility appointed a time to meet with health

care workers. A brief session on the nature of the study and the ethical rights of the participants in this research study was verbally provided. Written information and consent sheets were also provided. Health care workers and managers who volunteered to participate in the study signed a written consent form.

A purposive sampling approach was used to recruit participants. A total of 133 practitioners completed the health practitioner's survey and 11 managers completed the facility manager's survey.

Data collection tools

A survey tool is commonly used in quantitative research methods where the researcher administers a standardised questionnaire to participants (Kelley, Clark, Brown, & Sitzia, 2003). The survey can be a written document that is completed by the person being surveyed, an online survey, face-to-face or telephone interview. Surveys are designed to provide a snapshot of how things are at a specific time. Surveys are well-suited to descriptive studies but can also be used to explore a situation or to seek explanation and provide data for testing hypothesis (Kelley *et al.*, 2003).

Two sets of self-administered survey tools were used in collecting the data. The questions in each of the tools differ from each other. One survey was administered to the health care workers and the other survey was administered to the health care facility managers. The survey was based on the World Health Organisation Male Circumcision situation analysis toolkit (World Health Organisation , 2009b). Part one of the survey explored the health care practitioner's knowledge, experiences and attitudes of male circumcision for HIV prevention. Part two of the survey asked questions about the

infrastructure, equipment, views on possible implementation and challenges in establishing formal MMC program. The survey included: open-ended and closed questions; Likert scales; yes and no options; and multiple choice options (Appendix A: Health care workers and Health Care Facility Managers survey Parts 1 and 2).

The WHO survey was modified to suit the local context in PNG. Because of PNG's extensive foreskin cutting practice, terms such as 'male circumcision' were replaced with 'foreskin cutting' and questions were modified to include both complete circumcision (round cut) and partial circumcision (straight cut). For specific information on these types of foreskin cutting practices in PNG, refer to Chapter Two.

Data collection process

Survey forms were in blank envelopes and given to health facility managers in the 17 health care facilities. The health facility managers distributed the surveys to the health practitioners who volunteered to participate. Health facility managers who volunteered to participate were also provide health manager survey forms in separate blank envelopes.

Study information and consent forms were attached to the survey forms. Participants signed the consent form and voluntarily completed the questionnaire as instructed on the information sheets. Completed questionnaires were returned in a separate blank envelope that was then returned to the officer in charge of the facility. All paper forms were returned to researchers and data were entered in an Excel spreadsheet. The quantitative data were later imported into Statistical Package for Social Sciences (SPSS) software for analysis. Qualitative data from free text responses were copied on to a word document for analysis.

Quantitative data analysis

The responses to the multiple choice closed questions, Likert scales and yes and no closed questions were entered in the Excel spreadsheet. Both Excel and SPSS were used in analysing the data. Excel spreadsheet and SPSS are the software that are commonly used. They both have their pros and cons. Descriptive statistics were used to describe and understand the features of a specific data set by providing short summaries about the sample. Descriptive statistics were mean, median, and mode and presented in tables with numbers and graphs (Prvan *et al*., 2002). Prior to data analysis, data from all software files were cleaned to ensure data quality of the data set.

Qualitative data analysis

Self-administered, written, open-ended survey responses were entered and stored in Excel spreadsheets and later moved to Microsoft Word for analysis. A thematic analysis process was used to identify the main ideas that evolved from the open-ended survey questions (Braun & Clarke, 2006). I used thematic analysis because it has flexibility in interpreting the large data set I had collected on participant's views, opinions, knowledge and experiences from the study. It allowed me to easily approach my large data sets by sorting them into broad themes. Thematic analysis is a useful method of examining the perspective of different research participants, highlighting similarities and differences, and generating unanticipated insights (Castleberry & Nolen, 2018). It is also helpful in summarizing key features of a large set of datas*et al*lowing the researcher to take a well-structured approach to handle data to produce a clear and organized final report (Bengtsson, 2016; Castleberry & Nolen, 2018).

Thematic analysis process used in analyzing the qualitative data: Preliminary codes or categories were identified from the data to describe the contents of the responses from the open-ended questions. This was organized through repeated readings of the written data. Once the categories were identified and highlighted, I searched for patterns and themes from the codes provided. From the themes, I identified the most important features about the data in relation to the research objective which was to explore the views, attitudes and beliefs of health care workers and health care managers on MMC for HIV prevention

I finally used the themes to interpret and make meaning from the data I collected. A detailed description of the methods and results of Component Two are in Chapter Five of this thesis.

3.7 Component 3: Evaluation of Pacific Adventist University's male circumcision service

This study component evaluated the ad hoc MMC clinic at Pacific Adventist University (PAU) that periodically provides MMC for male university staff and students. The first ad hoc MMC service was provided in the mid 1990's for young men on campus to avoid unsafe foreskin cutting practices that were happening in the university dormitories and other locations on campus. The clinic now periodically provides a safe medical circumcision service on an ad-hoc, as needed basis. Although MMC for HIV prevention is not yet introduced to the formal health system in PNG, this ad hoc MMC service at PAU offers the opportunity to evaluate the quality and operational feasibility of providing a specific MMC service in PNG. This study used the WHO MC Quality Assessment Toolkit to evaluate the PAU MMC clinic for two reasons. First, to assess the quality of the current MMC service and second, to assess the readiness of the health system to adapt an MMC program should PNG wish to formally introduce it as an HIV prevention measure.

Study design

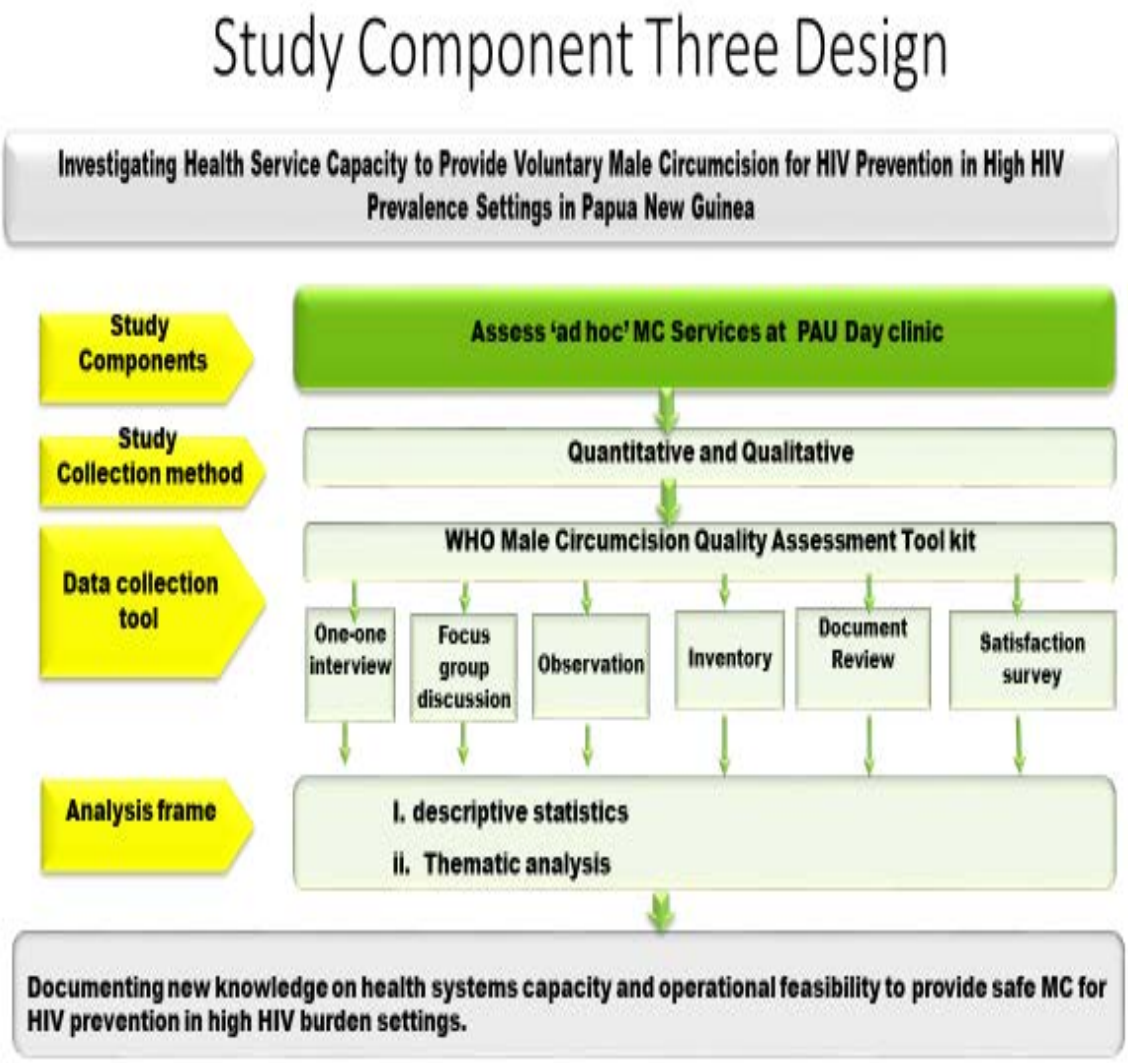

Figure 3.6 Component three structure and logic

Study setting

Study component three, operational feasibility, was conducted at Pacific Adventist University (PAU). The university owns and operates a small health care day clinic at the Koiari Park campus, which is 14 miles outside of Port Moresby, PNG. The day clinic serves university residents and the surrounding communities with an estimated population of approximately 10,000 people, and employs four full-time female registered nurses. The clinic

provides: antenatal care; family planning; child health clinic; follow-up of tuberculosis; and STI and HIV services. In addition to these established services, PAU's day clinic has also provided VMMC for the male university students on an ad hoc basis for almost two decades. Initially, the clinic provided MMC services as an alternative to foreskin cutting in the dormitories or at home. Informal foreskin cutting among the male students has public health implications including complications and infections. However, the demand for VMMC has increased in the last decade because of the ongoing research into MMC for HIV prevention conducted on the university campus (MacLaren *et al*., 2013; Redman-MacLaren *et al*., 2017; Tommbe *et al*., 2013).

Despite facilities that provide ad hoc VMMC in PNG, no research to date has examined facility preparedness or performance of VMMC procedures in the health facility to monitor the quality of the service and in turn ensure the safety of clients that access the VMMC service. Therefore, this study component evaluated the PAU MMC service. It assessed the facility preparedness and the quality of the VMMC service in terms of providing a safe MMC service.

Selection of study site

Selection of study sites depends on the objectives of the study. There are also pragmatic factors such as the distance, willingness of the participants, contacts to facilitate entry into the community, and previous experience(s) with the site (Harper & Zuckerman, 2006). PAU health care facility was chosen because PAU has an established and ongoing ad hoc MMC service. Numerous MMC for HIV prevention studies have also been conducted on the campus over the past decade (MacLaren *et al*., 2013; MacLaren *et al*., 2015; Redman-MacLaren *et al*., 2017; Tommbe *et al*., 2013).

Recruitment of the study participants and sample size

The selection of the study participants was guided by the WHO MC Quality Assessment Toolkit (see Section 3.4.5 below), chosen to collect data in this study component. I recruited two groups of participants: (i) health care workers and managers; and (ii) clients (male university students) accessing MMC services at the PAU clinic.

Purposeful sampling is a technique widely used in qualitative research to collect rich information to address the research question under study and for the most effective use of the limited resources. This involves identifying and selecting individuals or groups that are knowledgeable or have much experience of the topic under study (Palinkas *et al*., 2015). Purposive sampling was used in recruiting both participant groups. I purposely chose to interview all of the four health care workers to seek their views and experiences of the clinic. They were the experts and were knowledgeable in the areas of providing MMC in the clinic. All male university staff and students who received MMC surgery were invited at the six weeks post-surgery visit assess their experiences and satisfaction of the MMC program.

Upon receiving the ethical clearance for this study component (see Section 3.9 below), I emailed the officer in charge of the PAU Clinic to inform her of the nature of this study and sent the following documents: ethics clearance, study information sheet with invitation letter, and consent form. A brief session on the nature of the study and the ethical rights of the participants in this research study was verbally provided to available health care workers. The written information and consent sheets were also given to them. Health care workers who volunteered to participate in the study signed a written consent form.

An email invitation was sent to all male university students who had MMC surgery to invite them to take part in the satisfaction survey six weeks post MMC surgery. A total of 56 study participants were recruited: six health care workers and administrators and 50 male university students who had received MMC surgery.

Data collection process

An audit checklist toolkit designed by WHO to assess the quality of the MMC services provided by the health care facility was used to collect data (World Health Organisation , 2009a). The toolkit has been developed to assist facility managers and to assess MMC services to improve the quality of ongoing MMC services.

The WHO Quality Assessment Toolkit was designed specifically to assess the formal roll-out of national MMC programs via national health systems. Although there is no formal national MMC program in PNG, this study used the WHO tool as a systematic framework to systematically evaluate the ad hoc PAU MMC service. This allowed me to evaluate this localised service and inform facility managers and decision makers on how to improve the ad hoc MMC service to provide a high quality and safe MMC service for the staff and student of PAU and the surrounding community.

The assessment of the MMC service was guided by the 10 standards in the toolkit. Each of these standards had a checklist that was available to indicate whether adequate resources were in place to meet the quality standards of a MMC service. The standards are:

(i) management of MMC service;

(ii) minimum package of MMC services;

(iii) medicine and equipment supplies, conducive environment and equipment to provide safe and quality circumcision;

(iv) qualified and competent health care workers;

(v) information and education on MMC and HIV;

(vi) ongoing client assessment;

(vii) standard MMC surgical care guidelines;

(viii) infection control;

(ix) continuity of care; and

(x) monitoring and evaluation system.

Each standard has several criteria and each criterion has questions and information that guides the assessor to check every element in the checklist. The standards were seen as the overall category and the criterion became the existing subcategories where participant responses and the assessor observations were sorted.

Assessment of the clinic was done in three phases. Data were collected (i) in a baseline pre-surgical phase, (ii) surgical phase, (iii) or post-surgical phase. Relevant standards were assessed within the relevant phase.

Appropriate data collection methods and tools in assessing each standard and criterion were listed by WHO. These included direct observation; structured one-on-one interviews; focus group discussion; satisfaction survey; and review of documents and records. Some of these tools were designed by WHO, while others such as focus group discussion, and survey questionnaires were designed by the researchers. This gave me an opportunity to develop/design questions that were appropriate to PNG's context. Other WHO designed tools

were also modified to fit PNG's context. For example, the satisfaction survey was developed to provide appropriate questions that suit the PNG men in terms of diverse foreskin cutting and socio- cultural, and religious appropriateness of the MMC service provided at the clinic. The tools used are each briefly discussed below.

Observation

Observation, as the name implies, is a way of collecting data through observing, in which case the researcher immerses themselves in the setting where the respondents are, while taking notes and/or recording (Mulhall, 2003). Observation methods were used in observing the infrastructure and equipment; staff workflow; electricity and water; space; availability of infection control; emergency plans for referral of participants undergoing surgery; security for staff and participants; and other logistics that were all included in Standard Three of WHO MC Quality Assessment Toolkit (World Health Organisation , 2009a; Appendix B: Observation checklist for PAU MMC service).

Stock inventory is a sub group in the observation method and was mostly used in assessing the medicine supplies and equipment. Inventory refers to a process of inspection or observation to determine whether the essential equipment, medicine supplies and environment are available (World Health Organisation , 2009a). I used the MMC inventory checklist to check availability of essential medicines such as antibiotics; analgesics; STI treatments; emergency and resuscitation drugs. Also, I checked other supplies such as personal protective equipment; sutures; local anaesthetics. In addition to the above, equipment such as oxygen; surgical instruments and surgery lights were observed. A brief one-on-one interview was done with the participants (health care workers) to confirm the

functioning of the equipment and the availability of the stock (Appendix B: Inventory checklist for PAU MMC service).

Data collection process for observation-inventory checklist:

- Inventory checklist assessment was done prior to the MMC surgery. This provided an idea of the existing stock of the medicine, equipment and other MMC related supplies required prior to the MMC surgery
- An inventory tool from the WHO Quality Assessment Toolkit (medicine and equipment stock check cards) was used to observe and assess the availability of the equipment, medicine and other MMC related supplies
- Information from the inventory assessment was documented both in the medicine and equipment stock check cards

One-on-one interview

One-on-one or an individual interview is a common qualitative approach taken to collect data. Individual interviews occur between two people, the researcher and the participant. This method assists the researcher to gain insight into participants' perceptions, understanding, and experiences of a given phenomenon which can contribute to in-depth and rich information or data (Ryan, Coughlan, & Cronin, 2009). Designed open-ended questions provided on the toolkit were used in structured interviews seeking information for each standard and the criterion status in MMC Service at the clinic. Most of the data were collected prior to MMC surgery.

One-on-one interview:

- After the ethical clearance for the study, I requested a formal meeting through the head of the health care clinic to explain the nature of the study.

- A set fixed time for interviews with individual health care worker was provided during a brief break in the clinic. I informed them that the questions and the interview time frame would vary (10 minutes to 45 minutes) for different health care workers as per their daily roles played at the clinic.
- Information sheets were given to participants who were available at the health care clinic during the time of data collection. Participants voluntarily consented to participate after verbal and written information were provided.
- There were four individual interviews conducted. All were female registered nurses. The administrators were not available during interview.
- The questions asked were mostly guided by the standards and criteria. Some questions were asked specifically to certain health care workers. For example, voluntary and counselling testing (VCT) section of the questions were directed to VCT nurses only (Appendix C: Interview guide for PAU MMC service assessment).
- Most of the responses were short and brief, which were transcribed directly during the question- response time. The written information collected was entered into an Excel spreadsheet as explained earlier.

Focus Group Discussion

Focus Group Discussion (FGD) is a qualitative research method and data collection technique in which a selected group of people discusses a given topic or issue in-depth (Morgan, 2001). This group interview method helps to seek participant knowledge and experiences, attitudes and perceptions, and practices, shared in the course of interaction with different people. The technique is used with the assumption that the group discussion produces adequate and varied information and shared knowledge among groups and communities, which would be difficult to obtain with one-on-one interviews (Morgan, 2001).

A FGD was purposely hosted to seek a collective view from both the administrators and clinicians to provide additional and in-depth information on the provision of MMC at the PAU clinic at one time (Appendix D: Focus group discussion guide for PAU MMC service assessment).

Data collection process - Focus group discussion:

- Four participants volunteered to participate in the FGD upon reading and receiving verbal information of the nature of the study and the process of the FGD and consented to volunteer in the study. Of the four, three were female registered nurses and one male clinic administrator (Appendix E: Information and consent forms for PAU MMC clinic assessment).
- A tape recorder was used to record the discussion with consent from all participants.
- The questions asked were guided by the established standards and criteria.
- The recorded information of the focus group discussion was kept in electronic files in preparation for analysis.

Review of Documents

Reviewing of documents is a systematic way of collecting data by reviewing or evaluating existing documents. This can either be electronic or printed materials (Bowen, 2009). This study component reviewed the following reports and documents in the clinic: the client register or the client records; policies, guidelines and protocols; specific tools for pre and post assessment of men undergoing MMC surgery; and competency evaluating assessment forms to assess the skills of surgeons and counsellors.

Survey

Survey refers to “systematic data collection about a sample drawn from specified larger population. The final product of the surveys are survey statistics. That is percentage,

means, and measures" (Schwarz, Groves, & Schuman, 1998). In this study, 50 men had MMC surgery and a satisfaction survey was conducted six weeks after surgery. Their satisfaction level was evaluated to assess if the MMC service provided by the PAU clinic was able to provide a quality and safe service.

Data collection process-survey:

- The satisfaction survey was conducted six weeks after the MMC surgery was done.
- All men (50 clients) undergoing MMC surgery were invited to participate in the survey.
- Information sheets and survey forms were put in an unsealed envelope and were delivered to the participants six weeks post-surgery by a male research assistant (Appendix F: Information sheet and MMC client satisfaction survey form).
- The completion of the survey form indicated their willing consent.
- Participant anonymity was maintained throughout the study
- Completed survey forms were sealed in the same envelope and were returned after one week via the same dissemination route.
- All data were coded and entered into to an Excel spreadsheet.

Summary of the six methods involved in the data collection process

- Two groups of participants were involved in various data collection approaches. Health care workers and the clinic administrators were involved in qualitative data collection, while the male university students participated in the quantitative data collection methods.

- Six different data collection methods were used: individual interviews; FGD; survey; document review; observation and inventory.
- Data were collected at three different times relative to MMC procedure. These were: pre-surgery, during surgery, and after surgery.
- Data collection pre-surgery included: one-on-one interview among health care workers; focus group discussion among health care workers and the PAU clinic administrator; inventories were done to check on the medicine and equipment supplies; observing whether pre-assessment checks for boys undergoing surgery have been performed and documented by the clinic staff using the designated tools; and document reviews on policies, guidelines and protocols for MMC and its related services.
- Data collected during MMC surgery was mostly observation to assess adverse events and complications for immediate referral.
- Data collected post-surgery include: satisfaction survey for participants who had MMC surgery and observation for complications and wound healing.
- All the data collected from individual interviews, focus group discussion, observations, inventory checklist assessment, reviewed documents and satisfactory survey questionnaires were transcribed, collated, cleaned and entered in the Excel spreadsheet and Microsoft Word documents.

Data analysis

Qualitative and quantitative data analysis approaches were undertaken to analyse data. The analysed data provided interpretation and meaning that addressed the main objectives for this study component. The qualitative data provided a deep understanding of the participant's

perception and views, while the quantitative analysis technique provided descriptive assessment of the patterns of participant responses in the survey (Sandelowski, 2000).

Data analysis process for qualitative data

- The texts from the interviews, observations, focus group discussions and the records were entered in the Excel spreadsheet according to the respective 10 standards and criteria from the WHO MC Quality Assessment Toolkit
- An inductive thematic approach was used for analysis. The standards in the WHO Quality Assessment Toolkit became the broad existing themes and the criteria became the existing categories
- The participant's responses in the form of transcripts were arranged under existing themes and categories to understand the meaning of the relationship of the participants to the MMC services

Data analysis process for quantitative data

- All data from the satisfaction survey were entered into Excel spreadsheet
- Data were cleaned to ensure there was no misinformation
- Measures of central tendency, range (spread), frequencies and percentage were used to analyse the data
- The statistics were presented in graphs to assist with the visualizing the pattern and interpretation of the data

A detailed description of the methods and results of Component Three are presented in Chapter Six of this thesis.

3.8 Component 4: Engan health manager views on male circumcision policies

The fourth study component investigates the Enga Province health care managers' views, knowledge and experiences about MMC and their opinions on relevant policy issues in implementing MMC for HIV prevention in the health care system in Enga.

Study design

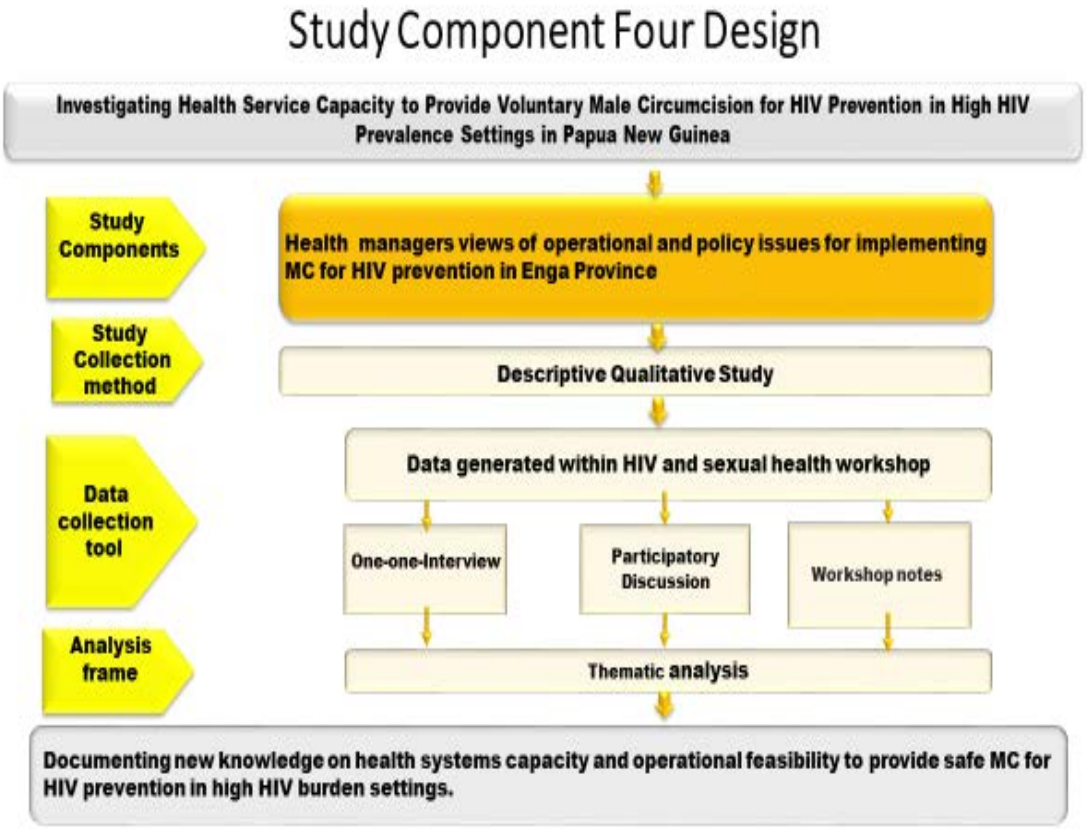

Figure 3.7 Study design for component four

Study setting

This study was conducted at the Enga College of Nursing campus. Study participants (health care managers of different levels) from the five districts in Enga Province came to one central study location due to geographical difficulties, time, and constraints experienced by the researchers.

Recruitment of the study participants and sample size

Initially, 20 participants were purposively invited but 27 participants showed up for the study. The additional people attended because the district health managers in some health facilities thought it was important for some senior and front line health care workers in the HIV and STI clinics to attend this workshop. These participants were selected from a diverse range of managers whom we thought could provide us with the detailed information on the basis of their expertise or knowledge of MMC and management of the program. These participants were likely to have knowledge or experience that is relevant to policy development on MMC program for HIV prevention in Enga.

The participants were frontline managers from STI/HIV clinics in the health centres, officers in charge of the health centers, district health managers and provincial health executives or the Chief Executive Officer of the provincial health. Frontline managers were from state operated health facilities, NGOs and faith-based facilities.

Data collection process

Prior to data collection, the disease controller assisted me in sending letters of invitation to the 20 first level, mid-level and top level managers from the health care centers, and to district and provincial health administration offices. Information about the dates, times, study location, the nature of the study in relation to attitudes, beliefs and practices

regarding circumcision, their views and concerns on policy matters relating to MMC for HIV prevention in PNG, along with information sheets and consent forms were sent with the invitations. Upon reading the information the invitees were asked to call the acting disease controller regarding their participation and requested to bring the signed consent form to the conference if they attended (Appendix G: Information sheet and consent form for Enga health managers).

A one day HIV conference was organised to present and discuss the relevant policies on MMC implementation for HIV prevention in Enga. The conference-style presentations on the day were from reports on sexual health in Enga and past research findings on MC for HIV prevention conducted in Enga, PNG and Sub-Saharan African countries. The presentations were by international and local researchers (including myself) to provide a conducive environment for the participants to stimulate their mindset to participate in the study discussion. There were three methods used in data collection. These were participatory discussion; focus group discussions; and individual interviews.

Participatory discussion

Data were collected in English through a participatory discussion following the presentations. Written open-ended questions to guide the discussions were provided to the assigned six groups about:

(i) views on MMC for HIV prevention;

(ii) strengths and weaknesses of the Enga healthcare system; and

(iii) consideration of relevance for MMC for HIV prevention policy.

At the end of the discussion, the groups presented the main points highlighted in the discussion. They wrote on butcher's paper as their presentation aid. Participatory methods

are designed to build self-esteem and the sense of responsibility for the decision one makes in the group of representatives in the community (United Nations High Commissioner for Refugees, 2006). Participants also learn from each other and develop respect for each other's knowledge and skills. This method is commonly used at the community level for planning to identify issues affecting their wellbeing (United Nations High Commissioner for Refugees, 2006). A constructive and free environment or space is created for group learning and an action planning process is initiated, often using visual methods of communication such as posters, role play, group presentations, and focus group discussions (United Nations High Commissioner for Refugees, 2006). The use of the recorder was made known to the participants in the information sheet.

Participants were asked to discuss the questions and to write their viewpoints on the butcher's paper. A representative of each group was asked to present group findings. Also, an overall group discussion was allowed for any urgent comments and feedback after the group presentations. The presentation and discussion were in English (Appendix H: Participatory discussion guide). Data sources for this study were the written butcher's paper, group presentations and group discussions that were recorded.

One-on-one interview

At the time of study, information on the use of the Shang Ring for MMC was highlighted during the participatory discussion by a health care facility manager of a stand-alone STI and HIV clinic. A follow-up one-on-one interview was conducted with the health extension officer who was managing the pilot study on Shang Ring that was about to be implemented in Endakalipin clinic. The interview was conducted in English. Consent forms

were signed for the study and the use of a tape recorder (Appendix H: One-on-one interview guide).

Focus group discussions

The study results from the workshops and one-on-one interview were presented to the top level managers at the provincial health headquarters in Enga province. All the discussions were conducted in English. Consent was given by the participants to their involvement in the study and for the use of recorder during the discussion (Appendix H: Focus group discussion guide).

Data analysis process

- The group discussions, presentations and the summary brief on the butcher's paper were all tape-recorded and noted manually
- Data were transcribed verbatim
- Each transcript was examined line-by-line manually
- Emerging themes and codes provided the understanding of the relationship between the participants and their views on the policy relevance on MMC for HIV prevention
- The participant's responses in the form of transcripts were arranged under existing themes and categories to understand the meaning of the relationship of the participants to the MMC services

A detailed description of the methods and results of Component Four are in Chapter Seven of this thesis.

3.9 Ethics approval and study dissemination plan

Ethics is important in research activities because it governs the standard of conduct for scientific or any other discipline of researchers. Ethical principles exist to protect the dignity, rights and welfare of research participants (World Health Organisation , 2011).

Ethical clearance for Study Component Two was granted to the 'Acceptability and Feasibility of Male Circumcision ion PNG Study" by Research and Ethics Committee of Pacific Adventist University (PAUREC), Divine Word University (DWUREC), James Cook University Human Research and Ethics Committee (JCUHREC), and Papua New Guinea National AIDS Council Research Advisory Committee (PNGRAC). Following the ethics committee approvals permission was also granted by the respective provincial health authorities to conduct research among health workers in the health facilities under their jurisdiction. Information and written consent forms were placed in a sealed envelope and distributed to participants. Participants voluntarily consented to participate in this study upon reading the information. Participants did not write their names on the survey questionnaires to ensure they remained anonymous to the research team.

Ethical clearance for Study Component Three was provided by Pacific Adventist University Research and Ethics Committee (PAUREC); National AIDS Council Research Advisory Committee (NACRAC); and James Cook University Human Research and Ethics Committee (JCUHREC; Appendix I: Ethics approvals). Detailed information was provided to the participants to be informed of the nature of the study, their safety and the rights to participate. Participants' voluntary consented in this study. Ethical clearance for Study Component Four was obtained from Pacific Adventist University Research and Ethics Committee (PAUREC); PNG Medical Research and Ethics Committee (PNGMREC), National AIDS Council Research Advisory Committee (NACRAC); and James Cook

University Human Research and Ethics Committee (JCUHREC). All participants' rights and benefits were clearly written on the participant information sheets and were taken into consideration throughout the study.

Study dissemination plan

In addtion to the traditional academic dissemination, it is ethically important to report back findings in an appropriate way to participants in Enga Province, PAU and to PNG National AIDS Council (NACS). Please read more of the study disemination plan for PAU MMC clinic evaluation in chapter six, and Enga study in chapter seven. A written report of the health care workers and health care mangers views of MMC in chapter five, as well as the PAU and Enga study will be reported to PNG NACS

3.10 Summary of Chapter Three

In this chapter, I discussed the overall study design for the thesis and have discussed each of the four study components and the process involved in data collection and data analysis. The chapter also describe the ethics process and the study dissemination plans.

In the next series of chapters (4-7) I will discuss the key results of the four study components. The results of the four study components are written in manuscript format. Hence the study background for each may be similar in all manuscripts throughout the four chapters. Starting with Chapter Four, presenting the results of Study Component One identifying and analysing literature around the globe, especially in Sub-Saharan Africa in implementing MMC for HIV prevention. The lessons identified may inform the program and policy developers on MMC for HIV prevention implementation in PNG.

Chapter 4. Systematic literature review on male circumcision

4.1 Manuscript: Health system lessons for implementation of male circumcision programs.

This chapter discusses the literature reviewed on health systems experiences around the globe especially Sub-Saharan Africa in implementation of voluntary medical male circumcision (VMMC) for HIV prevention. It discusses the results of the identified articles on health systems approach in providing VMMC services and experiences PNG can learn from to implement medical male circumcision (MMC) for HIV prevention in PNG.

The chapter presents the findings from the literature in a manuscript format. However, literature to this effect is listed in the reference section of this thesis.

Tommbe, R., Vallely, A., Larkins, S., MacLaren, D. What are the health service lessons for Papua New Guinea from providing Voluntary Medical Male Circumcision in Africa? Target Journal for publication: *BMC Health Service Research*. (Close to submission).

Abstract

Background

Medical Male Circumcision (MMC) is now an integral part of the global response to HIV. MMC is a key prevention strategy in populations with high HIV prevalence, heterosexual transmission and low circumcision rates. Providing a safe and effective MMC program depends on a responsive and functional health system. The purpose of this systematic literature review is to explore health service experiences in the implementation of Voluntary Medical Male Circumcision (VMMC) programs for HIV prevention. Lessons learned in this review may be useful for health program developers in Papua New Guinea (PNG) as they consider options for an additional HIV prevention strategy.

Methodology

A systematic review following PRISMA guidelines was conducted. The databases PubMed, Sage and Scopus were searched in September, 2016 and updated in May 2020, using a combination of keywords inclusive of male circumcision, HIV prevention, "health system" and/or "health service". Applying a systems thinking approach, the World Health Organisation health system building blocks framework was used to categorise the factors influencing the scale up of voluntary medical male circumcision (VMMC) programs.

Results

A total of 946 articles were identified. Of these, a total of 68 full text articles were included in the final review. The published literature about VMMC programs in Africa reveals complex issues. There were 13 papers on governance, 16 on funding, 27 on service delivery, 20 on health workforce, six on supplies and logistics, and five on monitoring and evaluation, analysed in this study. Key lessons for PNG's health system include the

importance of: ownership of the MMC program, financial ability to sustain the program, adequate and appropriate resources in terms of health care workforce, medicine and equipment, and ensuring the cultural appropriateness of the program. Should PNG's health system implement VMMC for HIV prevention program, these issues need to be considered. Specifically this would mean careful consideration of health system strengthening, including: gaining support from provincial and national health leaders and stakeholders; identifying and securing funding sources and program ownership; and negotiation of public-private partnerships for VMMC programs for HIV prevention.

Conclusion

This literature review suggests caution, given challenges in governance, funding pathways, and underlying complexities in health service delivery, inadequate resources in health workforce, infrastructure and procurement of equipment, and issues related to monitoring and evaluation of the program. We recommend that health system readiness is crucial should PNG wish to implement a safe and effective MMC program for HIV prevention.

Keywords: Male circumcision, HIV prevention, health system, health service, health care.

Study background

Voluntary medical male circumcision (VMMC) effectively reduces the sexual transmission of HIV from female to male by approximately sixty percent (Auvert *et al*., 2005; Bailey *et al*., 2007; Gray *et al*., 2007). In 2007, the World Health Organisation (WHO) and the Joint United Nations Program on AIDS (UNAIDS) recommended the inclusion of

VMMC as an essential component of comprehensive HIV prevention programs in high HIV prevalence settings with low prevalence of male circumcision (World Health Organisation & UNAIDS, 2007).

Since the WHO and UNAIDS recommendation, significant implementation of VMMC has occurred globally. In particular, fourteen (14) priority countries in Sub-Saharan Africa with high HIV prevalence and low levels of MC practice have implemented massive circumcision programs (Auvert *et al*., 2008; Bertrand *et al*., 2014; UNAIDS, 2011). The aim of these fourteen countries was to reach eighty percent coverage of VMMC, which equates to 20.8 million men by 2016. However, only 15 million VMMC have been performed by the given timeframe (World Health Organisation , 2017). It has been estimated for the VMMC scale-up in Sub-Saharan Africa to achieve eighty percent coverage, would cost US$1.5 billion but would lead to savings of US$16.5 billion by 2016 due to averted HIV treatment and cost of care (Njeuhmeli *et al*., 2011; Sgaier *et al*., 2014). Also, it is estimated that reaching the target would prevent up to 3.4 million new HIV infections (Njeuhmeli *et al*., 2011; Sgaier *et al*., 2014). Whilst VMMC programs are shown to be cost-effective in some Sub-Saharan African countries and massive numbers of VMMC have been conducted, very few countries have reached their targets (World Health Organisation , 2017).

The economic analysis of studies conducted in Africa provides strong support for VMMC as a cost effective strategy for HIV prevention in settings where HIV spread is largely heterosexual (Larson, Tindikahwa, Mwidu, Kibuuka, & Magala, 2015; Marseille, Kahn, Beatty, Jared, & Perchal, 2014; Menon *et al.*, 2014; Njeuhmeli *et al*., 2014; Uthman *et al*., 2010). This resulted in strong political support at the global level and within some nations, helping to develop strategic plans and established infrastructure to implement the

scale –up of the VMMC program in Africa (World Health Organisation , 2017). Despite the strong global political support in Africa, multiple health service challenges exist and have been reported during the scale-up of the program (Mwandi *et al*., 2011; Rech, Spyrelis, *et al*., 2014).

The VMMC scale-up program is heavily focused on Sub-Saharan Africa. However, we argue that there is less or no implementation of VMMC for HIV prevention in moderate HIV prevalence and low circumcision practice settings in the Asia Pacific region, especially in Papua New Guinea where there are similar key drivers of HIV transmission as in Africa (UNAIDS, 2013b).

The aim of this literature review is to investigate the health system issues relating to VMMC provision in Africa and elsewhere in the world, and discuss how these issues might apply in PNG's health system should it implement VMMC for HIV prevention.

Methods for systematic literature review

Search strategy

A systematic review was performed according to PRISMA guidelines to search journals that reported on health system responses to MC for HIV prevention (Young & Solomon, 2009). Articles were identified from the following databases: PubMed; Sage and Scopus. The search was conducted throughout September, 2016 and was updated in May 2020. The key words used for the search included variations on: male circumcision, HIV prevention, and health system or health service. The initial evaluation of the studies retrieved was undertaken by review of the title and the abstract.

Articles were included for review if they reported on: male circumcision for HIV prevention; health system or health service influences on MC programs; studies that were relevant to the PNG context; articles of both empirical evidences and commentaries or reviews; and studies in the English language. The relevant articles were extracted from the Scopus, PubMed, and Sage search engines and were carefully screened for eligibility by two authors, RT and DM. Eighty seven full text articles were summarised according to the title, author, date of publication, methods, summary of findings, and relevance to PNG context in terms of VMMC.

Quality appraisal of the included articles was performed using CASP framework Jatinder (2013). All articles were peer reviewed, 83 articles were research based papers with methods sections, while four were program description or discussion papers. Given the purpose of this review, no articles were excluded on the ground of low quality, although a low cut-off was used (Young & Solomon, 2009).

We used the WHO Health System Building Blocks (World Health Organisation , 2007a) to apply a systems thinking framework to review the articles. The building blocks framework was designed by WHO to promote a common understanding of the key components necessary for intervention designed to strengthen the health system (World Health Organisation , 2007a). These building blocks include: leadership and governance; finance; service delivery; health workforce; access to medicine, vaccines and technologies; and health information systems (World Health Organisation , 2007a).

Choosing relevant articles for PNG

Being a Papua New Guinean, and a health care professional, I have been working and experiencing the service delivery of PNG's health system for three decades. Based on my knowledge and experience I have selected the articles and deduced the relevance for PNG's health systems. To understand PNG's health systems further, PNG's Health Care Plan 2016-2020, and other relevant documents and reports on PNG's health system provided the basis of the relevant lessons for PNG (Ascroft *et al.*, 2011; Australian Government Department of Foreign Affairs and Trade, 2011; National Department of Health Papua New Guinea, 2010).

Search results

Figure 1 summarises the results of the search strategy utilised for this review (Moher, Liberati, Tetzlaff, Altman, & Group, 2009). The search of electronic databases produced a total of 946 articles. After adjusting for duplicates, 737 articles remained. Of the 737, 581 were discarded through screening of titles that were not reflective of the key words (male circumcision, HIV prevention, and health systems and/or health service). There were 156 eligible articles remaining, however after reading through the abstracts, 91 articles did not meet the inclusion criteria or were not in full-text. A total of 87 full-text articles were included in this study and reviewed in full (Appendix 2). Many articles were reporting on multiple aspects of the health system. Hence, for classification purposes articles were grouped according to their primary focus: 13 articles on leadership and governance of VMMC programs; 16 articles on financing VMMC program; 27 articles on VMMC services; 20 articles related to health workers and provision of VMMC provisions; six articles on

medical supplies and equipment; and five articles on information systems and VMMC programs.

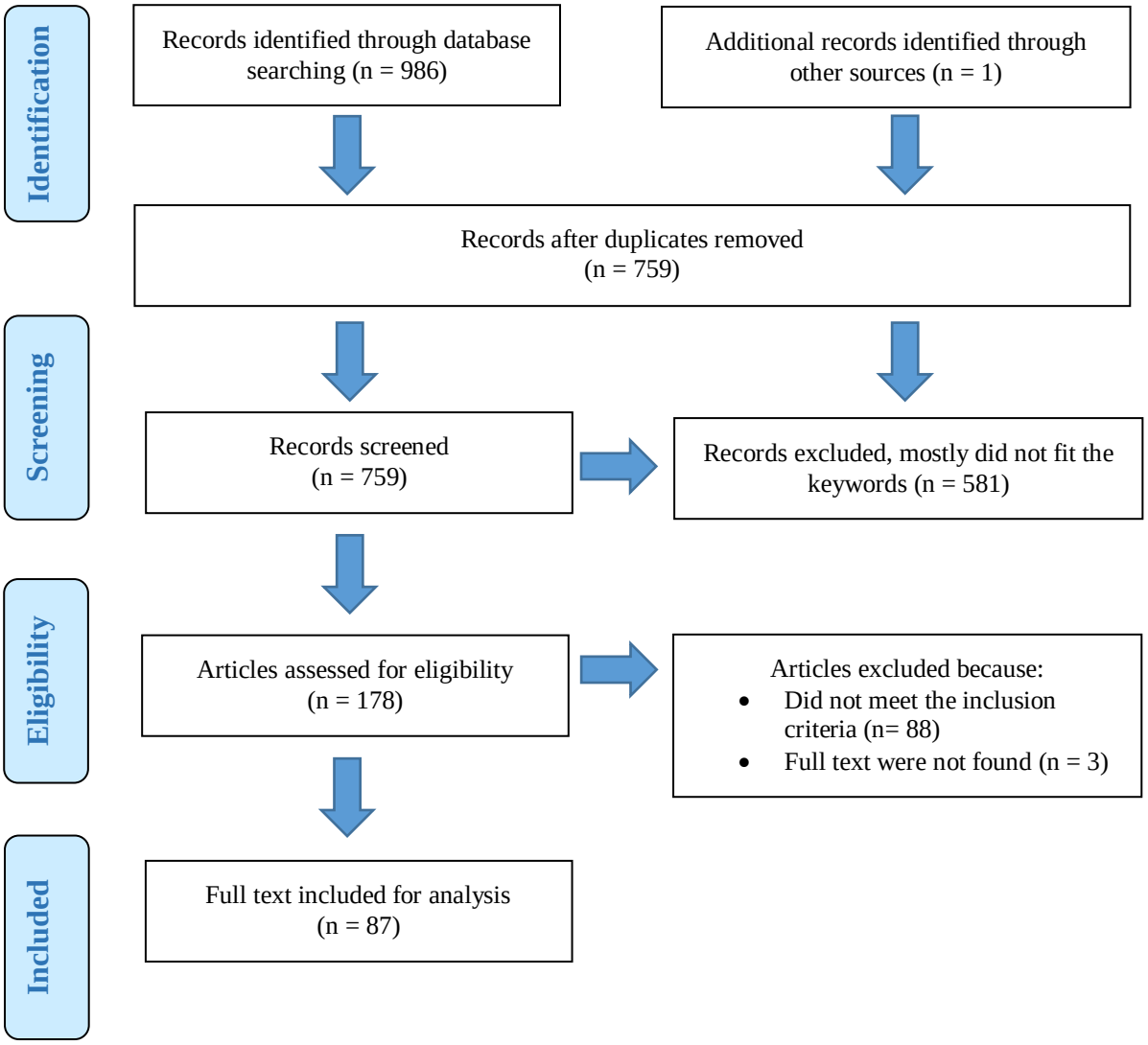

Figure 4.1 PRISMA flow diagram (Moher *et al.*, 2009)

Discussion and summary tables showing results of selected articles from each of the health systems building block and lessons for PNG's health system

The literature is now discussed in turn for each of these building blocks, followed by a consideration of what this means for PNG.

Table 4.1 Summary of papers related to leadership and governance

Author(s)/ Year	Title	Methods	Summary	Relevance to PNG context
Dickson *et al*., 2011	VMMC: A framework analysis of policy program implementation in Eastern and Southern Africa	Quantitative: Document reviews	Most successful VMMC programs had country ownership and continual leadership to translate research into national policy program.	Lessons on leadership and governance that can be learnt from Africa's experience: ▪ Strengthen management skills, provide local designed policies and guidelines for MMC program. ▪ Emphasise strong support from leaders at all levels and willingness to take challenges to implement MMC program, whether at the national or provincial level of support. ▪ Seek opinions of cultural and traditional leaders and involve them in policy formulation. ▪ The importance of partnership with stakeholders ▪ Involve stakeholders and partners in MMC policy development. ▪ PNG government need to know and understand both the donors' priority and goals and the in-country partner when discussing MMC implementation. ▪ Private–public partnership in implementing MMC program.
Mwandi *et al*., 2011	Voluntary medical male circumcision: Translating research into the rapid expansion of services in Kenya, 2008-2011	Systematic literature review	Strong support from government and community leaders had boosted Kenya's VMMC program. Their willingness to take challenges and trying out of various ways to provide VMMC had increased VMMC uptake.	
Mwanga *et al*., 2011	Policy environment and MC for HIV prevention: findings from a situation analysis study in Tanzania	Qualitative: One-on-one interviews	Most leaders in Tanzania were willing to support VMMC program. And they also encouraged policy driven program.	
Plotkin *et al*., 2013	''Man, what took you so long?'' Social and individual factors affecting adult attendance at voluntary medical male circumcision services in Tanzania	Qualitative: Focus group discussion	Older men in Tanzania did not fully access VMMC facilities. They were ashamed of passing their traditional cutting age which occurs before adolescence. Also post- surgical abstinence period has decreased the uptake amongst the older men. It was recommended that more strategies be put in place for demand creation amongst these age group. Also, communication initiatives to address concerns of older men, encourage women's support for circumcision and adherence to the post-surgical abstinence period, and change social norms that inhibit older men from seeking circumcision.	

Sabone *et al*., 2013	Impediments for the uptake of the Botswana Government's male circumcision initiative for HIV prevention	Mixed methods: Focus group discussion and survey questionnaire	VMMC was generally acceptable in Botswana. However, there were challenges when implementing VMMC. These issues include: social-cultural, knowledge/ information, infrastructural and system factors. Recommendations made for adequate resources, effective monitoring systems, more research needed on cultural issues of VMMC, involvement of local communities in VMMC Policy formulation in align to international standards, factoring in opportunity costs to enhance service accessibility, and effective communication.	
Tynan, Hill, *et al*., 2013	Listening to diverse community voices: the tensions of responding to community expectations in developing a male circumcision program for HIV prevention in Papua New Guinea	Qualitative: Focus group discussion and in-depth interview	Conflicting views on location of services, eligibility age, and type of foreskin cut and service providers amongst the participants in the community groups. This indicates community participatory approach to explore and designs culturally safe, specific and accessible program in PNG's diverse culture.	
Ledikwe *et al*., 2014	Scaling-up voluntary medical male circumcision – what have we learned?	Systematic literature review	Some of the barriers and facilitators of VMMC uptake highlighted in this review in a systems thinking approach include: leadership, human and material resources, funding, policy documents, guidelines and reports. These areas require strengthening to provide efficient VMMC program. Demand creation in VMMC services and access to the VMMC facilities are crucial. It was recommended for countries to understand the contextual barriers and facilitators of VMMC for the most at risk target group.	

Dickens, Ouma, Onyango, Onyango, & Bertrand, 2015	VMMC scale-up in Nyanza, Kenya: Evaluating technical efficiency and productivity of service delivery	Quantitative: Document review analysis	Upskilling of workforce to improve management capacity in the health facilities were seen to be the driving force of the increase or decrease rate of the VMMC performance.	
Odoch *et al*., 2015	Introduction of MC for HIV prevention in Uganda: Analysis of the policy process.	Systematic literature review	Key findings were to engage political leaders, government leaders and key partners to support the development of policies for VMMC implementations.	
Wynn *et al*., 2015	A program evaluation report of a rapid scale-up of a high-volume MMC site, KwaZulu Natal, SA 2010-2013	Quantitative: Document review of a MC training program	Providing VMMC in partnership with private health care organisation and state health care facility was workable for VMMC program. VMMC was seen to have increased in volume during school holidays and staff training period. Challenges faced in delivering VMMC service included: post-operation follow up, few adverse events reported. South Africa had successfully achieved staff training to perform VMMC.	
Katisi, Daniel, & Mittelmark, 2016	Aspirations and realities in a North-South partnership for health promotion: Lessons from a program to promote safe male circumcision in Botswana.	Qualitative: Focus group discussion, interview, and observation	The VMMC services reveals that external influences from the international donors influence the work of the in-country partnership. This becomes a major challenge within the context of partnership. The experiences of VMMC partnership in Botswana showed that the main influences on the success or failure of a partnership program were financial resources and the ownership of the program. Combine efforts by partners to achieve set program goal. However, prioritising externally formulated programs and lack of appreciation for local funding and local efforts diminished leadership and ownership of the program. The developing partner's in-country retreated early without accomplishing the program goals because	

			of the pressures by the international donors in meeting their expectation. The functions of the in-country partnership is significantly influenced by the global context such as target setters and donors.	
Feldacker *et al*., 2018	Implementing VMMC using an innovative, integrated, health systems approach: Experiences from 21 districts of Zimbabwe	Mixed methods: Interviews and document review	There is potential benefits of capacity building, sustainability, and health strengthening systems with the integrated VMMC model than the traditional approaches to program development. Attention should be given to country led approach to positive health system changes. This includes local ownership, capacity building, infrastructure and space.	
Njeuhmeli *et al*., 2019	Using mathematical modelling to inform health policy: A case study from voluntary medical male circumcision scale-up in eastern and southern Africa and proposed framework for success	Quantitative: Modelling study	Models can be used to mobilize support, strategically plan, and monitor key programmatic elements, but they can also help inform policy environments in which programs are discussed and implemented to achieve results. This modelling informed the policy to identify a champion, engaging stakeholders earlier in the program, encourage consensus, customise analysis, build capacity, and establish a sustainability plan.	

Table 4.2 Summary of papers related to financing male circumcision services

Author(s) / Year	Title	Methods	Summary	Relevance to PNG context
Lissouba *et al*., 2010	A model for roll-out comprehensive adult MC services in African low-income settings of high HIV incidence: The ANRS 12126 Bophelo Pele Project	Quantitative: Survey	Factors contributing to VMMC success were strong awareness in community to create demand for participants and providing quality and efficient services. Recommend adequate financial and human resources in low-income setting for high scale VMMC program.	What lessons can PNG learn on financing MMC service: ▪ PNG can choose from different MMC methods (PrePex, surgery, Shang Ring) because they are economically viable. ▪ Extra funding to deliver comprehensive HIV prevention packages if none in the identified MMC clinic. ▪ Strategies on how to maximise the utilisation of MMC service so unit cost can be minimised. ▪ PNG NDOH needs to understand potential savings in ART if more men are circumcised. ▪ System strengthening require in the areas identified: funding, support from all levels of government, and improved health workforce. ▪ It is vital for PNG to have adequate funding to upskill workforce and to create awareness in the
Doyle, Kahn, Hosang, & Carroll, 2010	The impact of male circumcision on HIV transmission	Literature review	The protective effect of VMMC by approximately 60% shows VMMC is highly effective at HIV prevention, and it is recommended by international health community. This review shows safe circumcision implemented in high HIV prevalence areas with low circumcision prevalence can save millions of lives and billions of dollars.	
Uthman *et al*., 2011	The cost utility analysis of AMC for prevention of heterosexual acquisition of HIV in men in Sub-Saharan Africa: A probabilistic decision model	Quantitative: Economic evaluation	VMMC cost-saving but more funding will be required for comprehensive HIV prevention packages. For example, a clinic may distribute condoms, treat and manage sexually transmitted infections but may not be able to provide voluntary counselling and testing service with anti-retroviral treatment. Thus may require more funds to provide the new HIV preventive packages.	
Uthman *et al*., 2010	Economic evaluation of AMC for prevention of heterosexual acquisition of HIV in Sub-Saharan Africa: A systematic review	Systematic literature review	VMMC is cost-effective for HIV prevention. It is suitable to implement in conjunction with other evidence-based prevention methods.	

Tynan *et al*., 2012	Vasectomy as a proxy-extrapolating lessons to MC as an HIV prevention strategy in PNG	Qualitative: One-to one interview	Problems encountered in vasectomy program can be similar to VMMC programs in PNG. This includes: obstacles in funding pathway; inconsistent gov't support; difficulties with staff retention and unreliable delivery of training programs with no current VMMC program in PNG. Recommended for health systems strengthening prior for VMMC implementation.	community for increased demand for MMC. ▪ Safe MMC performed in the hospital setting is an effective HIV preventive tool in saving thousands of lives and millions of dollars ▪ There is possibility of cost reduction in paying for antiretroviral treatment. ▪ Economic analysis to be done to suit PNG's context for providing MMC. ▪ Secure on-going funding source for all MMC programs to sustain for ongoing MMC services.
Obiero, Young, & Bailey, 2013	The PrePex device is unlikely to achieve cost-savings compared to the forceps-guided method in male circumcision programs in Sub-Saharan Africa	Quantitative: Document analysis	There is not much difference in unit cost of the PrePex and surgery for VMMC service. The PrePex is more costly than the surgery. Study recommended other devices to achieve greater cost efficiencies.	
Marseille *et al*., 2014	Adult male circumcision in Nyanza, Kenya at scale: The cost and efficiency of alternative service delivery modes	Quantitative: Document analysis	There is not much difference in cost of VMMC between the static clinic and the outreach and the mobile clinics in Nyanza. However, there was an estimate of large savings by VMMC for HIV prevention compared to life time cost of anti-retro therapy drugs for AIDS cases.	
Njeuhmeli *et al*., 2014	Cost analysis of integrating the PrePex Medical Device into a voluntary medical male circumcision program in Zimbabwe	Quantitative: Evaluation of unit cost of VMMC	Similar unit cost for routine surgery and mixed (mobile or outreach/ static). Low utilisation of the VMMC service can increase the unit price. To implement PrePex, countries toned to manage the health workforce and ensure that accessibility to the VMMC site is good to achieve the lowest unit cost.	
Menon *et al*., 2014	Costs and impacts of scaling up voluntary medical male	Quantitative: Unit cost analysis	There was evidence of health and economic benefits of VMMC provision in Tanzania. Recommendations were made for the government, its donors and stakeholders to leverage funds and mobile resource for	

	circumcision in Tanzania		rapid and full VMMC scale –up as a central component of the HIV prevention strategy. During its implementation, Tanzania retained its workforce through task shifting and sharing, improved supply chain system, decreased cost of supplies and equipment, and creating demand to access VMMC program. Tanzania also used both mobile and static mode to deliver its VMMC services.	
Kim *et al*., 2015	Evaluating the cost of adult MMC in a mixed (surgical and PrePex) site compared to a hypothetical PrePex-only site in South Africa	Quantitative: Economic evaluation	Adding PrePex to existing VMMC practice with forceps- guide did not show much difference in cost reduction Implementing PrePex only in a site is feasible and significantly reduced the cost in all aspects, including personnel.	
Larson *et al*., 2015	How much does it cost to improve access to VMMC in high risk, low-income communities in Uganda?	Quantitative: Micro-costing approach	Mobile clinic is proven to be cost- effective to provide VMMC services in rural and remote population.	
Bautista-Arredondo *et al*., 2018	Influence of supply-side factors on VMMC costs in Kenya, Rwanda, South Africa, and Zambia	Mixed method: Document analysis and interviews.	There is efficiency of VMMC in short term when there is high demand in VMMC in certain areas. This can be implemented by task shifting and taking advantages of efficiencies created by the integrating HIV service. However, it the longer term, reductions in VMMC unit cost are likely by increasing the volume of clients at facilities by implementing effective demand generation activities.	
Broughton *et al*., 2018	The cost-effectiveness of three methods of disseminating information to	Quantitative: Randomised control study	Providing both the post-operative information booklet and having face to face discussions with the coaching team was seen to be more effective than just providing manual on the VMMC post-operative care programs. This was cost effective.	

	improve medical male circumcision in Uganda			
McGillen *et al.*, 2018	The emerging health impact of voluntary medical male circumcision in Zimbabwe: An evaluation using three epidemiological models	Quantitative: Mathematical modelling	Strong evidence from Zimbabwe's mathematical modelling study shows that VMMC can reduce HIV, which saves money in the longer term.	
Torres-Rueda *et al.*, 2018	Cost and cost-effectiveness of a demand creation intervention to increase uptake of voluntary medical male circumcision in Tanzania: Spending more to spend less	Quantitative: Cost effective analysis	Cost savings were observed across the two sites of study. After the introduction of the VMMC intervention, there was a decrease in antiretroviral cost due to less men contracting HIV, because of more men seeking VMMC.	
Tchuenche *et al.*, 2018	Voluntary medical male circumcision service delivery in South Africa: The economic costs and potential opportunity for private sector involvement	Quantitative: Cost analysis	The VMMC unit cost among the private health care service did not differ substantially from that of the government and PEPFAR – supported facilities. However, this study did miss some important data that would contribute to a better understanding of the costs of VMMC service delivery among the different health care agencies. Information of the cost involved in providing VMMC is vital enable VMMC programs to make informed decisions regarding funding levels and scale-up strategies for VMMC in South Africa.	

Table 4.3 Summary of papers related to health service delivery

Author(s) / Year	Title	Methods	Summary	Relevant to PNG context
Bertrand *et al*., 2011	Voluntary medical male circumcision: A qualitative study exploring the challenges of costing demand creation in eastern and southern Africa	Qualitative: Observation	Demand creation activity in Eastern and Sothern Africa involves: interpersonal communication, awareness targeting educational institution, integrating VMMC messages in broader HIV prevention package, creating more demand among men over 25 years of age, good collaboration among stake-holders, involve traditional aspects for better understanding, strong media awareness (mass media, text message, print media).	Lessons learnt from the reviews: ▪ Creating demand for MMC requires intensive awareness of the benefits for male participants. This includes: socio-cultural awareness in PNG, economical barriers to access MMC clinic, complications and adverse-effects of MMC. ▪ Creating awareness by disseminating MMC related information suitable for different age groups may increase access to MMC services in PNG. ▪ Even though MMC may seem a minor surgical procedure, it is vital to take thorough history and close observation to identify blood related diseases and avoid adverse events. ▪ Emphasis of advocacy for whole HIV preventive package, including MMC so men can be well informed and access all service at one location.
Mahler *et al*., 2011	Voluntary medical male circumcision: Matching demand and supply with quality and efficiency in a high-volume campaign in Iringa Region, Tanzania	Literature Review	Effective awareness program on HIV prevention inclusive of VMMC and the other HIV preventive package is seen to be most effective strategy to create demand for VMMC service access in state health facilities.	
Odeny *et al*., 2012	Text messaging to improve attendance at post-operative clinic visits after adult male circumcision for HIV prevention: A randomized controlled trial	Quantitative: Randomised control trial	Text message to follow- up post-surgery were good. Many fail to visit the clinic because of transport fees and others were lowly educated and did not get the correct information for visitation.	
Ashengo *et al*., 2014	Feasibility and validity of telephone triage for	Quantitative: Retrospective document analysis	The feasibility study on the validity of telephone triaging shows experiences of using telephone-based triage system may become an appropriate first line of step to identify life-threatening and urgent complications following VMMC surgery.	

	adverse events during a voluntary medical male circumcision campaign in Swaziland		Individual settings require proper logistics and sustaining of this program for efficiency and accessible.	▪ Pre and post-operative information are important to deliver to MMC clients. Misinformation may become an access barrier. ▪ MMC service provision will require demand creation for boys under 18 years of age to access in-depth comprehensive MMC program. The program developers need to separate pre and post operation information for this group of young men. ▪ Need to create demand and to provide information and awareness of the benefits of male MMC to male clients. Understanding of socio-cultural aspects is crucial. ▪ MMC service should be organised to reach the maximum number of clients through fixed or mobile MMC services. Approaches that suit individual health care facility will require space, medicine supplies, staff upskilling and many other factors. ▪ Always have constructive and affordable measures in
Evens *et al*., 2014	Identifying and addressing barriers to uptake of voluntary medical male circumcision in Nyanza, Kenya among men 18–35: A qualitative study	Qualitative: Focus group discussion	Common barriers that hinder men's access to VMMC facilities in Kenya were in-depth information during the procedures and post VMMC procedure such as pain, complications, healing time so it gave them precise time for work leave request etc. Ongoing education to men population was crucial for demand creation in Kenya	
Hatzold *et al*., 2014	Barriers and motivators to voluntary medical male circumcision uptake among different age groups of men in Zimbabwe: Results from a mixed methods study	Quantitative : National population based survey	Barriers to VMMC accessibility include: fear for HIV testing, partner refusal, reluctance to abstain from sex post VMMC, and many other myths and misconceptions. The study recommended demand – creation messages should be designed for men of different age groups and should include other relevant sexual health information together with HIV prevention.	
Jennings *et al*., 2014	Quality of VMMC services during scale up: A comparative process evaluation in Kenya, SA, Tanzania & Zimbabwe	Quantitative: Comparative process evaluation	All the four countries provided VMMC services as fixed mode and outreach or mobile mode. Common problems identified in the service delivery in these countries includes no standards; less available consumables; no continual post-operative care and surgery provision.	
Montague *et al*., 2014	Implementation of adolescent-friendly voluntary	Qualitative : Participatory action research	There was high acceptability and feasibility of the school -setting used in demand creation for VMMC. This pilot study shows a convenient venue for reaching large population of young boys for VMMC services. The study also highlighted the	

	medical male circumcision using a school based recruitment program in rural KwaZulu-Natal, South Africa		possibility of integrating VMMC in its school program in the future for south Africa.	place for follow-up visits post-surgery. ▪ Health facilities providing MMC need to ensure that quality standards are in place to guide a safe and quality MMC service. Facilities must also provide adequate resources for an efficient and effective service and must ensure there is continuity of care provided post MMC. ▪ Telephone triaging of complications can be a means of communication or a follow-up tool post-surgery. ▪ Create demand for men to attend MMC programs. (inter-personal communication, media awareness, traditional aspects & targeting younger male population). ▪ Relevant information for MMC pre-post counselling. Need to assess the most effective counselling sessions and whether individual level or a group session. ▪ Previous study in PNG shows school age boys were highly involved in
Rech, Spyrelis, *et al*., 2014	Implications of fast-evolving scale-up adult voluntary medical male circumcision for quality of service in South Africa.	Quantitative: Comparative analysis various VMMC sites	Rapid program expansion requires quality management and increase resources on already existing facilities than setting new VMMC sites.	
Galukande, Kahendehe, Buuza, & Sekavuga, 2015	A rare but important adverse event associated with adult voluntary medical male circumcision: Prolonged bleeding	Quantitative: Case study with record analysis	Haemophilia is a rare genetic condition that can lead to the adverse events of prolong bleeding after VMMC. 3 cases were identified post-surgery in this study. It is highly recommended that when taking patients history, a close alert on past bleeding history is important to identify any abnormal bleeding disorder prior to VMMC surgery.	
Katisi & Daniel, 2015	Safe male circumcision in Botswana: Tension between traditional practices and biomedical marketing	Qualitative: Ethnographic methods	Botswana has existing traditional VMMC practice. Main aim for this study was to explore responses to VMMC awareness and implementation process in relation to traditional VMMC and medical VMMC. Traditional leaders and practitioners were superficially engaging in the interview and many withdrew from the study. Few data revealed that traditional VMMC's values and traditions were not met in medical VMMC, both in its awareness program and implementation. Awareness program were using sexualized languages which were not appropriate in public. The secrecy, timing, and rituals practice in traditional settings were not met by the bio-medical marketing. It was highly recommended that sociocultural aspects be	

			considered when implementing medical male circumcision.	split cuts. May reach large number of young men for MMC in schools. ▪ To minimise costs, PNG needs to increase resources and expand the capacity of the existing facilities rather than building new MMC stand-alone clinics. ▪ PNG needs to pilot the different devices to choose which MMC methods are applicable to its male clients. For example, consideration is required for those men who have existing dorsal slits in their foreskin. ▪ Every device and surgical method needs adequate counselling and information for pre and post-operative care to avoid adverse events. ▪ A good model for PNG to consider when promoting MMC for HIV prevention: i) transforming men's mindset about MMC; ii) facilitating accessibility
Omondi Aduda, Ouma, Onyango, Onyango, & Bertrand, 2015)	Voluntary medical male circumcision scale-up in Nyanza, Kenya: Evaluating technical efficiency and productivity of service delivery	Quantitative: Evaluation of VMMC program using document review method	Technical change and efficiency were required to increase fixed and mobile and or outreach VMMC programs. These involve factors such as staff skills, program managements in individual facilities, utilisation of resources such as theatre space, drugs, supplies etc. Strengthening the technical aspects can sustain long term VMMC services.	
Boyee *et al*., 2017	What messages are adolescent voluntary medical male circumcision clients getting and how? Findings from an observational study in Tanzania	Qualitative: Observational study	Most clients preferred one-one counselling pre and post VMMC procedure. Group counselling was seen to be effective if the participants were assembled among different age group or amongst their marital status.	
Chiringa, Ramathuba, & Mashau, 2016	Factors contributing to the low uptake of medical male circumcision in Mutare Rural District, Zimbabwe	Quantitative: Cross sectional survey	Intensive health education on the benefits of VMMC was crucial. Many did not access VMMC service due to socio- cultural reasons such as shame, and circumcised men were tainted as promiscuous. Socioeconomically, men were also frightened of losing time from work. Complications encountered post-MC surgery was another bigger issue that discouraged men accessing VMMC services.	
Kaufman *et al*., 2016	Adolescent sexual and reproductive health services and implications for the provision of	Systematic literature review	Boys under 18 years of age have been the highest number compared to rest of the adult male that had VMMC. It seems boys of this age group are less informed of other MC comprehensive packages such as sexual health information. Separate program needed to be designed for this age group.	

	voluntary medical male circumcision: Results of a systematic literature review			and utilisation of MMC service; and iii) maintaining a supportive social system.
Zungu *et al*., 2016	HIV risk perception and behaviour among medically and traditionally circumcised males in South Africa.	Quantitative: National based survey	Men still uncertain of the risk for HIV infection with multiple sexual partners. Strengthening of counselling services and awareness strategies is vital. HIV education is a key component to inform people of HIV infection and its risk and the way forward for prevention including VMMC.	▪ Pilot study can be conducted to assess PrePex in PNG. ▪ For demand creation, access to service, and service delivery, it is important that the findings incorporate cultural aspects, involve community leaders and provide a men's forum. ▪ Important for PNG to evaluate MMC service in the future when it is formerly established in each health systems. ▪ It is important for PNG to conduct research on barriers and enablers of MMC service should it be established in the future. ▪ Consideration be given to waiting time and staff allocation to avoid interruption to existing
Bochner *et al*., 2017	Adverse event profile of a mature VMMC program performing PrePex and surgical procedures in Zimbabwe	Quantitative: Document review analysis	Clients receiving PrePex were more likely to seek assistance at the emergency department than surgical circumcision clients. It was mostly caused by displacement of the PrePex device, which requires prompt access to corrective surgical VMMC procedures as part of their clinical management. Most device displacements occurred because of ill-informed after-care of the device which could be corrected with more counselling. Also, infections in both PrePex and surgery require adequate information and counselling to avoid unnecessary adverse events.	
Lilleston, Marcell, Nakyanjo, Leonard, & Wawer, 2017	Multilevel influences on acceptance of medical male circumcision in Rakai District, Uganda	Qualitative: Focus group discussion	Uptake of VMMC is slow despite the access to medical male circumcision in Uganda and Sub-Saharan Africa. This study reports several key themes representing multi-level influences that may facilitate or create barriers to uptake of VMMC. These includes availability of MMC service; economic cost; social influence; masculine ideals and religion. Understanding the views of male and their female partner's views on VMMC is important step to increase the VMMC and also reduces the transmission of the disease.	

Manineng *et al*., 2017	Re-establishing safer medical-circumcision-integrated initiation ceremonies for HIV prevention in rural settings in Papua New Guinea. A multimethod acceptability study	Mixed methods: Focus group discussion, one-on-one interview, and cross sectional survey	The study was conducted in East Sepik Province, PNG. This study reported support from community folks to reintroduce male initiation ceremony in their traditional initiation house. MC is part of the culture that is performed during the initiation process. Although MC is conducted by the traditional doctors. There was support for MC procedures to be safely provided by health workers according to medical male circumcision procedure. The study further reported challenges in ownership and the initiative in leading the process in integrating the traditional and medical MC practice.	health care program when providing MMC ▪ MMC policy developers in PNG to identify efficient strategies to incorporate the medical MMC with the traditional MMC settings in settings that traditionally practice MMC.
Grund *et al*., 2018	Effectiveness of an "Exclusive Intervention Strategy" to increase medical male circumcision uptake among men aged 25-49 years in South Africa	Quantitative: Pre and post study phase comparison	The study shows an increase in adult men from ages 25- 45 years accessing the VMMC services when the MC service was separated according to the age groups. Also, there was an increase of accessing VMMC service among older men with HIV risk behaviours such as those that had multiple sexual partners.	
Ma *et al*., 2018	Chinese Shang Ring male circumcision: A review	Qualitative: Literature review	Chinese Shang Ring is a non-invasive device use in MMC. The device is small, provides an easy, quick, safe, and effective method to perform MC. It can be performed in 5 minutes. Compared with surgical MC, Shang Ring has shorter operation time, less blood loss, less pain score, high satisfaction rate and lower complication rate. This method has been used in Africa and shown to be effective.	
Semo *et al*., 2018	Modifying the health system to maximize voluntary medical male circumcision uptake: A qualitative study in Botswana	Qualitative: Focus group discussion	How factors related to the health system can be leveraged to maximize uptake of circumcision services, with a focus on demand creation, access to services, and service delivery shows: cultural acceptability of circumcision services can be improved by engaging age and gender-appropriate	

			community mobilizers; involving influential community leaders; providing a forum for men to discuss health issues; and bringing services closer to people can increase VMMC utilization. Service delivery can be improved by communicating the pros and cons of the procedure to the clients for informed decision-making.	
Carrasco, Wilkinson, Kasdan, & Fleming, 2019	Systematic review of barriers and facilitators to VMMC in priority countries and programmatic implications for service uptake	Qualitative: Systematic literature review	Barriers to VMMC services show MC negatively perceived as being foreign culture and religion, fear of feeling pain during the surgery, and perception of MC as not helpful and not needed. On the other end, the facilitators include: belief that MC reduces health risks and improves hygiene, family and peer support of MC, and enhanced sexual performance and satisfaction.	
Gilbertson *et al.*, 2019	Voluntary medical male circumcision for HIV prevention among adolescents in Kenya: Unintended consequences of pursuing service-delivery targets	Qualitative: In-depth interview	Multiple unintended consequences among adolescents, especially school age youths. This involved increased burden on clinics, long waits for care, potential misleading mobilisation practice, and deviation from the standard of care. There is a need to improve alternative systems to balance the goal of increasing service uptake with the responsible conduct of VMMC.	
Maibvise & Mavundla, 2019	A model to promote the uptake of male circumcision as an HIV-preventive measure in high HIV and low male circumcision prevalence settings	Qualitative: A theory-generative, qualitative, exploratory, descriptive and contextual research design	Three integral parts to promote the uptake of VMMC. This includes: transforming men's mind set about VMMC; facilitating accessibility and utilisation of VMMC service; and maintaining a supportive social system. This framework of reference for health care workers may promote uptake of VMMC for HIV prevenance measures in HIV burden and low MC settings.	

Mavhu *et al*., 2019	Is the PrePex device an alternative for surgical male circumcision in adolescent's ages 13-17 years? Findings from routine service delivery during active surveillance in Zimbabwe	Quantitative: Survey	This study was conducted in Zimbabwe to assess the acceptability and satisfaction level of men undergoing PrePex procedures. Results showed 95.4% were willing to have PrePex because they wanted to avoid the pain in surgery. Less than 3% uncounted complications.	
Atkins *et al*., 2020	Service delivery interventions to increase uptake of voluntary medical male circumcision for HIV prevention: A systematic review	Qualitative: Systematic literature review	Mobile clinic uptake was high while not much difference seen in the static clinics, also no significant differences seen in the rural and urban VMMC service delivery. Intervention creates economies of scale and efficiencies which reflected on the service delivery where intervention were feasible, improved facility preparedness, services were of both quality and quantity, and its efficiencies.	

Table 4.4 Summary of papers related to health workforce

Author(s) / Year	Title	Methods	Summary	Relevant to PNG context
Curran *et al*., 2011	Voluntary medical male circumcision: Strategies for meeting the human resource needs of scale-up in southern and eastern Africa	Qualitative: Desk top review	Case studies from Kenya, Tanzania, and Swaziland identified several innovative responses to human resource constraints. These include: use of a device easy to learn and teach for all health workers; training of other health workers apart from doctors (task shifting); sharing of tasks during surgical MC procedure; temporary employment creation, especially, during MC campaign periods, expansion of health workers through recruitment of unemployed, recently retired, newly graduate, or staff on-leave, and the use of volunteer medical staff from overseas.	Lessons for PNG to consider: ▪ Task shifting will be ideal to utilise already limited workforce. Training be given to male nurses and CHW ▪ Health care workers need to be informed of socio-culturally appropriate MMC services. ▪ Similar to South Africa and Zimbabwe, PNG need to provide culturally appropriate training to health care workers ▪ Some of the clinics in PNG may face similar situation as South Africa and Zimbabwe, where not all HIV preventative packages would be provided in one clinic. For example, most clinics may do VCT but if found positive they may be asked to go to other centres for confirmatory test ARTs. Therefore consider providing all HIV prevention programs in one clinic. ▪ Malawi situation would be similar to PNG. Traditional cultures and taboos be observed (male clinician to perform MMC and not female and
Galukande *et al*., 2012	Mass safe male circumcision: early lessons from a Ugandan urban site - a case study	Mixed methods: Case study.	Mass circumcision in Uganda's urban population was considered safe, efficient and cost-effectiveness because of task-shifting and a strong partnership between the private and public sectors.	
Herman-Roloff, Bailey, & Agot, 2012	Factors associated with the safety of voluntary medical male circumcision in Nyanza province, Kenya	Qualitative: Interview	Nurses and doctors provided equivalent VMMC services. Health workers who performed more than 100 VMMC were competent with an outcome of less adverse events experienced by clients, and that the VMMC performance time was less, than those who had not performed much VMMC.	
Sheldon *et al*., 2012	Male circumcision for HIV prevention: Clinical practices and attitudes among health care workers	Quantitative: National survey	Clinicians were willing to integrate VMMC into practice. Most health workers offered counselling and referrals and not performing VMMC. Nurses were highly recommended for task shifting. Also, consideration be given on culturally appropriate training.	

	in South Africa and Zimbabwe			taking note of rituals in MMC procedures in certain cultures in PNG). Policy developers need to consider traditional aspects ▪ PNG's health care workers may have similar knowledge deficit and misconceptions about MMC and HIV prevention. Proper information and training is important for PNG's health care workers. ▪ Given existing illegal cuttings by health workers in PNG, awareness need to be brought to the top level to formally introduce MMC provision as a formal procedural service to the community. The health workers needed to be trained in the specific skills to provide MMC. There is risk involve in the unregulated foreskin cutting in PNG e.g. risk of infection and malpractice. ▪ PNG to ensure upskilling package with competencies and certification for specialised MMC training ▪ Motivation of health workforce is paramount for quality work output and optimum health. ▪ Training of nurses and CHW to perform MMC with PrePex
Galukande *et al*., 2013	Use of surgical task shifting to scale up essential surgical services: a feasibility analysis at facility level in Uganda	Qualitative: In-depth interview and focus group discussion	Uganda had no formal policy on surgical task-shifting but it is informally practiced widely with varied understanding of the principles. There is strong support from front line health workers and the facility managers for surgical task shifting. Uganda is ready to implement formal training and supervision on task shifting support program.	
Tynan, Vallely, *et al*., 2013	Sociocultural and individual determinants for motivation of sexual and reproductive health workers in PNG and their implications for MC as HIV prevention strategy	Qualitative: In-depth interview and focus group discussion	Health worker motivation is important for MC provision program. Recommended for policy makers to incorporate staff motivational factors for future MC programs in PNG.	
Umar, Mandalazi, Jere, & Muula, 2013	Should female health providers be involved in medical male circumcision? Narratives of newly circumcised men in Malawi	Qualitative: Focus group discussion	Most participants in the Malawi study shows men were not comfortable with women clinicians to perform VMMC. Main reasons include: Traditional MC practice involves secrecy of MC rituals and this needs to be maintained in medical MC; and MC involves sexual organs which was not sexually appropriate for women to conduct.	
Barone, Li, Awori, Lee, & Goldstein, 2014	Clinical trials using the Shang Ring device for male circumcision in Africa: A review	Qualitative: Article review	Shang Ring device is easy to teach and learn, making it an appealing technique for use in Sub-Saharan Africa where doctors are inadequate, other health care workers are performing through task shifting. Studies in Africa and China have reported less problem encountered in terms of less minutes	

			for the procedure, less complication with little disruption to wearing it.	device should be appropriate Mobile clinics may raise more operational issues (cleaning time, staff burnout, and transport cost.). ▪ Task shifting and task sharing approach in organising limited health workforce should be considered to minimise burnout. ▪ PNG to consider how to cater for mass MMC such as school programs. ▪ PNG to consider training HCWs to provide and be aware of the different ▪ If non-physicians can perform MMC using PrePex in three of the African countries, then so can PNG's front-line health care workers (registered nurses and community health workers). Proper training on the use of PrePex would be paramount, including pain management. ▪ With proper training, Shang Ring can be effectively used by registered nurses and community health care workers. ▪ Shang Ring may not be feasible for men who have split
Bertrand *et al*., 2014	Systematic monitoring and evaluation of MMC scale-up: Adoption of efficiency elements in Kenya, South Africa, Tanzania & Zimbabwe.	Mixed methods: Systematic evaluation of VMMC implementation.	Issues related to VMMC services: requires task shifting, accreditation for nurses to perform VMMC, proper monitoring system to be in place, preferred usage of pre-packaged kits for VMMC; and policy dialogue on VMMC delivery.	
Bollinger *et al*., 2014	Cost drivers for VMMC using primary source data from Sub-Saharan Africa	Quantitative: VMMC cost analysis	Task sharing is the key factor in improving efficacy but not privacy. Improvement is also required to maintain ongoing consumables for MMC procedures in Sub-Saharan African countries.	
Mavhu *et al*., 2014	Provider attitudes toward the voluntary medical male circumcision scale-up in Kenya, South Africa, Tanzania and Zimbabwe	Quantitative: Survey	Some similarities between each countries policies and the provider attitude. For example, all participants in Kenya and few from Tanzania believe that the provider had a professional obligation to remain with one client from the start to the end of procedure. However, Zimbabwe and South Africa had no task shifting in place, although this was endorsed. The providers' attitude was much more influenced by the individual countries. Most participants expressed that involving service providers at the formulation of guidelines will ensure a successful program. Using of diathermy during VMMC was efficient and a faster way that minimises bleeding and sped up procedure.	
Perry *et al*., 2014	Work experience, job fulfilment & burnout among VMMC providers in Kenya, South Africa,	Quantitative: Systematic monitoring of VMMC	Most VMMC providers were male. Task shifting and task sharing were common. Task shifting was legal in some countries and illegal in others. Most experienced burnout during peak periods such as school holidays.	

	Tanzania & Zimbabwe			foreskins in PNG. A feasibility study is required. ▪ Innovative ways of strengthening and utilising limited health workforce in Africa may well fit with PNG. Apart from task shifting and task sharing, PNG can consider employing new graduates, training front line HCWs on the use of devices us as Shang Ring and PrePex. ▪ PNG's HCWs are knowledgeable on MMC and are performing foreskin cutting but will require proper training. ▪ Possibility of accreditation of nurses program for MMC training. Highly relevant for PNG. ▪ PNG to train health workers to provide appropriate and effective communication with to adolescents and provide counselling and information accordingly. .
Phili *et al*., 2014	Health workers' perspectives on implementation of an integrated medical male circumcision strategy in KwaZulu-Natal, South Africa	Qualitative: Focus group discussion	There was high acceptability of VMMC amongst the HCWs but most did not fully understand the MC and HIV prevention concept. There was role confusion in terms of their scope of practices, also constraints in infrastructure. Negative perceptions included beliefs that MC would increase HIV among males.	
Tynan *et al*., 2014	Building social currency with foreskin cuts: A coping mechanism of PNG health workers and the implications for new programs.	Qualitative: In-depth interview and Focus group discussion	MC practice is seen as an emergence of unauthorised service by health workers in PNG. Coping mechanism were compelled by mutual obligation where health workers are obliged to their skills and resources. Recommended for proper training and implementation of MMC.	
Devieux *et al*., 2015	Knowledge, attitudes, practices and beliefs about medical male circumcision (MMC) among a sample of health care workers in Haiti	Quantitative: Exploratory survey	Health workers in Haiti had much knowledge of MMC and were willing to perform but reported they lack the skills and require training. Responses were mostly from doctors and nurses.	
Feldblum *et al*., 2016	Safety and efficacy of the PrePex male circumcision device: Results from pilot implementation studies in Mozambique, South Africa, and Zambia	Quantitative: Pilot implementation study on the use of PrePex	Pilot study in Mozambique, South Africa and Zambia suggests PrePex performed by non-physicians is both safe and feasible, but requires proper pain control measures when removing devices.	
Fram *et al*., 2016	Employing demand-based volumetric forecasting to	Quantitative: Population based survey	Zambia and Zimbabwe had potential demand in using the different devices instead of surgery. It	

	identify potential for and roles of devices in scale-up of medical male circumcision in Zambia and Zimbabwe		needed nation-wide awareness and availability of devices. In terms of preference, PrePex may have high demand, followed by Shang Ring.	
Kufa *et al*., 2016	Delivering PrePex medical male circumcision services through a mobile clinic: The experience from a pilot project in North West Province, South Africa	Mixed methods: Evaluation study: document and report review: thematic analysis used in analysing texts.	It was feasible to provide PrePex in mobile clinic, training health workers on how to apply and remove device and demand was there. But there were operational issues such as procedure time and cleaning time, staff burnout, client transport so continuous review of plans and challenges was a way forward for providing PrePex via mobile clinic.	
Tobian *et al*., 2018	Providers' perceptions and training needs for counselling adolescents undergoing voluntary medical male circumcision	Qualitative: In-depth interview	Adolescents should have their own specific guidelines and counselling skills. Providers expressed hesitation in communicating complete sexual health information including HIV testing, HIV prevention and proper condom usage and the importance of knowing partner status and abstinence from sex or masturbation during wound healing. Providers preferred counselling younger adolescents with their parents or guardians present. The lack of training for working with adolescents influences the type of information communicated.	
Nxumalo & McHunu, 2020	Healthcare workers' perceptions and experiences of implementing voluntary medical male circumcision in KwaZulu-Natal, South Africa	Qualitative: One-on-one interview	Health care workers reported that VMMC services were led by the national health department, implemented in the state health care facilities and supported by NGOs and the private clinic. They reported that there was poor preparation and training for health care workers to implement the VMMC service. This resulted in inefficient MC delivery.	

Table 4.5 Summary of papers related to the supply of medicine and equipment

Author(s) / Year	Title	Methods	Summary	Relevant to PNG context
Edgil *et al*., 2011	Voluntary medical male circumcision: Logistics, commodities, and waste management requirements for scale-up of services	Quantitative: Cost analysis on VMMC commodities	Experiences of using the expanded WHO recommended commodities list for VMMC services in Swaziland indicated that supply chain and waste management has nearly doubled the total per procedure cost. Program planners need to consider the vital contribution of supply chain and waste management to VMMC program cost.	Lessons that may be applicable to PNG: ▪ Budgets for MMC provision require additional expenses for supply chain and waste management. These items are not included in the current expanded WHO recommended list for MMC provisions in the service delivery. ▪ Feasibility study on device use is required to inform appropriate methods suitable for PNG. ▪ PNG to learn from Zimbabwe to implement both PrePex device use and surgery according to different age group preferences. ▪ A feasibility study needed in PNG to confirm the adverse events and concerns regarding PrePex device. Precautions are required for proper training and hygiene for the client,
Kigozi *et al*., 2013	The acceptability and safety of the Shang Ring for adult male circumcision in Rakai, Uganda	Quantitative: Evaluation of the Shang Ring device: observation and document analysis.	Men in Uganda were to choose between Shang Ring and dorsal- slit procedure for VMMC. Shang Ring recipients had complete would healing and resumed sex four weeks earlier post-operatively than the dorsal-slit. It seems the most acceptable, safe and efficient method is Shang Ring. In the event of ring displacement, surgical facilities were necessary to step-in.	
Rech, Bertrand, *et al*., 2014	Surgical efficiencies and quality in the performance of voluntary medical male circumcision (VMMC) procedures in Kenya, South Africa, Tanzania, and Zimbabwe	Quantitative: Cross sectional study	The study confirms that there is efficiency in task sharing of suturing and use of electrocautery to decrease the operating time. The quality was good.	
Kohler, Tippett Barr, *et al*., 2016	Safety, feasibility, and acceptability of the PrePex device for adult male	Quantitative: Prospective study	PrePex device is shown to be safe in different areas in Malawi. However, few men complained of bad odour, this was day 4-5 post device implementation. Early removal and pain were some of the adverse	

	circumcision in Malawi		events reported. There is also challenges for health workers to be trained well to insert the devices. Clients post device advice was vital. This involves appropriate hygiene, abstinence, post placement care and keeping to clinic visits appointment. Surgical facilities were required for severe adverse events and complications.	the health care facilities and procedure. ▪ Consideration of diathermy machine to control haemostasis. It makes it easier and quicker in terms of task sharing, where one person is trained in using diathermy machine and does the actual surgery.
Tshimanga, Mangwiro, *et al*., 2016	A Phase II randomized controlled trial comparing safety, procedure time, and cost of the PrePex device to forceps guided surgical circumcision in Zimbabwe	Quantitative: Randomised controlled study	PrePex device study in Zimbabwe shows great potential to use to in resource limited settings. The findings shows the device was safe, quick and easy to apply, and effective in procedural time as an alternative to surgical MC.	
Tshimanga, Hatzold, *et al*., 2016	Safety profile of PrePex male circumcision device and client satisfaction with adolescent males aged 13–17 years in Zimbabwe	Quantitative: Comparative evaluation study.	Use of PrePex device amongst adolescents aged 13–17 years is safe. However, more males in this age group were opting for surgical circumcision. Study recommended both PrePex and surgical MC services in VMMC facilitating clinics	

Table 4.6 Summary of papers related to information and reporting systems

Author(s) / Year	Title	Methods	Summary	Relevant to PNG context
Herman-Roloff *et al*., 2011	Implementing voluntary medical male circumcision for HIV prevention in Nyanza Province, Kenya: Lessons learned during the first year	Quantitative: Facility need assessment	The health facility needs assessment is an appropriate tool used tool to assess the VMMC services provided. Some of the challenges identified were shortage of manpower, low HIV testing rates, fluctuation in demand for VMMC. Responses to challenges were coordinated by all stakeholders. This include the district, provincial, and national VMMC task force. The findings were likely to be generalised across African countries.	Lessons for PNG: ▪ Strengthening of data and information systems is paramount in PNG's health systems. Implementing MMC for HIV prevention in PNG will require training to upskill health workforce on data information and management programs. ▪ Accurate documenting and reporting for ongoing MMC programs is important and requires upskilling of health workers for proper record keeping. ▪ Adopt WHO evaluation framework and contextualise to PNG. This will ensure the standards are met by the MMC clinic who will be providing MMC service. Ongoing improvement of the service needed. ▪ 'Facility needs assessment' is a very important assessment for PNG prior to implementing MMC. This assessment will inform about the resources that are available and what needs to be improved to provide an effective MMC service**.**
Dickens, Ouma, Onyango, Onyango, & Bertrand, 2014	Systematic monitoring of MC scale-up in Nyanza, Kenya: Exploring factor analysis of service quality instrument and performance ranking.	Quantitative: Comparative process evaluation	MC quality assessment tool by WHO can be adopted and re-designed to contextualise its use in local setting. Modified tool used in Kenya shows smooth and ongoing evaluation on quality improvement management.	
Sgaier *et al*., 2014	Achieving the high HIV prevention impact of VMMC: Lessons and challenges for managing programs	Systematic literature review	MMC is effective to reduce HIV transmission. But resource capacity constraints poses huge challenges. More evidence based management and training requires in strengthening data, improving management capacity and plan for ongoing Sustainability of VMMC programs.	
Byabagambi *et al*., 2015	Improving the quality of VMMC through use of continuous	Quantitative: evaluation of VMMC using	The services require improvement to provide VMMC in Uganda in: monitoring & evaluation,	

	quality improvement approach: A pilot in 30 PEPFAR supported sites in Uganda	quality assessment tool	management issues, inadequate trained staff to provide VMMC, ongoing quality assessment.	
Kohler, Namate, *et al*., 2016	Classification and rates of adverse events in a Malawi male circumcision program: Impact of quality improvement training	Mixed methods: Retrospective audits and focus group discussion	Adverse events rates of VMMC in Malawi where within the range of as the clinical trial. Post-operative infections and documenting of adverse events were common issues. Specific wound care management and importance of documenting adverse effects were workshopped. Post- workshop evaluation showed fewer adverse events with proper documentation and reporting program.	

Leadership and governance

It is important for PNG to take ownership of the MMC program should the country wish to implement it for HIV prevention. Policy frameworks and situational analyses of VMMC programs for HIV prevention in Africa reveal that successful VMMC programs for HIV prevention depend largely on countries' ownership of the program and partnered leadership with global stakeholders, political and other government and community leaders (Dickson *et al*., 2011; Mwanga *et al*., 2011). Africa's lesson implies that PNG government must take ownership, and then work in partnership with stakeholders, including both the international and local stakeholders.

For example, PNG has a decentralised system of health service delivery that is likely to pose challenges for various areas of the health system should it implement MMC. However, given the fragmented governance in administration of the health care system in PNG, program implementers need to identify key health administrators at the provincial and national level. These key administrators will require strong and clear support and ownership of the program at both levels of government prior to implementation of the program at the national level. However, using strengths-based lens, the fragmented health care system in PNG becomes an opportunity to work directly with provinces with high HIV prevalence and low rates of circumcision as recommended (Gray *et al*., 2014).

International program partners, other stakeholders and NGOs have been partnering in a range of health and HIVAIDS programs in PNG. Hence, it is important that these organisations become partners in the MMC program for HIV prevention (National Department of Health Papua New Guinea, 2010). Involvement of community leaders (church

pastors, teachers, traditional leaders, women leaders and so on) is also crucial to incorporate their ideas into policies and engender shared ownership. African experience suggests that involvement of these leaders at the beginning and through to implementation and sustaining the program is crucial (Dickson *et al*., 2011; Mwanga *et al*., 2011; Sgaier *et al*., 2014).

Health systems financing

Funding a MMC for HIV prevention program may add to the current economic burden in PNG. However, it is seen to be cost-effective in the overall prevention program; MC can prevent HIV resulting in a decrease in antiretroviral costs (McGillen *et al*., 2018; Torres-Rueda *et al*., 2018).

Funding from international donors was helpful in countries with an inability to fund projects themselves. However, international funds also became a major barrier in some priority countries such as Botswana, where VMMC achievements have been slow although donors are typically interested in rapid results. When results are not met, donors abruptly stopped funding, leaving governments who had not budgeted for the massive scale-up stranded for funds to continue the VMMC programs (Katisi *et al*., 2016; Ledikwe *et al*., 2014). Some African countries are avoiding reliance on donor funding by generating and directing national funds specific to HIV programs. The government of Kenya had suggested establishing an HIV trust account; and the Kingdom of Eswatini (formerly Swaziland) is opting for competitive tenders for procurement of drugs and supplies which saves money to utilise in other HIV responses (Pillay, 2012; UNAIDS, 2013a).

Establishing ongoing funds for a MMC program for HIV in PNG will be challenging because of the economic instability that already burdens new and existing health programs in the country (National Department of Health Papua New Guinea, 2010). PNG may seek financial assistance from existing in-country international partners and donors. The United Nations Fund for Population Activities (UNFPA) and the Bill and Melinda Gates Foundation have been funding collaborative health programs such as TB, Malaria and HIV program (National Department of Health Papua New Guinea, 2010; Tynan *et al*., 2012). However, setbacks may arise as in Africa's experience, where there are negative impacts from an imbalance between donor reporting requirements and health system reporting structure, which may abruptly stop funding MMC for HIV prevention (Katisi *et al*., 2016).

Initiatives to generate and sustain funding have been a way forward for some Sub-Saharan African countries (UNAIDS, 2013a), including South Africa where the government committed to increase their funds from the national treasury budget (Pillay, 2012; UNAIDS, 2013a). This was seen as a way forward to self-sustain HIVAIDS program. Likewise, PNG may initiate programs to generate funds for HIV programs including a MMC program.

Health service delivery

Key successes for VMMC program delivery in Sub-Saharan African countries involved the cooperation of health agencies from state, to non-government organisations (NGO), and private organisations (Lissouba *et al*., 2010; Sgaier *et al*., 2014; Wynn *et al*., 2015). This can easily be adopted in PNG because of the similar partnership and collaborative existing mechanisms for other health service delivery programs (National Department of Health Papua New Guinea, 2010). Currently almost all health agencies in

PNG are involved in some HIV programs but the feasibility of taking on MMC activities for HIV prevention is still uncertain.

Constraints in resources were a major setback in providing safe and high quality VMMC services for HIV prevention in some African countries (Sabone *et al*., 2013; Sgaier *et al*., 2014). Issues encountered include inadequate availability of consumable goods; limited health workers with few skills to perform MMC, lack of basic infection control measures; inadequate antibiotics and related drugs; no proper post-operative care and inadequate counselling in some facilities (Jennings *et al*., 2014; Ledikwe *et al*., 2014).

Adequate resource capacity needs to be established prior to implementing the MMC for HIV program in PNG. The capacity to provide first line drugs/antibiotics, surgical equipment or devices, space, good lighting, water, hygiene environment, other HIV prevention packages such as voluntary counselling and testing (VCT) centres, condoms, anti-retroviral drugs are crucial to assess using the WHO MC Commodity List (Edgil *et al*., 2011; Mwandi *et al*., 2011). This is to ensure adequate consumable and non-consumable supplies are available prior to implementing MMC program.

Mobile and outreach modes of VMMC provision were effective in mass campaigns, while fixed VMMC clinics were effective in sustaining ongoing VMMC programs in Africa (Jennings *et al*., 2014). The modes of MMC delivery in PNG are likely be determined by the capacity of the various health agencies who are already overwhelmed by day to day health needs, the client demands, the national or regional targets set by policy makers and the availability of funding. This may become crucial to discuss amongst stakeholders and policy implementers in PNG.

Local beliefs and practices in some African countries were identified as a setback for VMMC for HIV prevention programs. For example, older men in Zimbabwe had negative perceptions about the post-operative abstinence from sex timeframe of six weeks, while others feared pain, haemorrhage and other complications (Chiringa *et al*., 2016; Hatzold *et al*., 2014). Cultural and religious taboos and restrictions in Botswana also hindered adult men in accessing MMC services (Katisi & Daniel, 2015). PNG has a diverse cultural background and has traditional foreskin cutting across different cultures. Hence, cultural issues experienced in Africa are likely be experienced in PNG, and require incorporation of knowledge about cultural taboos and practices when developing polices and standards for MMC provision (Katisi & Daniel, 2015; MacLaren *et al*., 2013). The integration of traditional knowledge and practice may create a demand for MMC among men to achieve the desired reduction in HIV incidence in PNG.

Health workforce

Expanding qualified human resources for MMC services will be a major challenge because of the inadequate health care workforce in PNG's health system. However, adopting Africa's experiences of training and sustaining qualified staff through 'task shifting' and 'task sharing,' may be seen as effective use of limited staff in PNG (Bertrand *et al*., 2014). Task shifting and sharing can be applicable in PNG because the country experiences similar issues to Africa with few medical doctors, and unaccredited nurses and other health workforce to perform MMC (National Department of Health Papua New Guinea, 2010). Governments and MMC drivers need to develop training programs that are guided by the regulatory and legal framework as implemented in some Africa countries. This will allow MMC to be performed

by front line health workers such as nurses and CHWs in a safe, organised and efficient manner.

MC is commonly performed by men in traditional circumcision settings in Africa (and PNG). As such, most men attending VMMC preferred male health workers. Having male health workers in VMMC clinics had a positive impact on the access to VMMC program in most African VMMC Clinics (Katisi & Daniel, 2015; Umar *et al*., 2013). There are similarities in some of these gendered cultural values between much of PNG and Sub-Saharan Africa (Kelly, Kupul, Nake Trumb, *et al*., 2012; MacLaren *et al*., 2013), which may allow male health workers to attend to MMC. This scenario may provide a burden for PNG's health workforce plan for MMC, because the majority of the existing health workforce are female (National Department of Health Papua New Guinea, 2010). Program developers need to strategize how to maximise the limited number of male health workers in PNG.

Physical and emotional exhaustion, stress and frustration were high amongst health workers in Kenya, South Africa, Tanzania and Zimbabwe during mass VMMC implementation (Perry *et al*., 2014). Health worker motivation was an effective mechanism to encourage the health workforce; short term-training of staff to take on other roles in VMMC or constant rotation were both reported to relieve health workers' boredom (Perry *et al*., 2014). Program planners in PNG need to be aware of the staff burnout situation. This was common in Africa due to large number of VMMC conducted with limited workforce. PNG's experience may differ with the scope of MMC program implementation.

Medicine and equipment supplies

An ineffective supply chain was identified as a major obstacle for continuous medical supplies in the health facilities for VMMC roll-out in Sub-Saharan Africa. Some facilities had adequate supplies of medicine and equipment, while others had limited and or none (Jennings *et al*., 2014). This resulted in unnecessary referrals for patients when seeking further treatment, care and support. Inadequate supplies of antibiotics and gauze were also common items necessary for the MMC program (Sgaier *et al*., 2014).

NGOs and private facilities tend to maintain and control their supplies and logistics more efficiently than the state facilities (Byabagambi *et al*., 2015). Uganda improved some of the state facilities with supplies and logistics with the assistance of NGOs during the VMMC implementation (Byabagambi *et al*., 2015). Kenya performed well in terms of equipment and supplies and introduced diathermy machines that are effective in controlling bleeding, which resulted in decreased post-operative care. Kenya also used pre-packaged kits to perform VMMC, which appear to prevent infections (Bertrand *et al*., 2014; Rech, Bertrand, *et al*., 2014).

The use of the expanded WHO Recommended Commodity List for MC services was helpful to many VMMC clinics in Africa (Edgil *et al*., 2011). The WHO Commodity List made it easier for the VMMC clinic to maintain their inventory, stocked with medical and equipment supplies. The list not only focussed on the VMMC supplies but was inclusive of other HIV preventative packages as well. This includes counselling and testing kits, condoms, anti-retroviral drugs, antibiotics and other drugs to treat opportunistic infections (Edgil *et al*., 2011; World Health Organisation , 2009a).

Establishing logistics, supply chain and procurement for MMC program is important should PNG wish to implement successful MMC programs for HIV prevention. Africa's

experience in using the WHO Recommended List is a possible way forward that should inform PNG in organising its medical supplies and equipment.

African studies also suggest training and upskilling health facility managers about procurement and logistics (Bertrand *et al*., 2014; Edgil *et al*., 2011). A person who is knowledgeable on his/her role performs well and ensures all stocks needed for the program are adequate and maintained. PNG may consider short training programs for officers on procurement of medical supplies in preparation for the MMC implementation.

Apart from establishing the MMC commodity needs in a clinic, African studies also reveal facilities need to be strengthened in their main supply procurement system and other logistics in place. This involves waste management, cleaning appliances and solutions and many others (Ledikwe *et al*., 2014). It is likely that PNG may focus on direct supplies of MMC procedures and may overlook the other logistics required. Including these indirect costs in the budget together with medical supplies is crucial for accurate monitoring.

Health information systems

A VMMC evaluation study on the 'impact of quality improvement training' in Africa revealed inadequate record keeping and reporting of follow-up visits. For example, VMMC facilities in Malawi had no standard guidelines and kept no records of adverse events (Kohler, Namate, *et al*., 2016), while an evaluative study in Uganda shows VMMC drivers conducted staff training on record keeping and reporting concurrently with performing VMMC, which improved the information system in these clinics (Byabagambi *et al*., 2015). Studies further revealed that some VMMC clinics in South Africa trained specific staff for

record keeping. However, the records were only provided to VMMC program funders, and there was limited monitoring in place to provide data to guide local quality and ongoing VMMC service delivery within the primary health care sector (Rech, Spyrelis, *et al*., 2014).

Appropriate standards and quality assessment tools for the VMMC program developed by WHO have been utilised by some VMMC program sites (Dickson *et al*., 2011; World Health Organisation , 2009a), while others felt the WHO quality assessment tools were too complex so that individual countries have modified the tool to suit their settings. For example, Kenya modified the WHO Quality Assessment Toolkit to suits its own local settings and has since successfully used them for ongoing program assessment and improvement (Curran *et al*., 2011).

Africa's experiences in VMMC scale-up studies suggest quality information is required to guide evidence-based decisions on the allocation of resources or for continual support by health system leaders and funding agencies (Uthman *et al*., 2010). For example, the national level may require the data for funding VMMC programs while the ground level staff require local data for on-going quality management of the VMMC program (Byabagambi *et al*., 2015).

Information systems will be highly challenged in the rural and remote health facilities in PNG. The challenges include: inadequate communication processes; unreliable transport system; little or no availability of stationery in health care facilities; and unclear standard tools for reporting and receiving of feedback in most settings (Tynan *et al*., 2012). PNG may strategize carefully to improve the existing challenges whether it be health facility management approach or an inter-sectoral approach in improving its information system.

PNG may use the WHO's Quality Assessment Tool to guide the monitoring and evaluation of the MMC program (2009a). Learning from Kenya's experience, PNG may also adopt and modify the WHO Quality Assessment Toolkit to better suit PNG's setting. Furthermore, upskilling of health workers for accurate recording and reporting is paramount to collect quality information to inform both the government and the stakeholders.

Study conclusion

It is important to determine the readiness of the health system in PNG at a national, regional and provincial level to support the implementation of an MMC program for HIV prevention. PNG's health system may be able to provide MMC services, as this is a relatively simple outpatient surgical procedure. However, for successful implementation the country will need: ownership of the program and the funding; the availability of trained personnel, necessary supplies and equipment; quality assessment control; adequate space, lighting, hygiene, record keeping and information systems; and adequate follow-up. All of these should all be explored in order to see what investments may be required at different levels of the health system for the introduction of a safe and quality comprehensive MMC service. The MMC implementation further requires the understanding of the social, cultural, geographical and epidemiological context in which MMC services will be offered. Understanding the health systems aspects of the MMC service delivery will help strategic decisions around where to prioritise specific investments in human resources, equipment and infrastructure for the greatest public health benefit.

Given that PNG has similar HIV drivers as does Africa, the evidence compiled in this review provides an opportunity for PNG to consider the health system implications should it

wish to implement MMC for HIV prevention in the future. The results of the literature reviewed suggest caution, given challenges in governance, funding pathways, and underlying complexities in health service delivery, inadequate resources in health workforce, infrastructure and procurement of equipment of both consumable and non-consumables in nature, and issues related to monitoring and evaluation of the program.

Summary of Chapter Four

In this chapter I discussed Component One of the study, which is the systematic literature review on health systems experiences of implementing MMC for HIV prevention globally. There are many health systems challenges faced by VMMC program in Sub-Saharan Africa which are common among LMIC. The success of the program depended on how well the health system building blocks were strengthen concurrently with the implementation of the VMMC program in Africa . PNG may draw on from Africa's, VMMC program to implement its male circumcision program in the future. Chapter Five discusses two different parts of Study Component Two. This includes the views and experiences of health care workers and facility health care managers' about MMC for HIV prevention in PNG. The two sections are discussed in the format of two separate manuscripts.

Chapter 5. Health service providers views on male circumcision

This chapter presents results of two health surveys conducted with health facility managers and health care workers across 17 health care facilities in four PNG provinces. The results of these surveys are presented and discussed in manuscript format.

The first manuscript presents and discusses the experiences and attitudes of health facility managers towards MMC for HIV prevention. The second manuscript presents and discusses the experiences and attitudes of the frontline health care workers towards MMC for HIV prevention. The literature cited in the two manuscripts is provided in the reference list.

1. **Tommbe, R.**, Browne, K., Vallely, A., Larkins, S., MacLaren, D. Views of health care facility managers on male circumcision for HIV prevention in Papua New Guinea. Target Journal for publication: *Journal of Health Care Management.* (Close to submission).

2. **Tommbe, R.**, Browne, K., Vallely, A., Larkins, S., MacLaren, D. Experiences of foreskin cutting amongst front-line health care workers in PNG: An exploratory study on male circumcision for HIV prevention. Target Journal for publication: *Health Service Management Research.* (Close to submission).

5.1 Manuscript One: Health managers views on male circumcision

Abstract

Background

Papua New Guinea (PNG) has the highest number of Human Immunodeficiency Virus (HIV) cases in the Oceania region. Despite the availability of prevention programs, anti-retroviral therapy, care and support, PNG still has new HIV cases reported in certain geographical regions. Medical male circumcision (MMC) for HIV prevention has been recommended by the World Health Organisation (WHO) for countries experiencing general epidemics spread via heterosexual sex. Several MMC for HIV prevention research projects have been conducted in PNG but no direct research has been conducted on the feasibility of implementing formal MMC services in health care facilities. This study aimed to document the views of health care facility managers about MMC for HIV prevention in four provinces in PNG.

Methods

This cross-sectional descriptive study involved a situational analysis survey intended to inform a better choice of MMC intervention for HIV prevention if MMC was formally introduced to PNG's health care system. The survey was conducted amongst 11 health care managers in 11 different health care facilities in four provinces in Papua New Guinea (PNG). Data were analysed using simple descriptive statistics for quantitative responses and thematic analysis for qualitative data.

Results

Ten (91%) of the participants held positive views about implementing formal MMC for HIV prevention in their health care facilities. However, they also acknowledged limitations in terms of: staff training (91%); equipment and instruments (82%); disposal of equipment and supplies (82%); medications (73%); and availability of an extra surgical procedure room to perform MMC surgery (55%).

Conclusion

Almost all health care managers acknowledged limitations in terms of MMC equipment and supplies, space and privacy for MMC provision, qualified manpower and training needs to perform MMC. However, they were positive that each of their respective health care facilities could be supported to implement formal MMC for HIV**.**

Study background

Three randomised control studies in Kenya, Uganda, and South Africa provide conclusive evidence that male circumcision reduces the risk of heterosexually acquired immunodeficiency virus (HIV) among men by 50-60% (Auvert *et al.*, 2005; Bailey *et al.*, 2007; Gray *et al.*, 2007). Evidence from these African studies together with other observational and ecological studies prompted the World Health Organisation (WHO) and the United Nation Joint Program on HIV/AIDS to issue a joint statement recommending that medical male circumcision be integrated into existing HIV prevention programs (World Health Organisation & UNAIDS, 2007). Thirteen priority countries in Sub-Saharan Africa

with high HIV prevalence and low levels of MC have rolled out large-scale Voluntary medical male circumcision (VMMC) programs (World Health Organisation & UNAIDS, 2007).

While much research has been focused on the role of MMC in high HIV- burden countries, little is known about the operational feasibility of MMC for HIV prevention in low-moderate burden countries, such as in the Asia-Pacific region (Kelly, Kupul, Fitzgerald, *et al*., 2012; MacLaren *et al*., 2013; Tieu *et al*., 2010).

PNG is reported to be one of the countries with the highest HIV burden in the Asia-Pacific and has more than 90 percent of all HIV cases in Oceania (UNAIDS, 2016a). Although PNG has a national HIV prevalence of 0.9%, the prevalence of HIV varies in different provinces and regions. HIV transmission is predominantly heterosexual with many existing traditional circumcision practices across the country (Hill *et al*., 2012; MacLaren *et al*., 2013; MacLaren *et al*., 2015; National AIDS Council of Papua New Guinea, 2018). PNG does not have a formal medical male circumcision for HIV prevention program, nor is a medical male circumcision a routine service provided by health facilities in PNG. However, some staff at some clinics do perform MMC when requested. These predominantly male staff most often perform MMC procedures after-hours and/or outside the facility, in community settings such as beside a river or under a tree. Most of these procedures are not supervised or documented in official health system records and is such are completely unregulated (MacLaren *et al*., 2013).

An understanding of the readiness of the health system in PNG to support the implementation of any future MMC program for HIV prevention is important. To date there

is a limited evidence-base on aspects of operational MMC service provision in health care facilities in PNG. It is therefore important that more studies are conducted to inform program developers about how best to implement any future MMC for HIV prevention programs in PNG. This study was conducted to investigate the views and experiences of health facility managers about existing ad hoc or periodic MMC procedures in their health facility and their views on the implementation of MMC as a part of formal HIV prevention strategies in the future.

Study methods

This study collated and analysed data collected during the "acceptability of male circumcision for HIV prevention in PNG study" conducted in four provinces (Enga, ORO, Madang and NCD) from 2011-2013 (MacLaren *et al*., 2013). The aim of this study was to explore the views of health facility managers about medical MMC as an additional HIV prevention strategy in PNG.

Seventeen health care facilities in four provinces (Popondetta in Oro Province, Port Moresby in National Capital District, Porgera in Enga Province and Madang in Madang Province) were invited to participate as part of the "Health care workers and facility managers' views and experiences of MMC for HIV prevention study". Eleven of the 17 officers in charge of the health facilities responded and completed the survey.

A structured survey was used to collect data. The survey was adapted for the PNG context from the service availability questionnaire in the WHO Male Circumcision Analysis Toolkit (World Health Organisation , 2009b; Appendix 3.2). Questions were both

quantitative (closed) and qualitative (open) in nature. Participants were informed of the nature of the study and voluntarily consented to complete the survey. Questionnaires were self-administered with pen and paper.

Data were entered into an Excel spreadsheet, cleaned and then imported into the statistical package SPSS for analysis. Data were cross-checked for accuracy both during data entry and analysis. Numerical data were descriptive in nature and were summarized as percentage, mean and median. A thematic analysis process was done for the qualitative free-text responses (Bradley, Curry, & Devers, 2007). The main themes were categorised and supported by appropriate quotations.

Ethics approval

Ethical approval for this study was granted by PNG National AIDS Council Secretariat (RES10011, Pacific Adventist University (Approval letter, Nov 2011), and James Cook University Human Research and Ethics Committee (H3757). The study was endorsed by the Provincial AIDS Councils of the study sites (Enga, Madang, Oro and NCD).

Study results

Study results are presented according to the background of the health care facility; the types of services provided and the availability of the resources to provide MMC; followed by health facility managers' views and experiences of MMC

Demographic findings

Table 5.1 presents the background results of the health facilities as provided by the facility managers. Of the 17 health care facilities surveyed, 11 health care facility managers responded. Four (36 %) were from Oro, three (27%) were from Madang, three (27%) were from Enga, and one (10 %) was from NCD. The facility managers were from different health care cadres: four (36 %) were doctors; one (10 %) was a Health Extension Officer (HEO), five (46 %) were Registered Nursing Officers (RNOs), and one (10%) was a Community Health Worker (CHW). Different types of health facilities were managed by the facility managers: four facilities (36%) were hospitals; two (18%) were health centres; and five (46%) were day clinics. Different bodies operated the health facilities: the state operated six facilities (54%); four (36%) were privately operated, and one (10%) was operated by a faith based organisation (FBO).

Table 5.1 Health facility information

Province	Professional qualification of facility manager	Type	Operator
Enga	Medical doctor	Medical centre	Company (gold mine)
Enga	Medical doctor	Hospital	Private
Enga	Health Extension Officer (HEO)	Day clinic	State
Madang	Medical doctor	Rural hospital	State
Madang	Registered Nursing Officer (RNO)	Health centre	State
Madang	Registered Nursing Officer (RNO)	Day clinic	State
NCD	Registered Nursing Officer (RNO)	Day Clinic	Faith based organisation
Oro	Medical doctor	Provincial hospital	State
Oro	Registered Nursing Officer (RNO)	Health centre	State
Oro	Registered Nursing Officer (RNO)	Day clinic	Company (NBP oil)
Oro	Community health care worker (CHW)	Day clinic	Company (NBP oil)

Existing infrastructure, equipment and services

Health care managers reported the availability of the resources and services required for MMC at their health care facilities. Tables 5.2 and 5.3 present the availability of surgical facilities, equipment and the services provided by each health care facility as reported by health care managers.

Table 5.2 Existing surgical facilities and related equipment

Existing items N=11	***n* (Percentage)**
Water (tank, well water, main supply dam, running stream)	11 (100%)
Functional electricity (solar, hydro & generator)	10 (91%)
Minor surgery room/procedure room	9 (82%)
Functional sterilising equipment (autoclave, pressure cooker, antiseptic solution, open fire)	7 (64%)
Surgical theatre	5 (46%)
Functional surgical and emergency room	5 (46%)
Adequate supplies for basic infection prevention: Chlorine Gloves Waste disposal	 8 (64%) 8 (73%) 7 (64%)

Table 5.3 Basic health services provided

Services provided (N=11)	***n* (Percentage)**
Sexually transmitted infection tests and treatment	11 (100%)
Family planning	9 (89%)
Minor surgery	9 (81%),
Voluntary Counselling and Testing (VCT)	8 (73%)
Established and dedicated VCT services	4 (34%)
Vasectomy and tubal ligation	3 (27%)
Caesarean section	2 (18%)

HIV and male circumcision related services

Seven of the 11 (64%) health care facilities surveyed had HIV testing facilities, while 10 (91%) of the facilities provided condoms for HIV and STI prevention. Five (46%) of the facilities already provided MMC services. Of the five (46%) facilities where MMC was performed, two (18%) reported that MMC was performed for medical reasons and three (27%) reported MC and other foreskin cutting was performed on request for personal reasons.

Health facility managers reported that MC and other forms of foreskin cutting was performed on all ages ranging from infants to adults. However these cuttings were reported to be mostly performed on teenagers and young adults.

Pre and post-surgery counselling services

Five of the 11 (46%) facility managers reported that their facilities provided counselling to their clients before and after MMC surgery regarding risks and benefits. Four (36%) health care facilities provided counselling on sexually transmitted infections (STI) and HIV for their MMC clients and also provided information about post-operative care of the wound. Three (36%) health care facilities reported counselling their clients for HIV risk reduction post-surgery. Two (18%) facilities provided counselling on resumption of sexual activity, while one (9%) health care facility counselled on other male reproductive and sexual health topics.

All five (46%) of the health care facilities reported counselling was performed by the clinician performing MMC surgery, and three (36%) facilities further reported that RNOs and

others assisting the surgeon were performing the counselling, with one (9%) health facility utilising certified counsellors.

Health care workers performing foreskin cuttings out of their scope of practice

Medical doctors and HEOs are the only health workers who can perform MMC surgery within their official scope of practice in PNG. The official scope of practice of Registered Nurses and Community Health Workers, who comprise the majority of the health professional workforce, does not currently include MMC surgery. This section highlights the views of the health care managers about which health care workers are accredited to perform MMC surgery. Three (36%) health care managers reported that all health care workers were authorised to perform MMC surgery, while three (36%) reported that medical doctors, HEOs and RNOs were the only workers to perform MMC. Two (18%) managers indicated only medical doctors are allowed to perform MMC; one (9%) indicated only medical doctors and nurses; one (9%) reported only HEOs; while one (9%) reported only HEOs and RNOs can perform MMC. Ten managers (91%) wanted to provide safe MMC services in their respective health care facilities.

Views of health care managers on implementing medical male circumcision

Various views of the health care managers about the implementation of MMC for HIV prevention were highlighted in this study. The study participants described that MMC should be implemented not only for HIV prevention but that MMC was good for male genital hygiene, and also, MMC was seen as a mechanism to reduce the risk of contracting other STIs. While MMC was seen as beneficial, others reported that MMC needed to be

implemented in health facilities for clients' safety. Others expressed that MMC is costly and requires adequate funding. Some health care managers reported that awareness programs on MMC were important to disseminate accurate information. Others expressed a view that constant medical supplies were needed. Furthermore, participants reported that skilled and adequate health care workers were required, some reported that their health facilities were already challenged and that adding MMC will overstretch or burden their existing service. Table 5.4 provides a summary of qualitative responses to an open question about formal MC service implementation.

Table 5.4 Qualitative responses to formal MMC service implementation

Themes	**Example quotes by health care managers**
MMC is good for genital hygiene	*MMC should be promoted for penile hygiene in men (Male RNO).*
MMC reduces risk in contracting STI and HIV infection	*Chances of contracting HIV and STI is less for men who are circumcised (male doctor).*
Administer MMC in health facilities for safe MMC services	*There is much complication such as infection and haemorrhage seen in foreskin cutting outside of health facilities. This can be prevented if we introduce MMC as a routine service inside the health clinics (female, RNO).*
MMC implementation is costly	*It is an expensive exercise to provide MMC awareness and also to implement MMC (male HEO).*
Awareness and promotion needed to introduce MMC for HIV prevention	*MMC for HIV prevention is new knowledge among many staff and the community. This will require more awareness if it is routinely provided in our health facilities (male RNO).*
Specialty training required by staff to perform MMC	*More male staff required with extra knowledge and skills to perform MMC (female RNO).*
Extra burden on overstretched health care service	*MMC service will be a burden due to limited supply of antibiotics and dressings we have in the health care facility (male RNO).*
MMC implementation requires constant medicine and other MMC service related supplies	*We will need more medical supplies and more maintenance work in the health care facilities if we are planning to introduce MMC in our health care facility (female RNO).*

Health care managers views on the resources to provide medical male circumcision services

Health care managers were asked their views on the resources needed should their health facilities implement MMC for HIV prevention. Ten (91%) reported that qualified health care workers were required to perform MMC and it was important to train the frontline health care workers, especially CHWs and RNOs. Nine (82%) of the managers reported they needed proper equipment and instruments to provide MC services. Nine (82%) reported that waste disposal equipment and supplies were important for the clinic to provide MMC

implementation. Eight (73%) participants reported their facilities would require additional antibiotics and STI/HIV medications. Six (55%) reported their facility would require extra space to perform MMC surgery. All 11 (100%) participants reported they would require additional health care workers and items to facilitate the surgery. Table 5.5 provides a summary of the items required by health facilities to implement MMC, with the percentage of participant responses for each item.

Table 5.5 Items required for MC implementation

Item (% participants)	**Examples of free text response**
Staff training (91%)	- *The health centre will require qualified staff to perform MMC.* - *It is important that we train all front line health workers to perform MMC.* - *Extra human resources will be needed for MMC implementation.*
Equipment and instruments (82%) (Surgical tables, operating instruments, etc.)	- *We will require appropriate instruments to perform MMC.* - *MMC surgery will require confined room for privacy.* - *Functioning steriliser is needed in the health centre to provide MMC.* - *Extra lighting and water is needed in the clinic to provide MMC.* -
Disposal equipment and supplies (82%) (Anaesthetics, sutures, gloves, needles etc.)	- *We do not have incinerator to burn waste from MMC and we will need one.* - *Maintaining constant disposable stock of MMC supplies is a great need for the clinic.* - *Stocks such as cotton wool, gauge, combine, gowns, or linens are important and we require more for MMC implementation.*
Medications (73%)	- *Maintaining constant stock of antibiotics for MMC wounds and infections.* - *Medicine for retro drugs and STI drugs will be needed if we provide VCT services for HIV and STI patient.*
Extra surgical procedure room to perform MC surgery (55%)	- *Privacy and space is required to perform MMC procedures in the clinic.*

Discussion

This is the first study to examine the views of health facility managers in rural hospitals, health centres and day clinics in PNG about MMC for HIV prevention. We sought to document their knowledge about the benefits of MMC in light of the existing health services and their challenges. We also explored their views to understand their perceived needs if MMC services for HIV prevention were to be implemented in PNG.

Existing male circumcision and foreskin cutting practice

This study has provided evidence of ad hoc, but regular foreskin cutting and MMC performed by front line health care workers at the formal health facilities in PNG. Almost half of the participants reported that MMC was being performed in their health facilities. Further questions were not asked about the types of foreskin cutting and who performed the MMC surgery. This supports evidence from previous studies that document numerous forms of penile foreskin cutting in communities being performed by health care workers both in the community and within health care facilities (Hill *et al*., 2012; Kelly, Kupul, Fitzgerald, *et al*., 2012; MacLaren *et al*., 2013; MacLaren *et al*., 2015; Tynan *et al*., 2014).

Health care managers reported that men 18 years and above were more commonly circumcised than other age groups. Most MMC were conducted for personal reasons and few for medical reasons. As shown in previous MMC studies in PNG, it is likely that personal preference may include cultural, peer cutting or religious foreskin cutting (MacLaren *et al*., 2013).

Although MMC for HIV prevention strategy is a potential strategy in PNG, it is evident from this study that MMC is an existing practice in PNG's formal health systems and it needs to be regulated well so MMC for HIV prevention can be formerly established.

Medical male circumcision and foreskin cutting beyond the scope of practice

Health care workers are guided by a specific scope of practice to deliver health care services. However, as reported in this study, some frontline health care workers, mostly CHWs and RNOs, have been performing MMC beyond their scope of practice. Similar findings were reported in earlier studies, where community groups and health care workers shared that MMC was performed by health care workers and villagers in some parts of PNG (MacLaren *et al*., 2013; Tynan, Hill, *et al*., 2013; Tynan *et al*., 2012).

This study also reported that some health care managers were less knowledgeable of which health care workers were credentialed to perform the MMC procedure. This is reflected in the results, where a few participants highlighted that CHWs and RNOs who were not accredited were eligible to perform MMC. It seems that a lack of awareness of the scope of practice of their health care workers amongst a few health care managers has led to the performance of many potentially unsafe MC and foreskin cuttings. It is important for the health care facility managers to ensure their staff are qualified and properly accredited to provide safe MMC with appropriate record-keeping and monitoring.

Basic resources for providing medical male circumcision services

It is crucial for health care facilities to have adequate resources to provide an efficient MMC for HIV prevention service. In general, this study shows that some health facilities had adequate health workers with equipment to provide basic health care services, while other health facilities had limited health workforce, medicine and equipment supplies. Less than half of the facilities have a functional operating theatre for major surgery, more than three-quarters had minor surgery or procedural rooms. This reflects the level of health care facilities engaged in this study. Rural hospitals tend to have functional operating theatres, while the health centres and day clinics/outpatients have established procedural rooms to perform minor procedures only. Most health care facilities required supplies of both disposable and fixed/reusable items such as surgical tables, operating instruments, surgical sutures and gloves, proper lighting, space for privacy and proper access to waste disposal. These concerns are national issues in PNG where most state health facilities include many run-down facilities, with shortage of equipment and supplies jeopardising provision of routine services (National Department of Health Papua New Guinea, 2010; Tynan *et al*., 2012).

Most health care facilities with functional services are operated by private companies and faith based organisations, or are larger provincial and rural hospitals operated by the state. Such functional equipment and infrastructure is unlikely to be the case in government operated small day clinics and health centers. This is supported by reports from the PNG National Department of Health (2010) and Tynan *et al*. (2013) showing that state health facilities mostly display run down facilities with lack of basics such as electricity and water (National Department of Health Papua New Guinea, 2010; Tynan *et al*., 2012). Africa's

MMC scale-up program reported few differences between the MMC services provided by the private and state owned health care facility. The funding support from the donor agencies upgraded the state facilities and resources for the scale-up program (Tchuenche *et al*., 2018). It is important to upgrade resources for the state health care facilities in PNG so all implementing agencies could provide an efficient MMC service. PNG may seek funding from donor agencies to upgrade state health care facilities.

This study confirms that access to essential medicines and supplies is a challenge in existing health facilities and that increasing reliable supplies of these items is required for MMC services. Given PNG's existing problems, MMC program developers need to strategise on how well they can provide adequate MMC related resources in the health care facilities. Establishing logistics, supply chain and procurement for the MMC program's commodity needs is an important element required for successful MMC program. One of the factors facilitating VMMC scale up in Sub-Saharan Africa includes access to the items on the WHO Recommended Commodity List (Edgil *et al*., 2011). This checklist tool can be utilised as an efficient guide for procurement and stock-taking of MMC in PNG. The commodity list not only includes MMC procedural resources but involves other HIV comprehensive prevention supplies such as condoms, Voluntary Counselling and Testing Kits, anti-retroviral drugs, antibiotics, analgesics and many more items.

Comprehensive HIV prevention package

MMC implementation should never replace other known methods of HIV prevention and should always be considered as part of a comprehensive HIV package (World Health Organisation & UNAIDS, 2007). This study shows existing comprehensive HIV services

were provided in all participating health care facilities where the existing and ongoing HIV comprehensive services are provided. The managers need to consider the impact that MMC for HIV prevention program may have on the existing HIV prevention packages. This includes the increasing workload for health care workers for counselling; increase in supplies of medicine to treat STIs; and increased supplies of HIV test kits and condoms. MMC scale-up in Africa did experience challenges to maintain and establish the comprehensive HIV package when rolling out the MMC services for HIV prevention (Rech, Spyrelis, *et al*., 2014). There were also issues with referral from one point of care to another because of the unavailability of certain services. For instance, HIV positive men from VCT were referred to other clinics because there were no antiretroviral therapies (ART) in those settings (Herman-Roloff *et al*., 2011; Rech, Spyrelis, *et al*., 2014). Careful consideration should be given if MMC is to be implemented as an additional HIV prevention strategy to minimise the impact that this will have on other routine HIV comprehensive services in the health facilities.

Training to upskill health care workers

A sufficient and skilled health care workforce is an important health systems element required in implementing MMC for HIV prevention. Almost all participants in this study reported that additional workforce was needed in their health facilities and that upskilling of HCWs was required to provide safe and quality MMC service. It appears that all levels of health facilities (mostly state and FBO facilities) have experienced a shortage of staff. Shortage of trained health workforce is experienced across PNG, although particularly acute in rural and remote areas (National Department of Health Papua New Guinea, 2010). Although the National Health Department has strategies in place to develop and to increase

the human resource capacity in PNG's health service delivery, there is still inadequate health care workforce in the country (World Health Organisation , 2018a).

Upskilling of HCWs to perform safe circumcision is important. Staff training on medical male circumcision was recommended to be established among front line health care workers in this study. Almost all participants reported that staff training for MMC skills is vital to prevent unwanted complications happening in the community. A vasectomy as a proxy for MMC study in PNG revealed that training provided for health care workers to perform vasectomy involved a large amount of money and placed a huge burden in terms of post–training follow-up (Tynan *et al*., 2012. This resulted in very few health workers certified to perform vasectomy; the rest were not certified because of a lack of practical supervision or being transferred elsewhere and unavailable for follow-up (Tynan *et al*., 2012). Similar issues may arise if the MMC training package is not implemented and monitored well in PNG. MMC scale-up programs in Sub-Saharan Africa have successfully trained nurses to perform roles in MMC provision; this includes task sharing with counselling of patients and referring patients undergoing MMC and some were trained to perform MMC in a task shifting role (Bollinger *et al*., 2014; Perry *et al*., 2014; Sheldon *et al*., 2012). External donor funding and the policies in human capacity building for MMC program were strategically revised to provide qualified staff to deliver large-scale MMC services in Africa (Bollinger *et al*., 2014).

Training of health care workers is a way forward to prepare health care facilities for formal MMC implementation. The training needs to be tactfully conducted to ensure health workers are competent in performing and providing safe MMC, and to ensure carefully monitoring and review of their performance and outcomes.

Study strengths and limitations

The study captures the views of the health facility managers through data collected by researchers well informed about the local context. This study presents a general view of the situation at a particular point in time and an opportunity to understand the factors that may enable implementation of MMC. The data were collected 8 years ago and it is unclear whether views have changed in the interim. It does not involve higher level management at the provincial and the national level. More studies are required to focus on the high level management for relevant policy issues. Also, future studies require more participants to allow more detailed statistical analysis between health systems factors and perceived readiness to implement MMC.

Conclusion

Health facility managers expressed positive opinions about the capacity of their facility to provide MMC for HIV prevention but were also mindful of the unsafe foreskin cutting practices outside the health care facilities. Almost all managers agreed that safe MMC for HIV prevention should be implemented and that upgrading of facilities and resources for MMC provision is necessary. This involves addressing issues related to space, privacy, qualified manpower and training, equipment and medicine supplies.

This study shows that all levels of health care facilities (hospitals to day clinics) in these 11 health care facilities in PNG have some existing and functional routine services. Almost all participants were willing to implement MMC for HIV prevention as a new service in their respective health facilities. However, it revealed that additional expansion for space,

supply procurement, staff empowerment, and other MMC program support facilities such as Voluntary and Counselling Testing (VCT) are also necessary.

5.2 Manuscript two: Health care workers views on male circumcision

Abstract

Background

Medical male circumcision has been recommended by the World Health Organisation (WHO) and joint United Nations Program on AIDS (UNAIDS) to help prevent the spread of HIV amongst heterosexual males. Despite these recommendations, Papua New Guinea (PNG) with moderate HIV prevalence has not implemented MMC as an additional HIV prevention strategy. We sought to assess the knowledge and experiences of MMC among a sample of frontline health care workers (HCWs) in four provinces in PNG.

Methods

A convenience sample of 133 frontline HCW in 17 health care facilities in four provinces in PNG responded to an exploratory survey that collected a range of information on MMC, using the WHO Male Circumcision Situation Analysis Toolkit. The WHO-designed survey consists of both quantitative and qualitative questions that seek to understand the demographic background of the participants, their knowledge and experiences of MMC, and perceived challenges in implementing MMC as a routine health care service for HIV prevention in PNG. Descriptive statistics were analysed for quantitative responses and thematic analysis for qualitative data.

Results

The sample consisted of female HCWs (57%) and male HCWs (43%). The majority of the participants were registered nursing officers (RNOs; 44%) and community health workers (CHWs; 42%), followed by health extension officers (HEOs; 8%) and medical doctors and other allied health professionals (6%). Forty-four percent worked in state health facilities, 36% in private and 20% in faith-based organisations (FBO) and non-government organisations (NGO).

Foreskin cutting occurred mostly in adult men. Traditional foreskin cutting practices involved the charging of fees from K100-K1500, while others were less expensive. Thirty-two percent of the 133 participants performed surgery on the foreskin, of which CHWs did most cutting (40%). Most HCW's (52%) performed dorsal cuts; RNOs and CHWs (40%) were not formally trained but performed surgery after having observed the procedure.

Most (n=99, 75 %) HCWs were highly knowledgeable about the general health benefits of MMC. Most (n=94, 71%) of the participants were willing to offer MMC if it was formally introduced by National Health Department as a routine service in health facilities. If adopted as national policy as an additional HIV prevention strategy, most HCWs expressed a need for government to equip health facilities with human resources, instruments, drugs, and space to provide MMC.

Conclusion

MMC is not currently a routine and formally established health care service for HIV prevention in PNG health care settings. However, most participants demonstrated positive attitudes towards MMC. There is some reflection that HCWs need more evidenced based

knowledge on the advantages and disadvantages of MMC for HIV prevention. Participants strongly recommended that the PNG government facilitate specialised training, and equip health facilities with resources to perform MMC for HIV prevention. Furthermore, public health awareness is crucial to reduce unsafe foreskin cutting practices in PNG. This would minimize the risk of contracting HIV.

Keywords: Foreskin cutting, medical male circumcision, HIV prevention, health care workers, implementation.

Study background

Medical male circumcision has been recommended by the World Health Organisation (WHO) and UNAIDS for the prevention of HIV acquired via heterosexual sex in communities with high HIV prevalence and low rate of male circumcision (World Health Organisation & UNAIDS, 2007). Though PNG has a moderate HIV prevalence of 0.9% with variation in geographical distribution of the epidemic in four regions, it has potential to increase in certain settings in the country where male circumcision is not practiced (MacLaren *et al*., 2015; Vallely *et al*., 2014)

PNG has various forms of existing foreskin cutting practices (MacLaren *et al*., 2013). These are mostly performed as cultural rituals for religious beliefs, masculinity and sexual enhancement, and there is cutting among peers for acceptance in their confined groups (Kelly, Kupul, Nake Trumb, *et al*., 2012; MacLaren *et al*., 2013). The most common form of foreskin cutting is a dorsal slit where a straight cut is done on the foreskin, leaving the remnant foreskin hanging around the shaft of the penis. Dorsal slits are performed by both

HCWs and non-HCWs. Very few men undergo formal MMC performed by health care workers (Hill *et al*., 2012; MacLaren *et al*., 2013).

Formal MMC in PNG is performed as an elective case by accredited HCWs (medical doctors and health extension officers; HEOs). The elective cases of MMC are done for other medical reasons and not for HIV prevention (Tynan *et al*., 2012). However, recent studies in PNG have shown considerable informal foreskin cutting done by unaccredited health workers, Registered Nursing Officers (RNO) and Community Health Workers (CHW), both inside and outside health care facilities (MacLaren *et al*., 2013; Tynan *et al*., 2014; Tynan *et al*., 2012). Although a qualitative study in PNG shows that health workers perform informal foreskin cutting as a mutual obligation to gain community recognition and satisfy moral, professional and cultural obligations (Tynan *et al*., 2014; Tynan*et al*., 2013), there is limited knowledge about HCW knowledge and experience of MMC in health care settings. In this paper, we explore frontline HCW's experiences and knowledge about MMC for HIV prevention in health care settings. Frontline HCWs refers to the health care workers that are in a position to assess and treat clients at the initial phase of treatment and care. In PNG, this group comprises of CHWs, RNOs, Health Extension officers (HEOs) and very few medical doctors. The frontline health care workers provide basic primary health care services to more than 70% of the country's population in the rural towns, villages, and in urban day clinics (National Department of Health Papua New Guinea, 2010; Tynan *et al*., 2012).

Study methods

Study setting

This component of the study used data from a large cross-sectional multi-center study of the acceptability of MMC for HIV prevention in PNG. This survey involved 861 men and 519 women and was collected in 2011-2013. The study was conducted across four PNG provinces (MacLaren *et al*., 2013). In this component, we conducted surveys with frontline health workers to seek their knowledge and experiences of MMC and their views of the capacity of the health services to provide a VMMC program. We also sought their views on existing facilities, equipment and medical supplies for MMC provision.

Most of the health care facilities were close to the study sites of the "Acceptability and feasibility on MMC for HIV prevention study" (MacLaren *et al*., 2013). The study was conducted at Porgera gold mine, Igaturu Oil Palm (NBP oil), Divine Word University (DWU), and Pacific Adventist University (PAU). The first two sites are a large gold mine in the highlands and oil palm production facility on the coast. The latter two were universities. The main study sites were selected because men from all over PNG come for work and study in these sites and therefore the resultant quantitative data may be nationally representative. Hence, the nearby health facilities selected for this sub-study were convenient for concurrent data collection with the closeness of the large study sites.

The health facilities were contacted by the researchers through email, phone calls and visits to negotiate the availability of health care workers to participate in the sub-study. A total of 17 health care facilities responded to participate in the study. Not all health care

facilities involved in this study component provided a formal MMC program. However, a few health facilities provided MMC on demand, while others nursed men with complications from traditional and contemporary cuts done outside of health facilities.

Following approval from the four study sites, permission was also granted by Provincial Health Authorities to conduct research among health workers in the health facilities that were in the vicinity of the main study sites. A convenience sample of 133 frontline health workers from 17 health facilities in four PNG provinces (Enga, Oro, Madang and NCD) participated in the survey. Health care workers (HCWs) of both gender willingly volunteered to participate. These included HEOs, RNOs and CHWs and doctors.

Administering of Questionnaires

Questionnaires were distributed in an enclosed envelope by the researchers to the respective health managers. The health care managers opportunistically distributed the questionnaires to the HCWs who volunteered to participate in this study. HCW who were sick, or had days off or leave during the distribution of the survey questionnaire were excluded. The questionnaire had an information sheet attached. Participants were informed of the nature of the study and volunteered to participate. Questionnaires were self-administered and consent was implied through completion of the questionnaire. A timeframe of two weeks was given to fill the form and it was then collected by the health care managers of the designated health facilities.

The structured questions were adapted from WHO Male Circumcision Analysis Toolkit (World Health Organisation , 2009b). Questions were both quantitative and

qualitative in nature. The questions were on health workers' demographic and professional practice status, knowledge and practices of informal foreskin cutting, views on possible implementation and challenges in establishing formal a MMC program in PNG.

Data analysis

Questionnaires were collected, coded and data entered into an Excel spreadsheet and then imported into the statistical package SPSS for analysis. The data were checked for accuracy, both during data entry and analysis. Numerical data were descriptive in nature and were summarized as frequencies, percentages, means and median as appropriate. Simple thematic analysis was undertaken for the qualitative data from the free-text responses (Bradley *et al*., 2007).

Ethics approval

Ethical approval for this study was granted by PNG National AIDS Council Secretariat (RES10011), Pacific Adventist University (Approval letter, Nov 2011), and James Cook University Hyman Research and Ethics Committee (H3757). The study was endorsed by the Provincial AIDS Councils of the four study sites.

Study results

Findings are presented according to the participant's demographic characteristics, MMC knowledge and experiences and their perceptions of MMC implementation for HIV prevention in their respective health care facilities.

Demographics and facilities

Of the 133 HCWs who completed surveys, 76 (57%) were female, 54 (41%) male; three HCWs (2%) did not indicate their gender. Almost half (44%) of the HCWs were employed in a government health care facility, a third (36%) in private facilities (mostly mining and agricultural companies) and 20% were employed in faith-based or non-government organisations. Registered Nursing Officers made up almost half (44 %) of participants, followed by CHWs (42%), HEOs (8%), medical doctors (3%) and allied health workers (3%). Of the 17 different health facilities involved, seven (41%) were established day clinics, four (24%) were health centers, and six (35%) were provincial and district hospitals.

Health care workers' knowledge about medical male circumcision

Table 1 presents findings about HCW knowledge and attitudes towards MMC. Of the 133 respondents, most stated that MMC helps improve penile hygiene (n=117, 86.3%), provides health benefits (n=123, 92%), and reduces sexually transmitted infections (n= 115, 58.3%). Seventeen (15%) stated that MMC entirely prevents HIV infection while 28 (25%) stated MMC increases risk of contracting HIV. Almost half (45%) stated they did not know if MMC increases sexual pleasure, 63 (60%) were not sure if circumcised men were more promiscuous, and exactly half were not sure if women preferred circumcised men.

Table 5.6 HCW knowledge and attitudes about MMC

Questions/statements	**Yes**	**No**	**Don't know**
Does MMC provide health benefit? (n= 123)	92 (74.8%)	7 (5.7%)	24 (19.5%)
MMC helps improve penile hygiene (n=117)	101 (86.3%)	10 (8.6 %)	6 (5.1%)
MMC reduces risk of STI (n=115)	67 (58.3%)	25(21.7%)	23 (20%)
MMC reduces risk of HIV (n=119)	61 (51.2%)	29 (24.4%)	29 (24.4%)
MMC prevents HIV infection entirely (n=115)	17(14.8%)	70 (60.9%)	28 (24.3%)
MMC increases risk of HIV (n=113)	28 (24.8%)	56 (49.6%)	29(25.6 %)
MMC reduces risk of penile cancer (n=112)	41 (36.6%)	26 (23.2%)	45 (40.2%)
MMC increases sexual pleasure (n=118)	47 (39.8%)	18 (15.3%)	53 (44.9%)
MMC reduces sexual pleasure (n=111)	10(9%)	52(46.9%)	49 (44.1)
Men who are circumcised are more promiscuous (n=105)	23 (21.9%)	19 (18.1 %)	63 (60%)
Women prefer men who are circumcised (n=115)	37 (32.2%)	21 (18.3%)	57 (49.5 %)

Health care workers experiences of foreskin cutting

Of the 131 participants, 42 (32%) reported they had performed some form of foreskin cutting and 65 (51 %) reported assisting others with foreskin cutting procedures. Of the 42 HCWs who had performed foreskin cutting, the largest number (n=17, 40.5%) were CHWs, followed by RNOs (n=11, 26.2%), HEOs (n=11, 26.2%), and medical doctors (n=3, 7.1%).

No anesthetic officers, laboratory technicians or medical students reported performing any form of foreskin cutting. The median number of surgeries (foreskin cutting) conducted by HCWs was seven (range 1-100). More than half (23 of 42) reported performing a procedure

in the past 12 months (median 3– range 1-100). Just under half (17 of 42) had performed a procedure outside the health facility (in a non-clinical community setting) in the past 12 months (median 3, range 1-100). One third (21 of 65) of HCWs who reported assisting with procedures had done so in the past 12 months. When asked about training in foreskin cutting procedures, 64 (48%) did not respond, 33 (25%) stated they had no formal training, 24 (18%) learnt from observation and assisting other HCWs, six (5%) trained at medical school, four (3%) trained in HEO school and two (1%) gained skills from traditional practitioners.

Of the 27 participants who responded about foreskin cutting styles, half (n=14, 52%) of the HCWs performed dorsal slits, a quarter (n= 7, 26%) the full removal of the foreskin and five (19%) reported both full removal and dorsal slits. One HCW (4%) reported performing penile inserts. Two thirds (n=33, 25%) of HCW had performed foreskin cuttings on adults, 11 (8%) on adolescents, five (4%) on children 1-9 years and two (2%) had performed MMC on infants.

Cost for foreskin cutting was qualitatively reported at between PGK 2 – 100 (AUD $0.70- $30) in government facilities, PGK 20 – 300 (AUD $6-$100) in private facilities and PGK 10 – 1500 (AUD $3-$500) in community settings.

Adverse events and complications from foreskin cutting

Of the 131 HCWs, 19 (14%) reported seeing complications from procedures conducted inside the facility and 54 (41%) reported seeing complications from procedures conducted in community settings. The mean number of complications observed by the 19 HCWs following procedures conducted inside the health facilities were: blood loss, mean =

2.11, SD = 0.65; infection, mean = 2.47, SD = 0.52; impotence mean = 0.6, SD =0.21. This was slightly lower than the mean number of complications observed by the 54 HCW following procedures conducted outside of the health facilities: blood loss mean = 2.33, SD=0.70 infection mean = 2.7, SD=0.44 impotence mean = 0.8, SD=0.19. Paired samples t-tests indicated that there was no statistically significant differences in mean values of complications observed by HCWs following procedures conducted inside and outside of health facilities.

Many HCWs described complications seen at the health care facilities. HCWs description of complications and interactions between young men and health services include:

> *We never do circumcision in the health centre. Village boys and men do the circumcision, when the boys bleed they come to health centre for treatment. We applied stitches to stop the bleeding then we supply antibiotics to take at home. Most do not come for review (Female, RNO).*

> *We hear male nurses talking about bleedings from foreskin cutting. Young boys come in private to see the male nurses only (Male CHW).*

> *I have stitched bleeding foreskin performed by friends*
> *Many young boys asks us to give bandages, gauze and antibiotics to dress sores but they don't tell us where the sore is. Later we hear stories in the community that boys were cutting their foreskin (Female CHWs).*

Willingness to deliver male circumcision services

Of the 131 respondents, 94 (71%) stated they were willing to offer MMC if it were to be implemented in the health care facilities and 88 (66%) indicated a desire to undergo additional training to perform MMC. A quarter (n=25%) of HCWs stated a preference for MMC to be performed on children between 1-9 years, another quarter (n=33; 25%) preferred adolescence between 10 – 16 years, and further quarter (n= 30, 23%) preferred young men aged from 17-24 years (n=27, 20%). Of the remaining 18 (15 %) preferred infants and 12 (9%) did not have an age preference.

Qualitative results exploring age preference suggested that cutting during infancy and children ages is easy to manage during pre and post cutting, heals faster, and there is no stigma and no work or school restriction for children in these age groups. Reasons given for cutting during adolescence and into adulthood included that the youngsters were well informed of the foreskin cutting process, and puberty age is where most have their sexual debut, improve hygiene, and needed prevention of sexually transmitted infection

Preferred health personnel for foreskin cutting

More than three quarters of HCWs strongly agreed that male medical officers, HEOs, RNs and CHWs should be permitted to perform male circumcision. However only 20% agreed or strongly agreed that traditional foreskin cutters without health qualifications should be permitted perform male circumcision (Figure 5.1). In contrast, less than half of HCWs agreed or strongly agreed that female medical offers should be permitted to perform male

circumcision and less than 20% agreed or strongly agreed that female CHWs should be permitted to perform male circumcision (Figure 5.2).

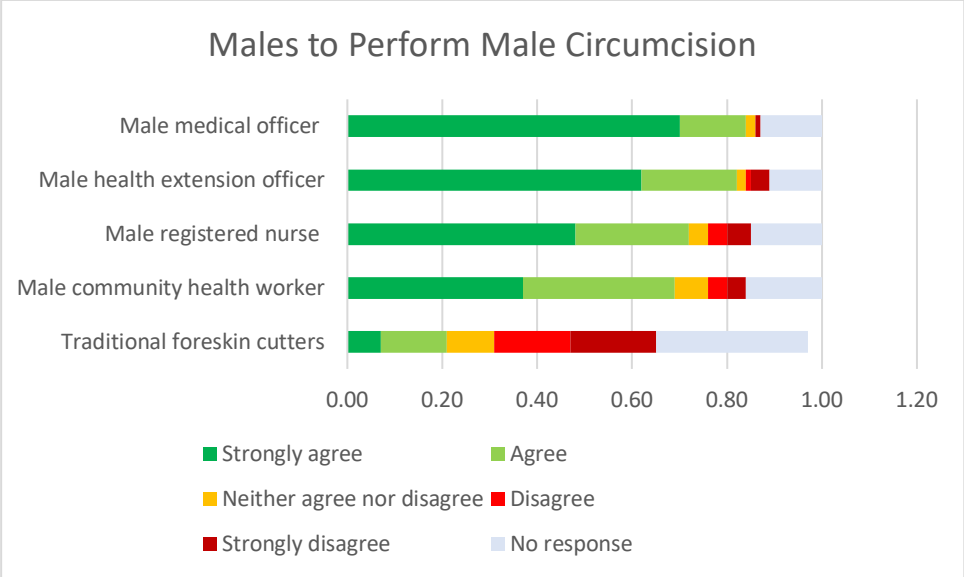

Figure 5.1 Male health care workers to perform MMC

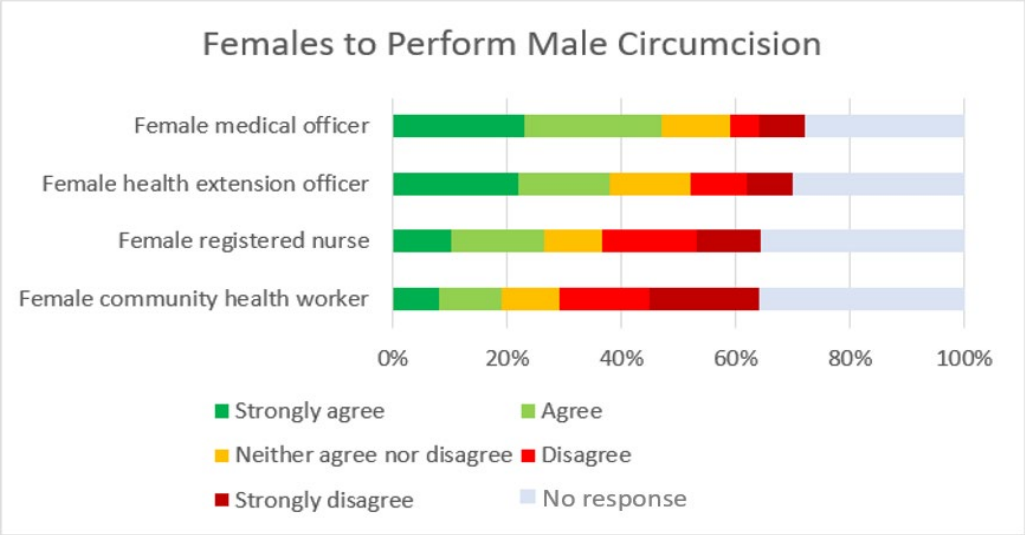

Figure 5.2 Female health care workers to perform MMC

Health care worker perceptions about implementation of medical male circumcision

Health care workers were asked their views on MMC implementation for HIV prevention. Table 5.7 illustrates the themes and quotes from both the positive and the negative response about whether health facilities should promote MMC services. Twelve themes emerged: MMC to be approved by National Department of Health (NDoH); high demand for MMC but no service available; accreditation of RNOs and CHWs to perform MC; training of more male health workers to conduct MMC; conduct MMC where there is availability of resources; cost will be the determining factor for MMC; cultural MC practice integrated in health care facilities; MMC awareness and promotion needed if MMC to be implemented in health care facilities; MMC will promote promiscuous behaviour; MMC prevents other STIs; MMC is good for hygiene purposes and should be implemented; and no proper instruments and facilities to provide MMC services.

Table 5.7 Health care workers views on possible implementation of formal MMC

Themes	Participant Quotes
MC to be approved by National Department of Health (NDoH)	- *If the health department approves MC implementation then it is good for HIV prevention (male, RNO).* - *National health department has the responsibility to authorise MMC program (male HEO).* - *We will perform MMC in our health setting if NDOH approves and this needs to be done because of the increased foreskin cutting and complication we attend to in our care (male RNO).* - *We can perform MMC but we are not trained properly and government must provide training for us so we can perform proper MMC at the health centres (male CHW).* - *I have seen many young boys being circumcised at home by other youths so I think it would be better if the government introduce MMC to be perform in our health facilities (male CHW.)*
High demand for MC but no service available	- *Many young boys are doing dorsal splits and there is no professional health worker willing to perform the operation and therefore are using their friends to do it for them (male CHW).* - *Many males are cutting their foreskin by bush doctors using unsterile technique (female CHW).* - *We do not have the training to cut but many village boys are smart and knows how to cut foreskin in the villages. People want it but we do it in the villages and not in the health centre. The authorities need to implement it in the health centre (male CHW).* - *We see a lot of infection, excessive bleeding etc.in the health facilities from fore skin cuttings in the villages. This is alarming, MMC must be done in the health facilities (female RNO).* - *We see many complications of MMC at the clinic that shows MMC is done by non-medical worker outside the clinic (male HEO).*
Accreditation of RNOs and CHWs to perform MC	- *Important that government allows MC to be done by CHWs and nursing officers so we can provide MC in the health centres (male RNO).* - *There is cutting everywhere in our surroundings. We need further training to perform MMC (male RNO).* - *We (CHWs) are not allowed to perform MMC so we hide from our bosses and perform cuttings in the villages or after the clinic is closed because men want to us to cut their foreskin (male CHW).* - *There are very few HEOs and doctors and they attend to big cases and have not time to do MMC. We need to be trained to do MMC (male RNO).*
Train more male health workers to conduct MC	- *If male nursing officer agrees to conduct MMC, then MMC Service must be provided in the health centres (female RNO).* - *There are less male doctors and HEOs to provide MMC (female RNO).*

	- *More male health workers need to be trained to suit our cultural practice and taboos (female HEO)*
Conduct MC where there is availability of resources	- *There is hospital with doctors who are experienced & have instruments for circumcision available as well as other equipment and resources (male HEO).* - *We have hospital and health centre, we should promote and provide male circumcision (male RNO).* - *MMC can be provided where sterile facilities are available (female HEO).* - *MMC can be performed in the District Hospital and Health centres (male RNO).* - *We have facilities, we must promote and perform MCs. (male RNO).*
Costing will be the determining factor for MC	- *Village foreskin cutting is expensive; MMC will be less costly if it is implemented in the health facilities (male RNO).* - *We are not certain of how much it will cost. It will depend on the government to impose the amount if the MMC Service is formally introduced (male HEO).* - *Private company will be happy to make more money if MMC (female RNO).*
Cultural MC practice in health care facilities	- *Health facilities can promote circumcision but otherwise in areas where this procedure has been practiced they can continue as their culture (male CHW).* - *It will be difficult to practice cultural ritual in the health centre if MMC service is provided (male CHW).* - *Men would not allow female health workers performing circumcision on them, it is our kastom or taboo (male RNO)* - *MMC may not allow cultural rituals embedded in its procedure (male HEO).* - *There will be some differences in the process in performing MMC. For instance, culturally we perform split cuts whereas MMC remove full foreskin" (male CHW).* - *Community feasting with harvest from gardens and slaughtering of pig is practiced in some areas of PNG and this involves large amount of money and time and preparation, this ceremony also halt usual village activities for weeks in preparation" (male RNO).*
MC awareness and promotion needed if MC to be implemented in health care facilities	- *I believe health facilities have to make more awareness and promoting MMC to keep male/female healthy/prevent STI (Female CHW).* - *The health facilities in this district will promote circumcision (male HEO).* - *Our health facilities are promoting and will still promote male circumcision (female HEO).* - *Male circumcision should be promoted (male CHW).* - *It is good to promote MMC services in this health facility (male CHW).* - *I think health facilities in the high HIV prevalence's district and provinces need to promote MMC (male RNO).*
MC will promote promiscuous behaviour	- *When males are circumcised they will go around with ladies catching infection and causing a lot of family problems. We should not entertain MMC (female CHW).*

MC prevents other STIs	- *According to what I know of circumcision reduces the risk of males getting STIs. Therefore, the health facility should promote and encourage male circumcision (male RNO).* - *To prevent the increasing rate of STI cases seen frequently at OPD of the hospital. This could help to decrease the number of male from getting STI and HIV plus reduce the mode of transmission between his partners (male HEO).* - *STD, HIV and PID cases here is high in statistics, due to promiscuous behaviour and polygamy. We should provide MC Service (female HEO).*
MC is good for hygiene purposes and should be implemented	- *MC may be implemented to keep men's private organ clean (male RNO).* - *Definitely, for hygiene purposes. Highlands region is cold and most men do not tend to wash. MC will be a good measure to prevent dirt being accumulated in the penis (female HEO).* - *I strongly advocate for MC Service to provide good hygiene for men folks (male RNO).*
No proper instruments and facilities to provide MC services	- *I do not agree for MMC to be implemented because most health facilities do not have proper equipment and facilities to conduct MMC as a routine service for HIV prevention (male RNO).* - *There is no proper instrument for MC procedure, we need to provide these instruments to provide MC (male RNO).*

Discussion

This study provides a significant contribution to the limited literature on the perspectives of frontline health workers about MMC for HIV prevention in PNG. By examining the attitudes and experiences of frontline HCWs in the rural villages and towns of PNG where health care resources are limited, this study provides a wealth of knowledge on foreskin cutting activities in 17 selected health care facilities in four of the 22 PNG provinces. Most importantly, this study reports the experiences of some front line health care workers, including RNOs and CHWs, whose voices are rarely heard.

Health care workers' knowledge about medical male circumcision

Although MMC for HIV prevention in PNG is new information for frontline health care workers, there is some form of existing foreskin cutting in some provinces and regions in PNG. The majority of the HCWs agreed that MMC provides health benefits. However, almost half of the participants were not sure that MMC reduces the risk of acquiring HIV and other STIs. This indicates HCWs had limited knowledge on the role of MMC in HIV prevention and that MMC reduces the risk of contracting HIV and certain sexually transmitted infections as evidenced by the randomised trials in Africa (Auvert *et al*., 2005; Bailey *et al*., 2007; Gray *et al*., 2007; World Health Organisation & UNAIDS, 2007). The majority of the HCWs were not aware that MMC reduces the risk of penile cancer, if it was performed before the sexual debut (Wilson *et al*., 2013). The knowledge gap of the association of MMC and penile cancer by HCWs could be due to low incidence of penile cancer in PNG (National Department of Health Papua New Guinea, 2010). Nearly half of the

participants were unsure if MMC would increase or decrease sexual pleasure. This result is similar to the acceptability of MMC for HIV prevention study in PNG where majority of the non-health care participants were not sure whether MMC increases or decreases sexual pleasure (MacLaren *et al*., 2013). Interestingly, post-MMC study evaluation on sexual drive conducted in Africa confirms high sexual satisfaction post MMC (Auvert *et al*., 2005; Bailey *et al*., 2007; Gray *et al*., 2007). Perhaps education of people in PNG about enhanced sexual satisfaction could overcome some barriers and negative information on MMC for HIV prevention.

This health care workers survey shows HCWs require reliable knowledge on the relationship of MMC and HIV prevention measures, its advantages and disadvantages. The information acquired by the HCWs would empower and enable them to impart it to clients who wish to seek more understanding on the benefits of MMC prior to the surgery.

Experiences of foreskin cutting

The increased demand in foreskin cutting in some provinces in PNG has exposed frontline health care workers to performing various styles of foreskin cutting beyond their scope of clinical practice. This study reports more than 30% of the frontline HCWs were not only performing MMC but were involved in other forms of foreskin cutting, including dorsal slits, among adult and adolescent men. Although the RNOs and CHWs knew they were not authorised under their scope of clinical practice to perform foreskin cutting, they continued to perform because of the increase demand for foreskin cutting. The foreskin cuttings were mostly performed inside the health care facilities as well as outside the health care facilities, especially in the villages. This study also reports numbers of complications and foreskin

cuttings performed outside the health care facilities were slightly higher than the ones performed in the health care facilities. The most common complications ranged from loss of blood to infection and men experiencing a disfigured penis and impotence. Most complications seen inside the health care facilities were from cutting performed outside by the traditional surgeons and peers in an unsterile environment. The common reasons for foreskin cutting as perceived by the health care workers, both inside and outside of the health care facilities include cultural factors, sexual enhancement, peer request with unknown reasons and very few medical reasons. No foreskin cuttings were performed specifically for HIV prevention.

Consistent with our findings,Tynan's study in PNG also identified the frontline HCWs performing foreskin cutting out of their scope of practice in the rural parts of PNG (Tynan *et al*., 2012). Another study by Tynan describes that frontline HCWs knew they were not authorised to perform MMC and other forms of foreskin cutting but were engaged in the procedure as a form of coping mechanism to improve their living and working conditions (Tynan *et al*., 2014). The involvement of health care workers performing beyond their scope of practice is not only common in foreskin cutting practice but in other areas of health care provision. This is confirmed by other studies of rural health services in PNG covering the ambiguity of the roles of health care workers in practice despite the clinical standards in place in PNG and the polices that guide their practice (Tynan *et al*., 2014; Tynan *et al*., 2012).

Findings indicate that though MMC for HIV prevention is a new and potential intervention for HIV prevention in PNG, HCW's are already performing foreskin cutting for various other reasons. If MMC is to be formerly implemented, then the HCW should be properly trained to provide safe MMC. .

Costs in foreskin cutting

Costs for providing MMC services vary across different health care agencies. This study identified that costs involved in cultural foreskin practices were expensive and for many community folk were unattainable. This was followed by the private clinics and state health care facilities. Most HCW felt that if MMC is implemented for HIV prevention, it is likely that cost will increase in the private health care facilities. Others raised that cultural foreskin cutting is expensive and suggested MMC be implemented in health care facilities to reduce the high cost experienced by villagers. PNG may need to implement a different price range if MMC for HIV prevention is to be formerly introduced. Africa's study shows MMC is cost-effective for HIV prevention and it is considered suitable to be implemented in conjunction with other evidence-based HIV prevention methods (Uthman *et al*., 2010). However, Uthman *et al*. (2011) also highlighted that more funding will be required for comprehensive HIV prevention packages. This suggests that should MMC be formerly implemented for HIV prevention, the government should set a fixed fee that is affordable so that the MMC service is accessible to everyone.

Strengthening of resources in health care facilities for medical male circumcision service

Resources required to implement MMC in the health care facilities are very important. This study highlighted that some health care facilities had enough resources for the basic routine outpatient services but this would not be adequate to cater for MMC as an HIV prevention service. Some of the resources required according to HCWs were: extra health care workforce, more medicines and surgical equipment, sterilizers, space and privacy in small health care facilities. Few from the private sector were keen for MMC to be

implemented quickly because they acknowledged they had resources and equipment available. Lack of equipment and facilities and other MMC support program were also a concern in the large scale up of MMC program in Africa, which were ongoing issues confronted by the governments and the development partners of the MMC program (Edgil *et al*., 2011). Atkins (2020) shows MMC scale-up for HIV prevention program depended largely on quality management and increased resources on top of the already existing resources in the health care facilities (Rech, Spyrelis, *et al*., 2014). Furthermore Atkins (2020) suggested that facilities that had the greatest preparedness for the scale-up MMC program provided efficient an MMC service. Findings from this study indicate that health system readiness to provide adequate resources is paramount prior to implementing MMC for HIV prevention.

Integrating traditional foreskin cuttings with medical male circumcision at the health care facilities

Integration of traditional MMC practices with MMC requires proper planning to ensure the programs do not conflict with each other. Suggestions to integrate traditional foreskin cutting with MMC to provide a safe and clean environment, were made by some participants in this study. However, issues around integration were also raised by few participants. Most common issues reported were: types of foreskin cutting, costings and preparation, rituals of initiation ceremony and activities involved. A study by Tynan *et al*. (2013) in PNG describes similar findings, that communities in traditional MMC practising areas reported foreskin cutting done by the traditional practitioners were unsafe and that this may increase the risk of introducing infections including HIV. A recent study in in the Sepik region of PNG identified that it is possible to integrate traditional foreskin cutting with MMC but that it requires considerable effort in establishing the service (Manineng *et al*., 2017).

Certain studies in South Africa involved traditional nurses and surgeons undergoing training on biomedical MMC procedure. The training showed significant improvement in knowledge and attitude about STI, HIV, environmental aspects, legal aspects, normal and abnormal anatomy and many more areas (Edgil *et al*., 2011; Peltzer, Nqeketo, Petros, & Kanta, 2008). Cultural issues were also a great concern in traditional foreskin cutting settings in Africa, which resulted in men and boys unwilling to undergo MMC for HIV prevention. Intensive health education was introduced to raise awareness and create demand in this setting (Chiringa *et al*., 2016). For example, a study in Botswana revealed that values and traditions in foreskin cutting were not upheld in MMC awareness and implementation programs, such as usage of sexualised language, which was inappropriate during public awareness raising. In addition, expectations about the secrecy, timing, and ritual practices in traditional settings were not met by the bio-medical marketing and setting (Katisi & Daniel, 2015).

MMC for HIV prevention program in PNG needs to be discussed among stakeholders and traditional cultural groups in terms of how best cultural practices can be included in MMC for HIV prevention. Consideration should be given to whether MMC should be provided in the provincial health facilities where foreskin cutting is a traditional practice.

Training of health care workers for MMC

Providing of skilled health care workers to implement MMC service for HIV prevention is important in any health care service. Participants in this study reported HCWs should undergo training for MMC procedure and preferred more male HCWs over female HCWs. Furthermore, participants had various opinions about who should perform MMC.

Some HCWs suggested trained medical doctors, while others suggested CHWs and RNOs. Expansion of health care workforce in Southern and Eastern Africa's VMMC scale-up program was reported to be crucial in providing efficient VMMC services (Curran *et al*., 2011). Nxumalo and McHunu (2020) identified that poor preparation and training for health care workers to implement the MMC service in South Africa resulted in inefficient MMC delivery. The African studies highlight that upskilling and expanding of the health care workforce is paramount in implementing MMC services. Because of the inadequate HCW, most countries in Africa trained nurses to perform VMMC. Herman-Roloff *et al*. (2012) recognised that nurses and doctors provided equivalent VMMC services. Health workers who performed more than 100 VMMC were competent with an outcome of less adverse events experienced by clients. Additionally, the VMMC performance time was less, than those who had not performed many VMMC (Herman-Roloff *et al*., 2012).

Africa has similar cultural views of preferring male HCWs over female HCWs. Umar, Mandalazi, Jere, & Muula (2013), reported in a Malawi study that men were not comfortable with women clinicians to perform VMMC because culturally, it was inappropriate.

Implementation of MMC for HIV prevention will require significant expansion of human resources. Consideration should be given to providing appropriate training to RNOs and CHWs to prepare them for MMC because this group of health care workers is larger than the trained and qualified doctors and HEOs. This may play a significant role in maximising the limited health care force in the country (Asante & Hall, 2011).

Health authorities to regulate foreskin cuttings and to formally establish medical male circumcision

Ownership of the MMC for HIV prevention program is important. This study shows strong support from HCWs for promotion and implementation of MMC in the health care facilities. However, most HCWs reported that government should take the lead role in formally establishing MMC for HIV prevention program. This study further shows that RNOs and CHWs are willing to perform MMC for HIV prevention, yet they are not accredited to perform this. As such they recommended the government to establish a training program to equip them to perform MMC. Participants also recommended that the government should formally introduce MMC in health care facilities because of the increased informal foreskin cutting. The unsafe cutting raises an alarm for the government to intervene to provide a safe MMC for HIV prevention service. Tynan *et al*. (2014), described that MMC practice is seen as an emergence of unauthorised service by health workers in PNG and recommended the health authority initiate proper training and implementation of medical MMC. It is important for the PNG health authority to regulate the unsafe MC program happenings inside and outside of the health care facilities. Also it is important the national health department take the ownership to develop the MC for HIV prevention policy and to integrate this program with the other HIV prevention measure.

Study strengths and limitations

This study has provided much new information and reflection of HCW's knowledge, understandings, and practices of foreskin cutting in health care facilities where MMC is not formally established. The health care workers openly shared their experiences even though

some of them were performing MMC procedures that were beyond their scope of practice. Although the survey was lengthy, most managed to complete their questions. The facility managers of the health care facilities were helpful in distributing the questionnaires to the health care workers. However, we felt that the sample size was quite small and did not have the power to detect more variation between subgroups. During analysis, we also identified that most CHWs had difficulty understanding some questions on the WHO Situation Analysis Survey Tool that we used to collect information. This reflects that the toolkit was not validated in this setting, so not necessarily reliable. In the future, WHO toolkits need modifying prior to use according to place of context and according to the knowledge level of the study participants.

Conclusion

Reliable and up-to-date information about MMC should be provided to frontline health workers to broaden their knowledge about the role of MMC in HIV prevention in PNG. The study also identified that most frontline HCWs were not accredited to perform MMC and that they require further training and accreditation, with more male HCWs overall. Health authorities need to follow up on unsafe foreskin cuttings and the complications happening in the health care facilities, as these increases the risks for HIV. Traditional foreskin cutting needs to be considered when implementing MMC for HIV prevention. A proper health system evaluation is required in the health care facility where MMC is performed. This would provide an insight on the facilities, equipment, special manpower and many other items for MMC provision in PNG.

Summary of Chapter Five

This chapter has discussed experiences of both health care managers and health care workers about MMC for HIV prevention, finding that they differed slightly. The facility managers had positive views about MMC as a potential HIV prevention strategy that could be integrated with the existing HIV comprehensive package, but were concerned about the resources required to implement MMC in their existing health care programs. The health care managers also expressed views about the unsafe foreskin cutting in the community that needed to be addressed. However, most health care workers, especially the CHWs and RNOs were willing to undergo training to do proper MMC for HIV prevention, because most have been performing dorsal foreskin slits beyond their scope of practice. Some health care workers suggested MMC service should be regulated well to provide safe MMC service in the rural health care facilities. Although understanding MMC for HIV prevention has been new knowledge to almost all health care facility managers and practitioners, this study reveals that most HCWs have vast experience of foreskin cutting and welcomed more information, knowledge, and training to perform proper and safe MMC.

The next chapter provides the assessments results of an operational ad hoc MMC service provided at the Pacific Adventist University health care facility. The findings are discussed under each of the ten standards of the WHO Male Circumcision Quality Assessment Toolkit.

Chapter 6. Evaluation of operational male circumcision service

This chapter presents and discusses the results of an evaluation of the ad hoc male circumcision service provided at the Pacific Adventist University (PAU) Health Clinic. The chapter is in two segments. The first manuscript presents and discusses the assessment of the PAU MC clinic using the WHO Male Circumcision Quality Assessment Toolkit. The second manuscript presents and discusses the satisfaction level of participants who have had medical male circumcision (MMC) surgery at PAU clinic.

The manuscripts are close to publication and the literature cited in the manuscripts are in the main thesis reference list.

1. **Tommbe, R.**, Vallely, A., Larkins, S., MacLaren, D. Evaluation of the quality of voluntary medical male circumcision service at Pacific Adventist University Health Centre, Papua New Guinea. Target Journal for publication: *Journal of HIV and AIDS*.
2. **Tommbe, R.**, Vallely, A., Larkins, S., MacLaren, D. Client satisfaction with the male circumcision service provided at the Pacific Adventist University Health Centre, Papua New Guinea. Target Journal for publication: *Journal of HIV and AIDS*.

6.1 Manuscript one: Quality evaluation of male circumcision services

Abstract

Introduction

Medical male circumcision (MMC) reduces the risk of female-to- male transmission of human immunodeficiency virus (World Health Organisation & UNAIDS, 2007). Despite a recommendation in 2007 by the World Health Organisation (WHO) and Joint United Nations programme on HIV/AIDS (UNAIDS), PNG has not formerly introduced MMC for HIV prevention. Whilst informal foreskin cutting outside health care facilities sometimes takes place, very few have performed MMC on demand in the health care facilities. This study evaluates an ad hoc MMC clinic provided by Pacific Adventist University (PAU) health care clinic in Papua New Guinea (PNG).

Methods

The WHO Male Circumcision Services Quality Assessment Checklist Toolkit was used to guide the evaluation of the PAU MMC clinic. A total of 56 study participants conveniently volunteered to participate in the study: four health care workers (HCWs), one administrator of the PAU clinic, and 50 male university students who were accessing the MMC clinic at the time of the study. The quality assessment toolkit was designed by WHO to help facility managers and health care workers assess their own performance and identify issues that needed improvement. Individual interviews and focus group discussions were transcribed and coded against each of the standards accordingly, while the observation comments, review comments and inventory findings were also entered under each of the standards. Data from the satisfaction survey were all entered into an Excel spreadsheet and then analysed under each of the standards.

Results

We learnt that the PAU clinic has been conducting MMC on an ad hoc basis without any policy guidance or standard operational manual. Doctors from the city were performing MMC when invited by the clinic management. Additional, necessary equipment and medicine for circumcision such as antibiotics, STI treatments, sutures and needles were available and provided prior to the MMC surgery. The minimum standard for HIV prevention was achieved, other essential requirements such as adequate space, lighting and water with established infection control measures were in place. A need for a male health care workers, a men's health clinic and cultural appropriateness in MMC provision were commonly reported in the study.

Conclusion

Even though PAU clinic is a small day clinic and VMMC is not formerly established or recognised by the national government; it has good clinic management with resources available to provide ongoing MMC with only a few areas to improve. An urgent need identified was for male health care workers with a need to established culturally appropriate MMC clinic, as a way forward for PAU clinic.

Study background

Medical male circumcision (MMC) for HIV prevention is now a well-established component of comprehensive HIV prevention services in regions of the world with high HIV prevalence, low circumcision rates and primarily heterosexual HIV transmission (World

Health Organization & UNAIDS, 2007). Since 2007, WHO/UNAIDS has recommended that Voluntary Medical Male Circumcision be incorporated into comprehensive HIV prevention programs. This recommendation was informed by evidence from observational and ecological studies and three large randomised controlled trials (Auvert *et al*., 2005; Bailey *et al*., 2007; Gray *et al*., 2007; MacLaren *et al*., 2015; Weiss *et al*., 2008). More than 22 million men have now received MMC in numerous countries across Sub-Saharan Africa (World Health Organization & UNAIDS, 2007). In the Oceania region, there is great diversity of HIV prevalence and HIV transmission risk. The country of Papua New Guinea has the highest burden of HIV with almost 46,000 people living with HIV, and a national prevalence of 0.9%. More than 90% of all HIV cases in Oceania are in Papua New Guinea (PNG; National AIDS Council of Papua New Guinea, 2018).

Quality health services are the foundation for the voluntary medical male circumcision (VMMC) roll-out in Africa. Studies conducted across Africa document numerous health service challenges in attaining and maintaining MMC standards and policies, availability of consumables, provision of surgical services and continuity of post-operative care in MMC programs (Jennings *et al*., 2014). Those health services that increased resources in existing facilities were able to provide a quality MMC service that operated efficiently and effectively (Rech, Spyrelis, *et al*., 2014). Quality health services are based on effective and efficient systems that include: proper policies and guidelines to guide the MMC program, skilled health care workers, adequate supplies and equipment to implement the MMC service, appropriate information available for clients, provision of other HIV and STI prevention services, and the establishment of a reporting and follow up system (World Health Organization, 2007a, 2009a). A WHO tool was created to assess the roll-out of VMMC in

Africa. The standard checklist in the tool was designed to be modified when used for other international settings (World Health Organization, 2009a).

Male circumcision for HIV prevention is not formerly integrated within the comprehensive HIV prevention package in PNG's health system. Evidence in PNG shows men have been performing a diverse range of foreskin cutting across the country, much of which takes place outside the health system (MacLaren *et al*., 2013). Some male health care workers respond to demand and conduct foreskin cutting procedures after-hours and/or informally in the community (Tynan *et al*., 2011; 2014). Most of these procedures are not officially recorded in health centre records. In many locations men with no medical training at all provide foreskin cutting procedures in the community. Most health staff interviewed in a large "Acceptability of Male Circumcision for HIV Prevention in PNG" study reported having treated men in their clinics that had complications as a result of community-based foreskin cutting procedures.

Some health care facilities in PNG provide an ad hoc or periodic MMC service for men as a safe alternative to community-based cutting by unqualified providers (MacLaren *et al*., 2015; Tynan *et al*., 2011). The health centre of Pacific Adventist University is one such facility. Pacific Adventist University has a history of male students performing informal foreskin cutting in dormitories and some students presenting to PAU health centre with bleeding and/or infections. In response to this student welfare issue, there have been a series of ad hoc MMC clinics operated at the PAU health centre. This study used the WHO Male Circumcision Quality Assessment Toolkit to assess the PAU ad hoc MMC clinic in 2019 (World Health Organization, 2009a). We aimed to assess facility preparedness and the quality of the MMC service at the facility level. We had a particular interest in whether they

had the capacity to provide quality and safe MMC in terms of governance, polices and standards; resources including funds, human resource, equipment and medical supplies, monitoring and evaluation measures and the various logistics and supportive resources in place.

Study Methods

Study Setting

The PAU clinic is owned and operated by the university in partnership with the National Capital District health services. It is a small day clinic with rooms available for immediate observations and referrals. The clinic serves approximately 10,000 people. It provides daily routine outpatient clinics and well-women and child clinics. In addition, the clinic provides an ad hoc MMC service. The clinic is connected with the School of Health Sciences and their facilities are used when male numbers increase for MMC surgery.

Most times, the PAU administration funds the ad hoc MMC program, while in the past decades MMC for HIV researchers from international collaborations have also funded the MMC services. There are four full-time registered female nursing officers (RNOs) employed by the clinic. Detailed background information is available in Chapter Three.

Participants

The study recruited all four female RNOs and the overall clinic administrator who was a male staff member of the university. The recruitment was purposeful to seek participants' views and experiences of the ad hoc MMC service provided by the clinic.

Data collection tool

The WHO MC Quality Assessment Checklist Toolkit was used in this study to assess the quality of the ad hoc MMC service provided at the PAU day clinic. The toolkit checklist was followed closely to evaluate what was available and unavailable at the clinic during the time of MMC surgery (World Health Organization, 2009a).

The MMC service was assessed against the 10 standards in the toolkit. Each of the standards had a checklist to indicate whether resources/systems were in place to meet the quality standards of the MMC service. The standards are:

1. Management of MMC service.
2. Minimum package of MMC service.
3. Medicine supplies, conducive environment and equipment to provide safe and quality circumcision.
4. Qualified and competent health care workers.
5. Information and education on MMC and HIV.
6. Ongoing client assessment.
7. Standard MC surgical care guidelines.
8. Infection control.
9. Continuity of care.
10. Monitoring and evaluation system (ref toolkit again here).

Each standard has several criteria. Each criterion has questions and information that guide the assessor to check every element in the list. The standards were designated as themes and criteria became sub-themes. Participants' responses and the assessor's observations were categorised according to these themes and sub-themes.

Appropriate data collecting methods in assessing each standard and criterion were provided in the toolkit. These are:

- Observation.
- Structured one-on-one interview.
- Focus group discussion.
- Satisfaction survey.
- Stock inventory.
- Review of documents and records.

The evaluations of MMC were done at three different phases, the pre-surgery phase, at the time of surgery, and post-surgery phase. One focus group was conducted with health care workers and the clinic administrators prior to the surgery. Structured interviews were conducted throughout. That is, prior to the surgery, at the time of surgery and post-surgery. Interviews were mostly conducted to confirm the observations, inventory of stock and equipment and to confirm the records and documents that had been found. Observations were also used during and after surgery. The satisfaction survey was performed six weeks after the MMC surgery. A tape recorder was used to record the focus group discussion and one- to-one interviews.

Data handling and analysis

One-on-one interview and focus group discussion data were transcribed and entered in an Excel spreadsheet to correspond to the standards and the criteria on the quality assessment checklist. Data from observation, inventory checklist and document review were also summarised and entered in the Excel spreadsheet against each standard.

Ethics approval

Ethical clearance for Component Three was provided by Pacific Adventist University Research and Ethics Committee (PAUREC); National AIDS Council Research Advisory Committee (NACRAC); and James Cook University Human Research and Ethics Committee (JCUHREC; Appendix I: Ethics approvals).

Study results

Demographic results

The PAU Health Clinic is staffed by four full time registered nurses. All four participated in the study. Three registered nurses participated in a one-one interviews. The focus group involved one male clinic administrator (non-health care worker) and three female RNOs.

MMC standards assessment results

The results were collected from the document and inventory review; observations; interviews; and focus group discussion. Results are presented according to the 10 standards of the WHO MC Quality Assessment Toolkit.

Standard one: Management of the provision of male circumcision services

Data were categorised for Standard One as:

(i) Health rights policies for MMC service provision.

(ii) Staff roles and responsibilities.

(iii) Organisation of MMC service provision.

(iv) Barriers to accessing MMC care.

(v) Improving quality and safety of the MMC service.

There was no specific health care policy at the PAU health care clinic on human rights or concerning confidentiality, privacy or informed consent specifically for MMC procedures. However, staff knew the patients' rights from prior learning and professional experience. Staff provided the appropriate information on patients' rights throughout the MMC surgery as evidenced by the information sheets and consent forms signed by the clients prior to surgery. The information was verbally provided through group information sessions and also during one-on-one Voluntary Counselling and Testing (VCT) sessions.

> *We have no specific written information of the clients rights to MMC service but we provide these information for all health care procedures... we learnt the patient's ethics during our training so we practice in our daily work…for clients we do not have specific written guides to provide but we provide but we inform them of their rights when they come to seek care at the clinic.* (Nursing officer)

There was no specific written job description for MMC surgery team. However, health care workers were oriented on their responsibilities on the day of MMC surgery.

We do not have written job description of MMC surgery but prior to the MC surgery we do have brief on who is providing what during the surgery. (Nursing officer)

The clinic administration scheduled two days during the semester break to conduct the ad hoc MMC service at the PAU clinic. Each MMC service was arranged with university leaders to deliver surgery within the university's holiday period so that it would not interfere with academic expectations or the academic calendar. This also enabled university building space, male nursing students and male nursing lecturers to be available for the MMC service. .Other routine clinics were cancelled, except for emergencies during the two days. This closure of the routine clinic services did interrupt ongoing health care services provided at the clinic.

We provide MMC program only during university study break so male students can access this service. (Nursing officer)

We close our other routine health care services during the MMC clinic days. MMC program does interrupt our routine clinic but we allow for emergency calls only. (Nursing officer)

We put up written notices for the patients and other clinic users of the short closure of the clinic during MMC program. (Nursing officer)

Two male doctors, a surgeon and a general medical practitioner were contracted by the PAU Health Care Clinic to perform MMC. A sexual health nurse consultant was recruited to provide pre-counselling and HIV and STI testing.

Surgeons are contracted by PAU clinic administration to provide the MMC service because the clinic is only a day clinic and does not have full time doctors or surgeons. At times we are lucky when the researchers on MMC project funds the MMC project. Because the project pays for the surgeons (Nursing officer)

The university arranges for a sexual health consultant to provide sexual health information counselling to the university's male staff and student (Nursing officer).

There was no specific documentation about the timing and scheduling of the MMC services at PAU Clinic. However, there were multiple sometimes conflicting issues to consider when managing the timing, use of facilities and personnel.

I don't only do HIV counselling, I also look after antenatal and STI services as well. So if MMC clinic is scheduled on a day where I supposed to provide antenatal service, it would really affect these services. So we really need to select a day so it cannot interfere with the VCT counselling for antenatal women and other routine STI screening". (Nursing officer)

Scheduling MMC service hours in response to the need of the men in the community will be a burden to the clinic but we can come up with an appropriate time that will suit the needs of the men in the community as well as the university students". (Nursing officer)

There was no specific documentation at the PAU Clinic outlining the known barriers to accessing MMC care or ways to address the specific barriers to MMC services at PAU. However, clinic staff were very aware of the barriers and some ways to address them both for

men living on PAU campus and men living in the community outside the university campus, but served by the PAU clinic

> *Not having male nursing officer in the clinic becomes a barrier to access MMC service, we need male health care workers if routine MMC is to be implemented.* (Nursing officer).
>
> *We do not provide information and counselling on sexual health because it is culturally inappropriate for us female nurses to provide these service. So we do not know where they seek such information.* (Nursing officer).

> *Previously, university pays for the doctors and pay for the student fees according to the user fee policy which is K10-K20 (AUD $5- 10). If we have MMC as a routine service to be extended to the outside community then we should consider doctors' fees, MMC service fees by clients and other expenses involve. Paying for the MMC can become a barrier for some to access this service* (Nursing officer)

There were no specific policies or documents outlining guidelines or frequency for information programs before each ad hoc clinic. In the 2019 ad hoc MMC service, general information on MMC was sent via email to all students. A second round of in-depth face-to-face sessions was presented prior to the surgery. The information covered: relationship of MMC with HIV; other HIV prevention packages including STI services; the surgery process; and the care and follow up review provided after surgery. However consideration for communication is required should MMC service is extended to the community.

We communicate via email to send awareness to students but this method of communication will not suit the outside community if they are to access MMC services in the future. We need to come up with new ways to communicate with them". (Nursing officer)

Another major consideration for the PAU MMC Service was the incorporation of specific socio-cultural aspects of the MMC service including gender appropriate MMC services; consideration of the integrations of rituals and cultural celebrations; and infant or children circumcision for religious obligation. Also it is evident that there is service limitation when only female nurses are employed.

"Foreskin cutting is a taboo in many cultures and male health workers are required to be assisting the MC service and not us female nurse…we can work on the little boys but not the adults" (Nursing officer).

Embarrassment and stigma can be experienced if privacy and secrecy is not maintained in the MMC program.

Boys will feel shy and would not want any girls to know that they are at the clinic to perform MMC. Hanging outside the clinic area would expose them and no privacy will be maintained. We need to consider this when conducting the routine MMC service (Nursing officer).

Cultural rituals and ceremonies are associated with foreskin cutting in some cultures. Consideration is required if there is an integration.

In many culture foreskin cutting is practised and men would want to perform MMC but rituals and celebration are performed during and after MMC. This will

make it difficult for men to access MMC clinic…especially, if they want to perform the rituals because no elderly men will be around at the clinic or either there family will not be around to celebrate the occasion… we do provide a small feast for them at the end of their recovery (Nursing officer).

Parents in the community have expressed MMC need for their children

Most parents were asking if they can bring their child for circumcision and this was for religious obligation but we inform them that this clinic was for adults only. One of our former female nurse has conducted child circumcision as requested by parents for religious reasons but she has left our clinic (Nursing officer).

There was no specific policy or documents on improving quality or safety for MMC at the PAU Clinic. Nor does the clinic have an established quality improvement team. However, staff suggested that if MMC was formally incorporated into the HIV prevention program in PNG by the National Health Department then a MMC quality team could be established to guide the MMC clinic program at the PAU clinic. Despite the lack of these formal, ongoing processes, the health care workers and the MMC surgery team always had discussions on how to improve processes from the previous ad hoc clinics.

We do not have quality management team to improve the MMC service but we discuss issues faced in earlier MMC service and continue to improve with the surgery team. Especially when ordering equipment and medicine and other supplies to meet the need of the number of students (Nursing officer).

Standard two: Minimum package of male circumcision services

Minimum package of male circumcision services were reported under the following categories:

(i) HIV testing and counselling services.

(ii) Syndromic management of sexually transmitted diseases.

(iii) Individual risk reduction and safer sex counselling.

(iv) Availability and distribution of male and female condoms.

(v) MMC is integrated with minimum package of HIV services.

A lack of knowledge on HIV testing and counselling service was identified as an issue at the PAU clinic. Rapid HIV test kits are generally available and in stock. However, HIV positive clients are referred for further confirmation test and treatment.

> *We need to do more awareness of the VCT service in our clinic. Especially, for those students and staff who are not aware of our VCT service. This will enable them to do voluntary HIV testing* (Nursing officer).

> *I am the only accredited HIV counsellor at the clinic and we only do VCT testing using the rapid test kits in our clinic. When the patients are positive we refer them to Hederu HIV and STI clinic for further testing and treatment* (Nursing officer).

Providing STI and HIV counselling was also identified as a gender challenge among health care workers.

Culturally it is inappropriate for a female to counsel a male patient of STI and HIV related information. PAU lack male nurse to provide counselling to the male patient. (Nursing officer).

PAU clinic has a well-established STI management system. This includes an STI syndromic management guide and STI treatment protocols. All health care workers are well informed of the STI management system but unable to perform physical examination required to confirm the STI signs.

Our staff are well versed in treating STI's but we do not have a male nurse to examine a male client who provides signs of STI during history taking (Nursing officer).

PAU clinic does not provide a routine risk reduction and safe sex counselling service. However, specific information is provided to males before MMC surgery. Again, female staff highlighted that a full time male staff member was required to provide ongoing sexual health education to men. Health care workers strongly advocated for the university administration to establish a specific men's health clinic as a part of routine clinical services. Female health staff stressed that men's health was often neglected particularly neglect of young men's health needs which was of public health concern.

Most of the risk reduction and safe sex counselling is provided by the male staff that are assisting in the MMC surgery. We do not provide this in the routine STI/HIVAIDS clinic… culturally It's not appropriate for us. We need a full time male nursing officer (Nursing officer).

"We need a full time male nursing officer to provide ongoing sexual health and risk reduction and safe sex counselling to the men accessing PAU clinic" (Nursing officer).

In support, another said there is need for men's health service: *"We've been focusing more on women and children and we've neglected man's health issues and concern for so long and its better we provide men's health service in PAU clinic"* (Administrator).

Another participant highlighted a special day in a month should be allocated for men's health clinic: *"We should have a day assigned for men's health clinic like the monthly clinic we have for antenatal, family planning, and well-baby clinics"* (Nursing officer).

PAU clinic provides both male and female condoms for clients of the clinic.

We provide both male and female condoms on the bench of the clinic. We have written names on the packet so people will decide. We do not force the young students to get them but for couples with STI we provide them with condoms while they are on treatment so they do not pass the infection to their partners (Nursing officer).

However, the fact that PAU is a faith based organisation and the religious beliefs of particular staff influence how condoms are provided to clients.

Because of our religious beliefs, some of us are uncomfortable when condoms are displayed at the counter of the clinic. It paints a picture as if we are promoting sex before marriage" (Nursing officer).

The minimum package for HIV service was provided efficiently during the PAU MMC clinic.

> *We do provide most of the HIV prevention package. This includes: condom distribution both male and female, STI treatment using its standard procedures, conduct voluntary counselling and testing services, treat opportunistic infection for HIV positive but we do not administer retro drugs for HIV patients. We only refer for further testing and anti-retro drug administration when we see a person is positive through our rapid testing* (Nursing officer).

Standard three: Conducive environment with necessary medicines, equipment and other supplies for providing safe and good quality male circumcision services

Participant's responses were categorised under the following categories:

(i) Essential medicines required for providing circumcision.

(ii) Necessary supplies and equipment for performing MMC surgeries.

(iii) Emergency equipment, supplies and medicines.

(iv) Infection prevention supplies and equipment.

(v) An adequate environment to carry out MMC.

The inventory system needs to be fully utilised to maintain a constant and up- to- date medicine stocks. PAU Clinic has most of the essential medicines required for providing circumcision service. However, additional stocks need to be ordered to meet the number of

men undergoing MMC at one time during the ad hoc clinic. The clinic has an inventory system that assists in maintaining medicines and other supplies.

> *The clinic does have enough medicine for syndromic management of STI; antibiotics for post-operative infection; analgesics to manage pain; and local anaesthetic for surgery. However, these stocks are less and we order more before the MMC surgery is provided. We increase our stock according to the number of men coming in for the surgery* (Female nursing officer).

It is important to monitor and regulate the room temperature of the rooms where medicines are stored.

> "*We are not aware whether we are keeping our medicine in the right temperature or not. We need to seek information on this"* (Nursing officer).

PAU clinic was able to provide necessary supplies and equipment for performing MMC surgeries. However, many of the supplies and equipment were only routinely kept in small numbers. This was particularly so for personal protective equipment. Therefore, when large numbers of clients are provided services through the ad hoc MMC clinic, disposable personal protective equipment was required. In the ad hoc MMC clinics that partnered with research projects (such as 2018 and 2019), the research partners often helped provide additional equipment and personal protective equipment. Supplies such as intravenous fluid sets and HIV test kits are routinely stocked in large numbers and were able to cater for large number of men in the ad hoc MMC clinics.

> One staff member stated: *"So far we do have small number of reusable MMC equipment but fortunately our guest researchers have supplied us with equipment*

such as gloves, gowns, gauze, sutures, and instruments such as forceps, scissors and a diathermy machine" (Nursing officer).

All non-emergency equipment to aid MMC surgery in the clinic are available. The reusable instruments and equipment are washed, packed and sterilised for next round of MMC at the Port Moresby General Hospital since our autoclave got spoiled. The disposal equipment's are mostly bought prior to surgery when there is increase of client number for MMC (Nursing officer).

Emergency equipment and resuscitation medicine supplies are required when conducting MMC surgery. Although MMC is a minor procedure, it is important that health care workers are well informed to prepare an updated emergency trolley. PAU clinic did not provide adequate or easily accessible emergency package. Although there was an emergency trolley available in the clinic but was not readily available during emergency.

Maybe we have been thought MMC has a minor procedure and does not require emergency but we will try and improve by daily checking our trolley during surgery. Also we have not got many emergency cases, that's why we were more relax… we will make sure this is in place in the next MMC clinic (Nursing officer).

Infection control is important when implementing MMC program. PAU Clinic had met basic infection control measures. However, the clinic did not have its own incinerator to burn their clinic waste but had options for disposal. The sterilisation of reusable equipment were sterilised at Port Moresby General Hospital

We maintain hygiene in our clinic. It is clean and all the basic necessities for hand washing is available, also we have our gowns, gloves and mask available. We do not have incinerator but the support services have helped us to dispose them in Sogeri health centre. They said to build one for this clinic but we do not know when the administration will build one (Nursing officer).

An adequate environment to carry out MMC is an important element to consider. PAU clinic was able to provide an adequate environment for carrying out a MMC service. There is a minor theatre in the clinic where minor procedures such as incision and drainage and suturing take place.

The clinic itself is clean and nice and also we have enough space in the clinic but we need to organize the current space so we can provide routine MMC service. For example, we have eight observation beds and a procedure room… we need to do is to organize ourselves to maximise the space in the clinic rather than using SOHS laboratories (Nursing officer).

We have good lighting and ventilation in all rooms from waiting room to minor surgery room. Also we have good space because we are utilising SOHS (School of Health Sciences) practical lab. We will face problem if the practical room for the students are occupied during semester classes (Nursing officer).

Standard Four: Qualified and competent health care workers

Participant's responses were categorised under the four themes:

(i) Increase qualified staff in the clinic**.**

(ii) Process in place to ensure that all staff has the appropriate qualifications and competence for their assigned tasks for MMC.

(iii) A periodic assessment of staff competencies.

(iv) On-going in-service education and training are provided to assist staff to fulfil their duties.

Qualified health care workers are required to perform MMC. PAU clinic has a shortage of qualified health care workers. In particular, male staff are critically needed to ensure MMC service was effective, ongoing, gender and culturally appropriate. To move beyond ad hoc MMC clinics, a more formal agreement with key health workers such as the surgeons will be required.

Clinic requires few more health care workers if routine MMC is to be provided. Especially, male staff (Male administrator).

*We have two doctors from the Central Papua Conference (CPC) of the Seventh Day Adventist (SDA) church and the Nation's Capital District Health Services (NCD) that comes for consultancy basis. We may negotiate with them to assist us in the MMC program (*Nursing officer).

"We can continue to provide MMC services so long as we have enough manpower. From previous MMC services we were so burnout because of the limited workforce and that many men came for surgery" (Nursing officer).

All health care workers who participated in the PAU MMC service were reported to be accredited by the PNG Nursing and Medical Board. However, this was not confirmed by actually sighting documents because staff documents were locked in the Human Resource Department of the university and staff cannot be employed through the university if they are

not qualified. Because there is no formal MMC program being rolled at the PAU clinic, no periodic assessment of staff competencies to provide MMC services or ongoing in-service education and training specific to MMC services was provided. Staff relied on generic skills for the components of the service that they provided.

> *"We are qualified as nurses to provide the basic care to the MMC clients but we have not trained to perform the specific procedures to care for MMC clients"* (Female nursing officer).

> *I am the only one who is accredited to do HIV and STI counselling services for every patient that come to our clinic including compulsory antenatal checks. However, I do not have any idea or knowledge on male circumcision for HIV prevention* (Female nursing officer).

Standard Five: Information and education for HIV prevention and medical male circumcision are provided to the clients

Information dissemination and education for HIV prevention and MMC is crucial in any MC clinics. Participant responses in this study were categorised under the following themes:

(i) Information provided to clients on MMC, STI and HIV prevention.

(ii) Reinforcing information and educational materials.

(iii) Informed consent is obtained from clients.

Information on MMC, STI, and HIV prevention is important for MMC clients. All clients undergoing MMC at the PAU clinic were provided with appropriate information prior to their surgery.

> *Clients are provided with such information as abstinence from sex for six weeks post-operative to allow wound healing; MMC is not done on HIV positive men and they need to do a HIV test before going through surgery and also we inform them that they will go through physical examination to treat STIs* (Nursing officer).

The PAU clinic did not provide specific written information on HIV and other sexual health issues. Clinic staff stated they have information and materials on STI and HIV but did not have any on MMC. As standard practice, prior to MMC surgery, information is verbally provided to clients on MMC surgery and risk reduction and written consent is signed by the participants upon receipt of this information.

> *The clinic has no written information for the client, parents, or the partners of men undergoing MC. If MMC is endorsed by the government then the clinic may produce leaflets with information that may become available for public as now I do not think there is funding for such resources and too, boys who went for the surgery consented prior to having surgery. The surgery information was provided by the surgeon prior to surgery* (Female nursing officer).

One participant described written information is required to reinforce the researchers information provided to men on foreskin cutting and modification to avoid complication.

We provided MMC at the clinic to discourage men from cutting their foreskin at the dormitory so we won't receive students coming with bleeding and infection. Now that the researchers have informed the men and even the clinic staff, we are now seeing this as a benefit to our boys so we will try and provide the information so it can be given to the boys (Nursing officer).

Standard Six: Ongoing client assessment

Responses about the assessment of clients prior to MC surgery were categorised under the following themes:

(i) Client past and present medical history;

(ii) Physical examination of the client.

PAU did not have specific forms with written guidelines on seeking participant's history prior to them undergoing surgery for MMC. Forms used in routine practice in history-taking for similar health care procedures were used when taking history for MC participants. This involved, client's biographic information, past and present medical conditions. Similar to the case with history-taking, PAU did not have forms specifically designed for physical examination in the MC clinic.

We take medical history as how we do for the routine outpatient cases…we write them on the patient clinic record books…sometimes researchers have their own forms where the forms are being kept secured in their office space but they do share information with the clinic staff if the clients require further assistance from the clinic (Nursing officer).

When physical examination was done on the client's foreskin, signs of penile modifications, including injections and inserts and signs of STIs or any other contraindications to undergo surgery were recorded on routine forms.

> *Physical examinations are done by a male staff straight after the history taking and VCT counselling and testing are done. Because it is a MMC procedure the male officer examines the foreskins, STI and any signs that will not allow the men to have surgery and that may require referral* (Female nursing officer).

Standard Seven: Male circumcision surgical care is delivered according to evidence-based guidelines

It is important to provide male circumcision according to the evidence-based guideline. The responses of the participants were categorised under the following themes:

(i) Male circumcision surgical procedures are performed according to standard guidelines.

(ii) Standard procedures for assessment and management of emergencies and complications are followed.

(iii) Immediate postoperative care is provided according to the standard protocol.

As the PAU clinic does not have a surgical guideline procedure form specifically to guide MC surgery, surgeons used their general surgical skills to perform MMC. PAU clinic staff emphasised the need for specific training on MMC surgery for the surgeons or other health care workers working in the MC clinic.

We do not have standard MC surgical procedure guideline in the clinic but the surgeons perform according to their general training in surgery. We would be happy that the MC surgery guidelines are provided in the clinic so surgeons can read and follow the procedure (Female nursing officer).

The need for procedural guidelines is further emphasised by this example:

I remember one time a surgeon was looking at the internet to explore different ways of conducting MMC surgery prior to performing MMC. It is important that doctors know the specific MC surgery skills (Nursing officer).

Standard procedures for assessment and management of emergencies and complications is required when providing MMC surgery.

The clinic does not have a specific MMC standard procedure for assessment but we do observe and manage MC complication similar to any surgery cases. We have not seen many incidences in this clinic since we started MC clinic. I can recall, some years back we receive only one case with haematoma and one with slight bleeding. These cases were reported to the surgeon and were managed effectively (Nursing officer).

Standard protocol for immediate post-operative care is important for MMC service. PAU does not have a specific care manual for post-operative clients specifically for MMC surgery at the clinic

"We provide immediate care at the clinic for two or more hours to monitor bleeding and swelling. The clients were then referred to the dormitory. The senior male

nursing students were assigned to monitor any complication in the dormitory under the supervision of their male lecturers. Complications were to be reported to us the clinic and the surgeon ASAP for further care and support (Nursing officer).

Standard Eight: Infection prevention and control measures

Infection prevention is crucial when providing MMC service. Participant responses were categorised under the following existing themes:

(i) Infection prevention and control policies and procedures.

(ii) Infection prevention and control measures are practised according to policy and procedures.

(iii) Designated individual accountable for infection control activities at the facility.

PAU did not have written documents or charts on infection prevention and control polices and principles specifically for the MMC clinic. However, health care workers reported that they are well informed of the infection control measures which are a part of their daily routine in the clinic.

We don't have written infection control measures in the clinic but we all know how to prevent and control infection because we practice this all the time (Nursing officer).

We do not have a designated individual responsible for infection control but we know what is expected on infection control measures (Nursing officer).

Surgical staff and all health care workers followed strict infection control measures prior, during and post-surgery. The following general infection prevention and control measures were observed to be practiced: hand washing; surgical scrubbing, gloving, gowning; disinfection of equipment; cleaning of operative rooms; handling of needles and sharps; and waste management. There were no designated staff assigned to infection control.

We do have water and other cleaning detergents for general clean up, we also have sluice rooms for soaking instruments (Nursing officer).

Two things that were of concern to the staff were that availability of an autoclave to sterilise equipment and an incinerator to burn waste.

Our autoclave is not functioning. We need to get this fixed to establish routine MC program because POMGEN will not receive many surgery trays day from us… we were depending on the former support service manager because he has contacts with technicians. Since he left we lost the follow up… I will follow up on this case (Male clinic administrator).

"We normally bring our clinic waste such as sharps and body tissues to Sogeri to burn them in their incinerator. We need an incinerator in our clinic. Not only for the MC Service but for other clinic waste" (Nursing officer).

"We can discuss with the support service and the finance office and build one for our clinic. Meanwhile we need to continue use the Sogeri clinic or either 9 mile clinic if they have one in place" (Male clinic administrator).

Standard Nine: Continuity of care provided to male circumcision client

Continuity of care for MC clients is important. The participant responses were categorised under the following themes:

(i) Established referral system.

(ii) Client/family is given discharge instructions.

(iii) Established mechanism for follow-up of clients.

An established referral system is required when providing MMC. The PAU clinic does not have a specific MC referral pathway but follows established referral systems for other cases. MC referral pathways were provided for both emergency cases and consultations and review cases. The MMC clinic does have a specific referral letter using the letterhead of the PAU clinic which is used when referring patients to POMGEN.

"We send our patient to POMGEN for other severe health condition and we also would do for MC clients. However, most MC clients are reviewed by the surgeon who performs MC surgery" (Nursing officer).

Senior nursing students are tasked to provide the post-operative care under the supervision of the School of Health Sciences male lecturer.

Post-operative clients are closely monitored at the clinic and then are discharged and dropped at the dormitories. Senior male nursing students provide the rest of the care at the dormitory. The doctors are being called if there is an emergency. For example, if students bleed or develop haematoma" (Nursing officer).

Discharge plans are provided by the surgeon when they detect no bleeding or swelling post-operatively at the clinic.

> *All the post-operative cares on wound care, treatments, when to seek help if bleeding occurs, and when to return to their normal activities are provided by the MC team when they are discharged from observation room*" (Female nursing officer).

Standard Ten: Monitoring and evaluation system for medical male circumcision service

Participant responses were categorised under the following themes:

(i) Data collected on services provided;

(ii) Data used for planning and improvement of service delivery;

(iii) System for prompt reporting and review of adverse events;

(iv) Data collection is thorough and accurate.

PAU clinic does not have a specific MMC surgical register book. However, records of the clients are kept in the daily outpatient register together with the other outpatient cases.

> *We do not have a separate log book to record MC surgery cases but we record the patient's name, age, date of visit and the main reasons to visit the outpatient in the same register used in recording other outpatient cases* (Nursing officer).

The clinic does have separate registers for antenatal, well baby clinic, family planning and VCT records. There is some consideration of keeping a specific MMC register in the future if MC clinics are scheduled at regular intervals like the other clinics.

"We have other specific registers for antenatal clinic, family planning clinic, CT, and well-baby clinic. We can create one for MMC if it performed monthly as the other clinics" (Nursing officer).

A monthly report of the records is submitted to the National Capital District Health Services (NCDHS) and to the university clinic management team. From the previous reports there have been no major adverse events reported but improvements to the care are considered to avoid any complications in the ongoing MC surgery clinic at PAU.

All the data that we keep are being sent to the NCD PHA and PAU clinic management team. We are not sure what they do with the data we send but I guess they keep them for their records and also upon those data they make changes that are needed in the clinic. For example, funding is increased or staffs are recruited (Nursing officer).

*We do not have records of separate form for adverse events but again we keep brief record of the outpatient register and most information is filled in the patient's clinic record book. Every time a MC is performing we ensure that the complication experienced earlier are minimised (*Nursing officer).

Discussion

For any health care program, it is important that the facility administering the program is prepared and ready to provide a quality and safe service for the clients who access it. For this reason, this study evaluated the quality of PAU's MMC clinic and the readiness of the facility to provide MMC service at the clinic. We used the standards of the WHO Male Circumcision Quality Assessment toolkit to evaluate the MMC clinic (World Health

Organisation, 2009). This section discusses the results and the implications of the evaluation study.

Standards and Guidelines

Consistent with the fact that there is no national MMC for HIV prevention program, PAU clinic did not have written policies and standards specifically to guide the ad hoc MMC services that were provided. However, the absence of these specific guidelines did not impede the successful provision of service at PAU. The HCWs also recognised the need for policies and procedures to be developed. HCWs followed universal policies and guidelines governing general infection control that supported the safe provision of the MMC services. Male circumcision was provided with full adherence to medical ethics and human rights principles including informed consent and confidentiality, with consideration to access during university study breaks and the socio-cultural context of the young men undergoing circumcision.

In line with evidence from WHO and UNAIDS, policy formulation and approval can be difficult and time-consuming but any formal health system can be guided by the existing public health and surgical policies and may develop guides over time to ensure all MC standards are met (World Health Organization & UNAIDS, 2008). Some African countries, with a much greater burden of HIV than PNG, did not initially have specific MMC policy and regulatory guidelines at the beginning of the scale up of MMC programs. This was not a barrier for rapid implementation because MMC services incorporated new MMC programming within existing HIV policy (Curran *et al*., 2011). PAU clinic has shown a pragmatic approach, demonstrating that MMC services can be provided in this context and

guided by the existing public health, surgical and nursing care policies. Should the national government formerly introduce MMC into the existing comprehensive HIV package in PNG, specific policies, standards and guidelines will need to be developed from this strong base.

Service delivery

MC can be provided at different levels of the health care system and so long as it meets the minimum conditions which include: availability of adequate surgical space, surgical and nursing equipment, infection control measures and competent HCWs (World Health Organization & UNAIDS, 2008).

The socio-cultural aspect of the MMC service was an integral part of the MMC service delivered at PAU. Some of the cultural obligations between the provider of MMC services and the men receiving MMC services, such as a celebration feast upon wound recovery were provide by the PAU clinic. However, there are other socio-cultural issues that remain, including the inappropriateness for female nurses to provide sexual health information to men in this context and the need to employ male nurses. Studies in Botswana documented that traditional MC values and traditions were not met in MMC, both in its awareness program and implementation; this caused a barrier for men to access MMC service (Katisi & Daniel, 2015). Another study in Malawi documented similar experiences to those at PAU, where men were not comfortable with women clinician providing MMC services (Umar *et al*., 2013). Given that staff and students come from across all 22 provinces of PNG, the PAU clinic needs to constantly assess the socio-cultural aspects of MC services and the specific barriers and enablers to MMC for HIV prevention for the culturally diverse population of men the clinic serves. It also serves as an example to other ad hoc or semi-

regular MMC service providers across PNG of the importance of incorporating processes to the socio-cultural norms of their specific settings.

Information, education and counselling on MMC for HIV prevention to the client accessing MMC services is a key service standard (World Health Organization & UNAIDS, 2008). Although information was provided to men during the MMC clinic at PAU there was limited information disseminated about the MMC clinic prior to its operation and no ongoing awareness and education. Studies in Zimbabwe reported that creating awareness and dissemination of accurate information about MMC prior to delivering services increased client demand to access the MMC service (Chiringa *et al*., 2016; Hatzold *et al*., 2014). In PNG, where there is no formal MMC for HIV prevention program, the situation is a little different. The ad hoc PAU MMC clinic actually responded to the existing high demand by university staff and students for MMC service. The issue was a lack of MC services to respond to the demand rather than providing information to create a demand. As a consequence, there was a strong recommendation from many participants of this study that PAU needed to provide designated men's health service staffed my men, which could become a hub for male clients to seek men's health information, education and clinical services, including MMC.

Human resources

Health care facilities that provide MMC must have skilled personnel to provide a safe MMC service of high quality in accordance with the policy and national clinical protocols and guidelines (World Health Organization & UNAIDS, 2008). Although the PAU clinic did not have MMC specific training and competency assessment guides, the surgeons and male

health workers were able to provide quality MMC service in a safe environment based on universal competencies and professional practice. As stated previously, an ongoing challenge at the PAU clinic is the lack of full time male health care workers. Shortage of skilled and gender-appropriate health care personnel is not a problem isolated to PAU. Case studies from Kenya, Tanzania, and Swaziland all demonstrated human resource constraints and the need for innovative responses to maximise limited HCWs capacity including: recruiting retired doctors, male staff and new graduates; training HCWs apart from doctors (task shifting); and sharing of tasks during surgical MC procedures (task sharing; Curran *et al*., 2011). These experiences in innovative ways of strengthening and utilising the limited HCWs provide guidance and examples of potential ways to manage human resources at PAU and other health care facilities in PNG. Such solutions need to be considered at both small or ad hoc MMC services and larger provincial or regional MMC programs.

Although this service was good for university staff and students it did not provide for men living in the outside community that the clinic also serves. Strategies for communicating information and providing awareness about MMC for HIV prevention to men off-campus need to be considered carefully.

Monitoring and evaluation

Keeping appropriate records is vital for a MMC service to inform planning and improve service delivery (World Health Organization, 2009a). Given that the ad hoc MMC clinics at PAU were responding to local demand/need rather than a site within a formal MMC program, patient information was documented in the client's personal clinic record books rather than in a central MC register. This poses challenges to systematically recording

complications and/or adverse events at follow-up. It is therefore important for the PAU clinic to consider a separate register and monitoring and evaluation system for clients of the MMC service. This register and monitoring and evaluation system could be the basis for future service improvement. A study from South Africa demonstrated that this gap can be improved by training health providers to keep client registers and follow-up visit documentation, which then allows assessment of the public health impact of the MMC services being provided (Phili *et al*., 2014).

Study strengths and limitations

This study was led by a PNG woman who was very familiar with the study context and experienced team. The PAU MC clinic was evaluated with a well-tested toolkit. Although this clinic is not accredited to perform MMC for HIV prevention, the WHO MC Quality Assessment Toolkit used has illustrated what is needed in the health system. This information might be used to strengthen facility readiness to provide formal MMC for HIV prevention in the near future when MMC is formally established in PNG's health system.

There was not much time to conduct training for the specific procedures identified in the WHO MC Quality Assessment Toolkit for the PAU MMC evaluation study. Therefore no evaluations were conducted in these areas. A full evaluation with proper training and workshops followed by competency assessments can be conducted at the clinic when MMC for HIV prevention is formally introduced into PNG's health system.

Conclusion

Although there are no formal implementation guides and polices for MMC services in PNG's health system, this study shows that PAU's health facility has met many of the WHO MC Quality Assessment standards. Potential improvements to the PAU MMC service include

employing full time male health care workers; providing ongoing information and education; and creating a system to document follow-up visits. The ability of the PAU clinic to provide a quality, accessible and safe MC service at PAU would be dramatically improved by establishing a specific men's health service. These findings are unique to the specific context at PAU, but are able to inform other state, private or non-government health centres across PNG.

6.2 Manuscript two: Client satisfaction survey on male circumcision

Abstract

Introduction

Medical male circumcision (MMC) has been recommended by WHO and UNAIDS to be implemented together with the existing comprehensive HIV packages in areas of high prevalence. It is important to monitor and evaluate a MMC service for continuous improvement towards a safe, high quality service for the clients. This satisfaction survey has been conducted to assess the quality and the safety of the ad hoc MMC service provided at Pacific Adventist University (PAU) day clinic.

Methodology

A self-administered survey was given to fifty male university students who volunteered to participate in a satisfaction survey six weeks after MMC, to assess their satisfaction with the MMC service they received.

Results

Thirty out of the 50 surveys were returned. Men from diverse religious and cultural background were involved in this study. Physical examination of the participant's foreskins prior to MC surgery showed: 17/30 (57%) of the men had full foreskin intact, while 13/30 (43%) had dorsal slits or partial removal. Of the men who had partial removal, 2/30 (7%) had some form of injection, while no inserts and attachments were reported.

More than half of the participants were very satisfied 19/30 (63%) and satisfied 9/30 (30 %) with the explanation on MMC, while very few (2/30; 7%) reported themselves

neutral. The information provided about Voluntary Counselling and Testing services (VCT) showed: half of the participants (15/30; 50%) were very satisfied, 7/30 (23%) were satisfied, 7/30 (23%) were neutral, and 1/30 (2%) was unsatisfied. Almost three-quarters of the participants (22/30; 73%) were very satisfied with the explanation of the MMC procedure and 6/30 (20 %) were satisfied. More than three quarter of the participants were very satisfied (16,30;53%) and satisfied 9/30; 30%), with the explanation of side effects of drugs administered while 3/30 (10%) reported neutral and 2/30 (7 %) were unsatisfied.

The main themes that emerged from the open-ended question were: appreciation for the MMC service; reinforcement of wound care and pain management; intensive awareness and information; lack of a male health care worker at PAU MC clinic; need for routine MMC service; nurses should be trained; need for MMC in schools and communities throughout Papua New Guinea (PNG).

Conclusion

Almost all participants were satisfied with the MMC service and recommended a few areas of improvement. These included the need for further information about MMC and its relation to HIV; pros and cons of MMC; surgical process; and the post-operative care. Most recommended that PAU clinic should employ a full-time male health care worker to provide continuity of care. In addition, some suggested PAU clinic should provide regular MMC services than at ad-hoc basis. The overall results shows PAU clinic meets most of the standards described in WHO MC Quality Assessment toolkit but requires improvement in the areas highlighted.

Study background

Providing a high quality male circumcision service is essential for the success of any male circumcision for HIV prevention program. Patient satisfaction data is an important source of information to inform health care workers and managers about practice gaps and to enable them to develop action plans to improve the quality of care in a health facility (Al-Abri & Al-Balushi, 2014). This study assessed the satisfaction of male patients who underwent medical male circumcision (MMC) at the Pacific Adventist University (PAU) day clinic in Port Moresby, PNG.

In response to peer-to-peer foreskin cutting happening in the university dormitories and other locations on campus, Pacific Adventist University day clinic has been providing a periodic, ad hoc male circumcision service to university students and staff since 1997 (Tommbe *et al*., 2012). Since 2010, a series of MMC for HIV prevention studies have been conducted on the PAU campus, including in the PAU clinic, which have documented the acceptability of MMC for HIV prevention in this setting (MacLaren *et al*., 2013; MacLaren *et al*., 2015; Redman-MacLaren *et al*., 2017; Tommbe *et al*., 2012). MMC is performed as an elective procedure in PNG and there is no formal MMC for HIV prevention program within the PNG health system.

In countries that have a voluntary medical male circumcision (VMMC) for HIV prevention program, health system managers are continuously evaluating their MC programs to improve services (Sgaier *et al*., 2014). Evaluations of MC scale-up conducted in Eastern and South Africa identified that many health system issues could easily be managed and improved (Sgaier *et al*., 2014). For example, an evaluation study in Malawi reported that most complications occur post-surgery and not when the actual surgery was performed. This

important information will enable the service provider in Malawi to improve their post-surgical care and service (Kohler, Namate, *et al*., 2016).

The WHO MC Quality Assessment Toolkit was developed to assess new MMC programs for accreditation and to evaluate the quality of ongoing MMC services (World Health Organization, 2009a). Most countries in Africa have modified the toolkit to contextualize its use to evaluate ongoing national MMC for HIV prevention programs (Dickens *et al*., 2014).

The WHO MC Quality Assessment Toolkit was used in evaluating the MC service at the PAU day clinic (World Health Organization, 2009a). The toolkit was modified to suit the need of an appropriate socio-cultural aspects of the program. The training and evaluation of the health care workers involvement in providing the MMC program was not evaluated because of the limited time. Although the WHO toolkit was designed to assess accredited national MMC for HIV prevention programs, we used the toolkit to assess the safety and the quality of the ad hoc MMC service at PAU clinic.

The toolkit comprised six different data collection methods that were used to assess each of the 10 standards of MC service provision: i) observation; ii) document review; iii) inventory checklist; iv) one-on-one interview; v) focus group discussion; and vi) a survey tool.

The study reported in this manuscript aimed to assess client satisfaction with the quality and safety of the MMC program. This study specifically extended few questions on the socio cultural appropriateness and also select the questions most likely to produce the

required data on (i) participant's knowledge level of HIV and MMC; (ii) the information and service provided before surgery; (iii) care and support provided around the time of surgery; (iv) care and follow-up support immediately after the surgery; and (v) overall satisfaction six weeks after surgery.

Study methods

To assess how patients perceived the quality and safety of the MMC service provided at the PAU day clinic, we distributed a self-administered written survey to men who had undergone MMC surgery. The survey assessed levels of satisfaction with the service received before surgery, at the time of surgery, and after surgery.

There were information sessions for MMC and HIV prevention for all staff and students interested in participating at the PAU MMC ad hoc clinic. Information was provided the week prior to MMC surgery. Some men who were not part of this process joined later on during the surgical phase.

A total of 50 males were informed of the satisfaction survey prior to their MMC surgery. A self-administered survey was given to all 50 men six weeks after surgery with a request to return completed questionnaires to a male student leader who then returned them to the lead researcher (RT). Of the 50 males, approximately one quarter did not attend the information session in the week prior to the clinic. However, this was not systematically documented at the time of surgery.

Data were entered into MS Excel and analysed using descriptive statistics. Data were categorised into: pre-surgical phase, surgical phase, and post-surgical phase. Histograms were generated to visualise responses to each question.

An open-ended question about how the MC service could be improved was asked at the end of the survey. Men were asked to write down ideas to improve the MMC service or other suggestions for the clinical or management team. Written responses to the open ended questions were transcribed into a Microsoft Word document and data were thematically analysed.

Ethics approval

Ethics approval was granted by Pacific Adventist University Research and Ethics Committee (PAUREC) and National AIDS Council Research and Advisory Committee (NACRAC), with reciprocal acknowledgement by James Cook University Human Research and Ethics Committee (JCUHREC; full details in Chapter Three, Section 3.9).

Study results

This section provides a description of the results in words, followed by tables covering each of the subtopics. The results are represented as knowledge and information prior to surgery, during, post-surgery to suggestions for improvement in service provision.

Demographic information

Of the 50 men who underwent MMC surgery, two thirds (30/50; 64%) returned completed survey forms. Their ages ranged from 19-27 years with a mean age of 23 years. Men were from 13 different provinces with 10 (33%) from Enga Province, five (17%) from Eastern Highlands Province, and both Manus and Southern Highlands Province had three (10%) each. The rest of the seven provinces had just one man (3%) each. All the men reported that they were single and all identified as Christian with almost two thirds (19/30; 63%) Seventh Day Adventist (SDA). Just under half (13/30; 43%) stated that MC is part of their traditional practice, with about a quarter (8/30; 27%) not sure. About a third (9/30; 30%) reported MC was part of their religion, with more than half (n= 17, 57%) stating they were not sure. Physical examination of participant foreskins prior to MMC surgery showed more than half (17/30; 57%) of the men had full foreskin intact, while 13 (43%) had an existing dorsal slit or partial removal of the foreskin. Of the 30 men, two (7%) had previously injected a foreign substance into their foreskin. No inserts and attachments were reported.

Participants' knowledge about HIV and medical male circumcision

Of the 32 men, almost all (28/30; 93 %; Figure 6.1) said HIV can be acquired via anal/vaginal sex with an HIV positive woman. Just over half (17; 57%) said HIV can be acquired via anal sex with HIV positive man, while a third (11; 36%) were not sure.

Two thirds of men (21; 67%) stated MMC reduces risk of contracting HIV. Exactly half of the men (15; 50%) said MMC does not increase the risk of contracting HIV, while the other half were not sure. Two thirds of men (21; 70%) stated MMC does not entirely prevent HIV, while eight (27%) were not sure.

The vast majority of men (26/30; 87%) said MMC reduces the risk of acquiring a STI. Three quarters (23/30; 77%) believed that MMC improves penile hygiene. Almost two thirds of men (19; 63%) were unsure if MMC increases sexual pleasure, and similar numbers (18, 60%) were unsure if MMC decreases sexual pleasure. A similar proportion (19, 63%) were unsure if circumcised men are more promiscuous.

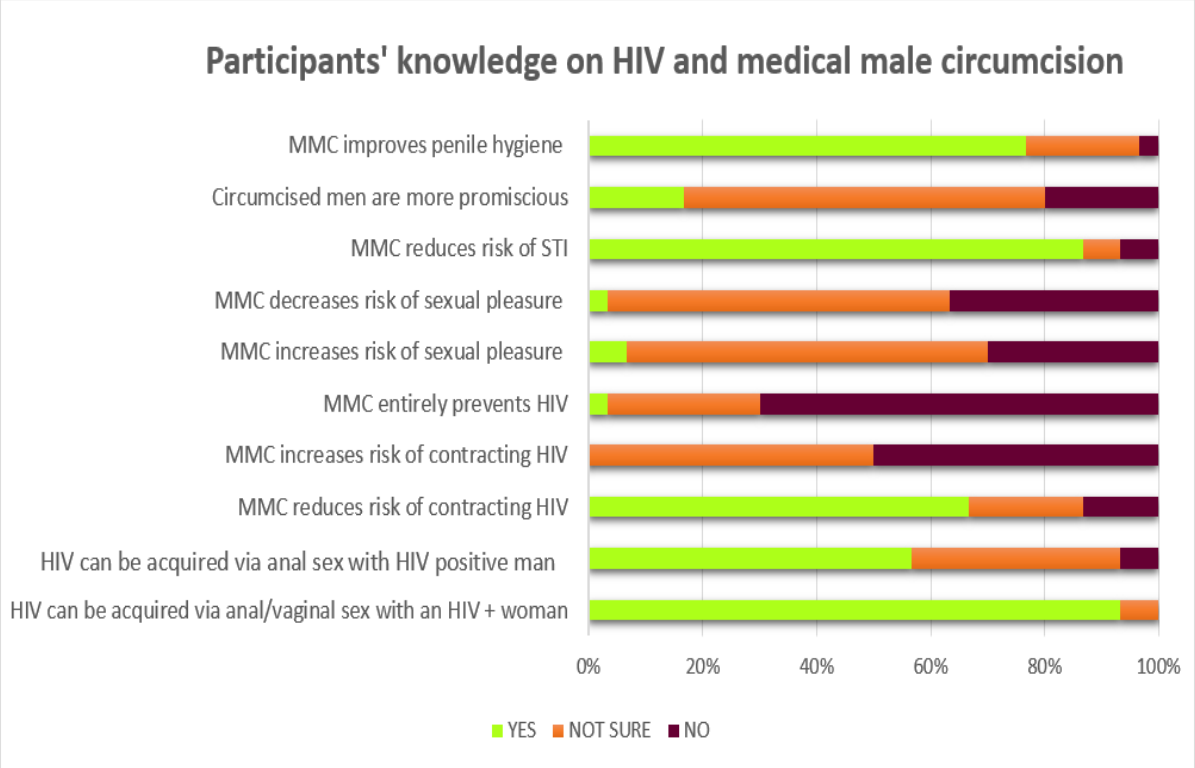

Figure 6.1 Participants' knowledge on HIV and MMC

Pre-surgical phase: Information on medical male circumcision

Almost all men (28/30; 93%) were satisfied with the general explanation of MMC in the pre-clinical phase: with nine men satisfied and 19 very satisfied. Similar proportions were

satisfied with information about the actual MMC surgical procedure (satisfied n=6/30; 20%; very satisfied n=19/30; 63%).

Three quarters of men were satisfied with the information provided about the relationship between MMC and HIV: satisfied (n=11, 37 %; very satisfied (n=11, 37%). Almost all men were satisfied with information provided on the benefits of MMC: satisfied (n=9, 30%), very satisfied (n=18, 60%). However, fewer than half of the men were satisfied with information provided on the disadvantages of MMC: satisfied (n=6, 23%) very satisfied (n=10, 30%), with almost a quarter either unsatisfied (n=3, 10%), or very unsatisfied (n=3, 10%). Almost all men were satisfied with information provided on the confidentiality and privacy of the MMC surgery: satisfied (n=5, 17%), very satisfied (n=20, 67%).

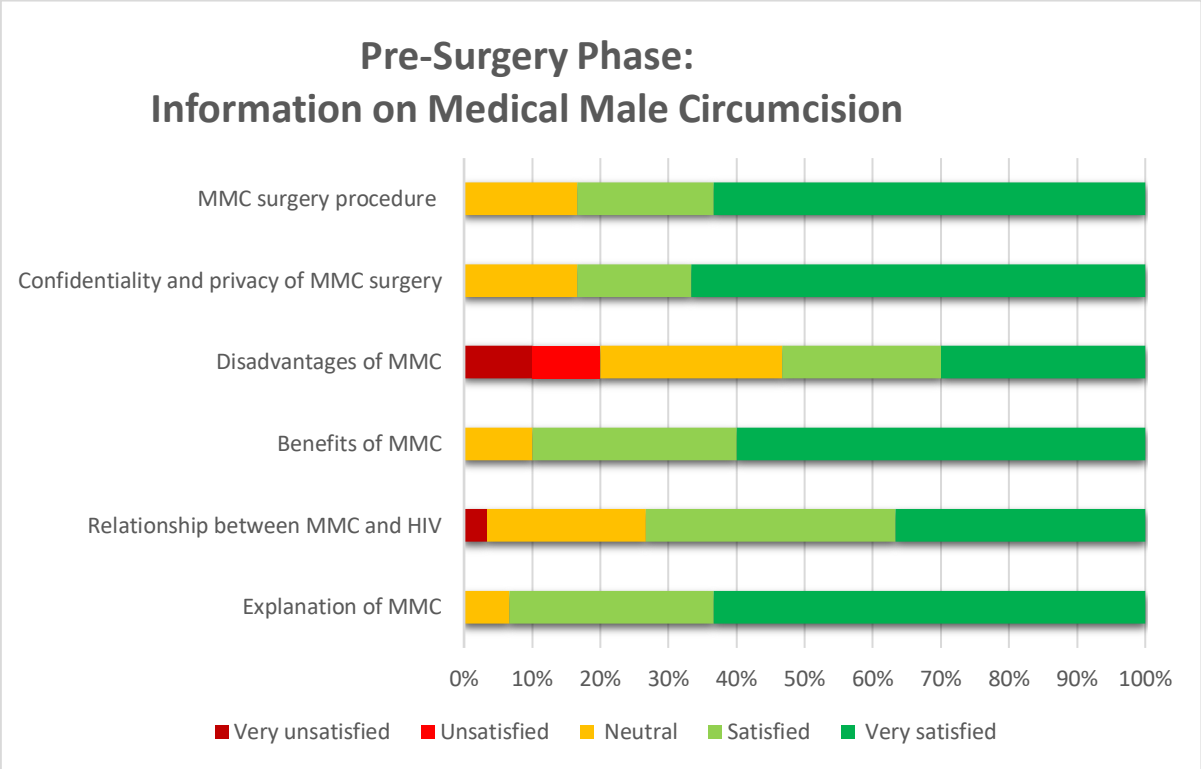

Figure 6.2 Pre-surgical phase: Information on MMC

Pre-surgical phase: Information provided on STI and HIV prevention

Three-quarters of men were satisfied with information provided through the Voluntary Counselling and Testing Service (satisfied n= 7/30; 23%; very satisfied n=15/30; 50%). Two-thirds of men were satisfied with information on the availability and use of condoms for STI and HIV prevention: (satisfied n=4/30,13%; very satisfied n=15, 50%). Similar proportions were satisfied with information provided on the availability of STI services and STI treatment: (satisfied n=7, 23%); very satisfied n=12, 40 %).

Less than half of men were satisfied about information provided on the availability of treatment for HIV positive people: (n=9, 31%) satisfied, n= 4, 3% (n=4) very satisfied; with more than a half were neutral (n=17, 56%).

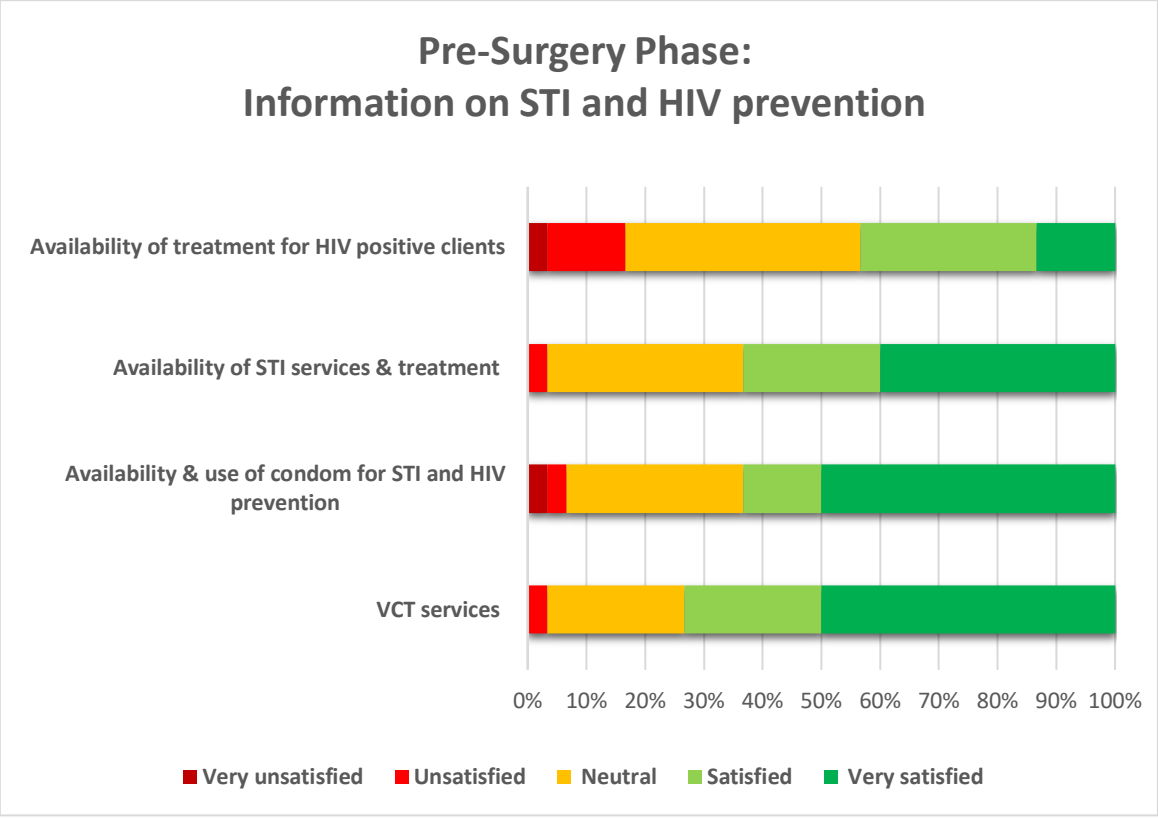

Figure 6.3 Pre-surgical phase: Information on STI and HIV prevention

Surgical phase: Information and services provided immediately prior to surgery

All men were either satisfied (n=5, 17%) or very satisfied (n=25, 83 %) with the privacy maintained during VCT procedure. All but one of the men were either satisfied (n 6=20%) or very satisfied (n=23, 77%) with the privacy maintained during physical examination, with just one being neutral (n=1, 3%). All participants were satisfied (n=5, 20%) or very satisfied (n= 25, 80%) with the privacy provided during surgery.

Almost all men were satisfied with the explanation of the MC procedure immediately prior to surgery: (satisfied n=6, 20%; very satisfied n=22, 73%). The vast majority of men were satisfied with the explanation of side effects of drugs administered (satisfied n= 9, 30%; very satisfied n=16, 53%), and explanation about adverse effects of surgery: (satisfied n=5, 17, %; very satisfied n=17, 63, %).

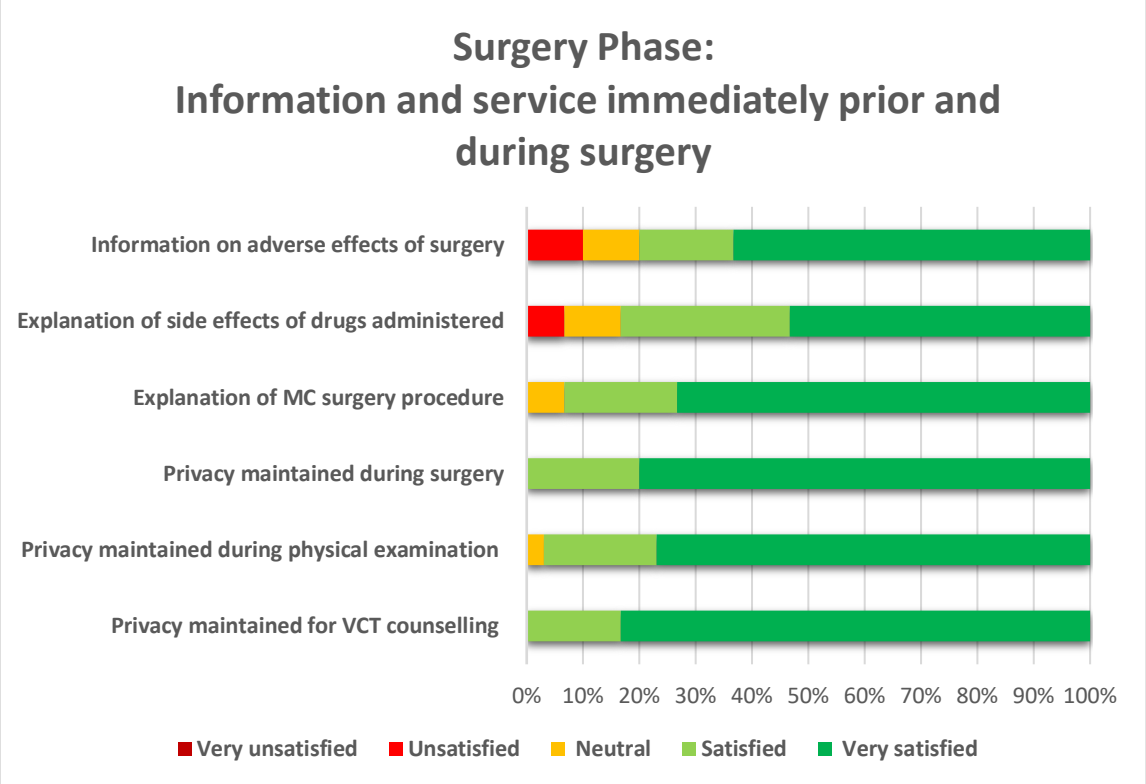

Figure 6.4 Surgical phase: Information and service prior to and during surgery

Surgical phase: Information and care provided immediately after surgery

The majority of men were satisfied with the type of wound care received after surgery: (satisfied n=10, 33%; very satisfied n=17, 57%), and management of pain and comfort: (satisfied n=10, 34 %; very satisfied n=16, 53 %). One man was very unsatisfied with wound care (n=1, 3%). Three quarters of men were satisfied with the information provided about when to seek further assistance in the event of a complication or adverse effect: (satisfied n=10, 34%; very satisfied n=12, 40%).

The vast majority of men were satisfied with the information provided for personal hygiene after surgery: (satisfied n=9, 31%); very satisfied n=16, 53 %), and information about dietary plans after surgery: (satisfied n=9, 30%, very satisfied n=11, 37 %).
More than three-quarters of men were either satisfied (n=4, 13%, or very satisfied n=20, 67%). with information provided about resuming sex post-surgery.

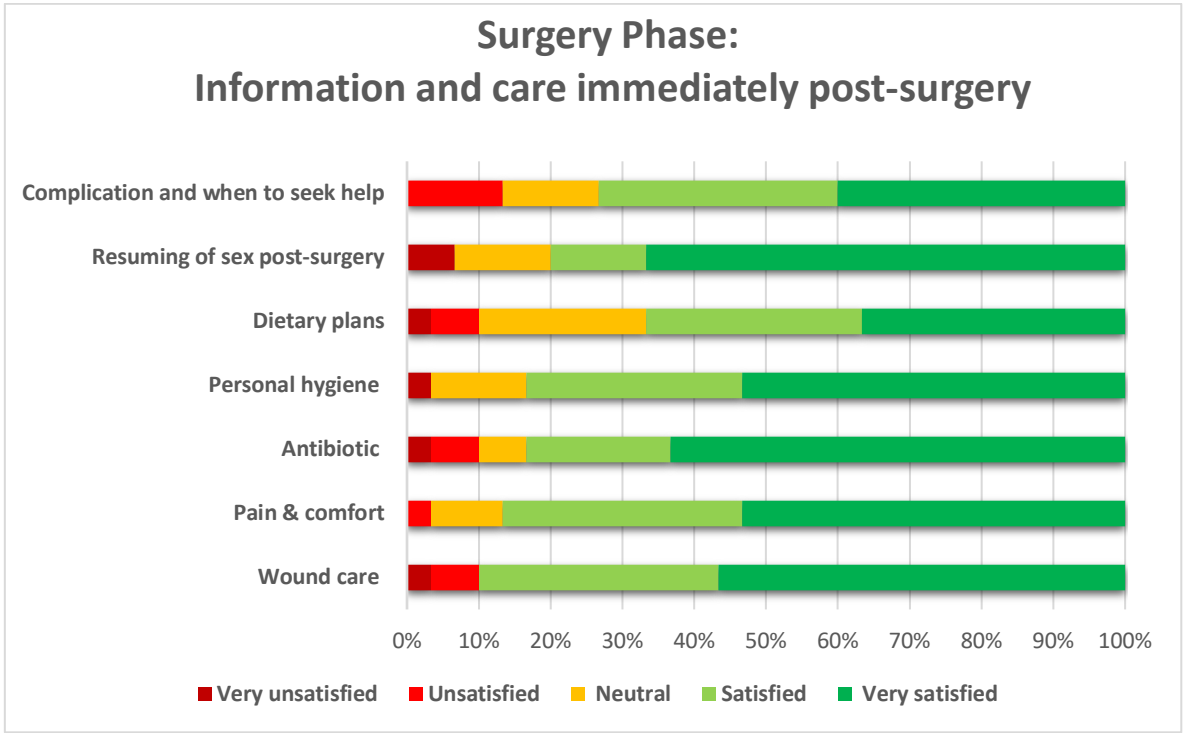

Figure 6.5 Surgical phase: Information and care post-surgery

Post-surgical phase: Resumption of normal activities

Six weeks after the surgery, the majority of men (27/30; 90%) stated they were satisfied with the overall outcome of the surgery, with one unsure and two (n=2, 7%) not satisfied. Most men (n=25, 84%) reported having had an erection, with five (17%) having had sex after six weeks. Of the five men who had sex, two reported using a condom.

Almost all men (n=29, 97%) stated they would recommend MMC to family and friends. Just under half of men (n=12, 39%) reported that cultural considerations were accommodated, with a third stating they were not sure (n=10, 32%) and (n=5, 19%) stating cultural considerations were not relevant to them. Overall (n=20, 65%) stated they were performing normal activities six weeks after surgery.

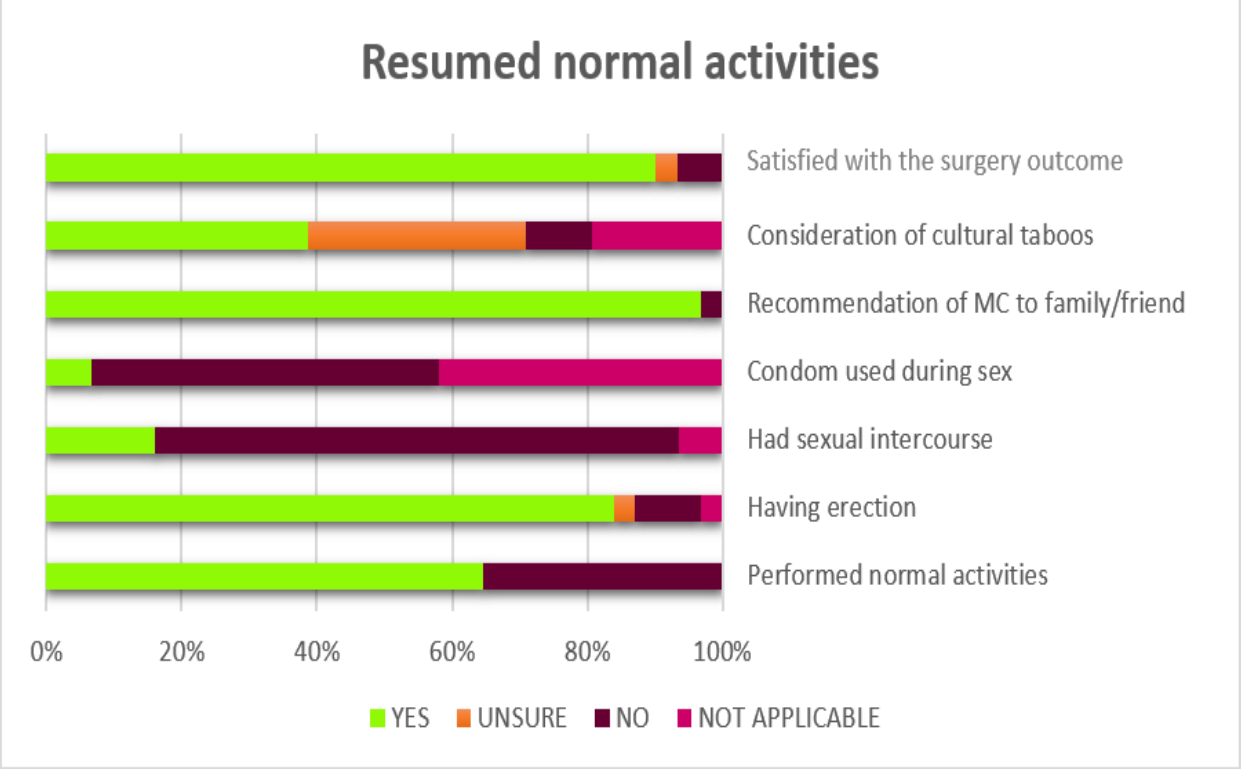

Figure 6.6 Post-surgical phase: Resumption of normal activities

How can PAU medical male circumcision service be improved?

Consistent with the quantitative results, written responses by men reported that they were overwhelmingly happy with the MMC service provided at the clinic and recommended that frequent services should be provided so that all male university students could access the MMC service.

"I was very satisfied because a good and safe MC was done".

"I like the way every health care team provided the MC care….a good and satisfying post-operative care provided".

"*MC service provided was successful and the study team took care of our need",*

"I like the MC service provided on me, PAU clinic should continue to provide frequent MC service to other boys who have not because of the limited intake".

Improvements in the post-operative phase care were suggested.

"The clinic should provide more gauze, bandages, and antiseptic solution for our wounds".

"I needed pain medicine initially. Clinic should supply more pain medicine".

"There must be adequate supply of medicine and male nursing officers to follow up with wound care and dress wounds".

Maintaining autonomy in the post-surgical phase, in particular information about self-care of the wound was highlighted as important.

"The MC clinic staff should provide information on how we could care for our own wounds".

"The clinic should provide more bandage and at least teach us how to properly care and dress the wound"

"I wish the clinic should provide more gauze and pain killers so I can look after myself".

A small number of men requested more awareness and information to more fully understand MMC, including the scientific evidence of MMC for HIV prevention.

"*The MC team should provide more information and awareness of MC, its scientific facts and the research based experiences"*.

"*MC clinic should take two to three sessions to provide information. Some boys had questions and were not sure to join the MC surgery"*.

A number of men stated their concern that their friends and colleagues had missed out on the MMC procedure because of the limited number of clients who were booked for the MC surgery.

"The process was very slow, in the future increase the number of doctors so 40-50 male can be circumcised a day or either have a routine MC clinic so boys can access the service at a time convenient for them".

Most participants recommended that MMC be provided on a routine basis rather than an ad hoc, annual or biannual service.

"PAU clinic need to provide MC service at the regular basis so all male student can access this service".

"The MC clinic was good and this service needs to be continued routinely so other boys can access this important service to prevent themselves from contracting STI and HIV".

"I would suggest PAU clinic to provide routine MC clinic than once or twice a year".

The lack of male nursing officers to provide continuing MMC program and other essential male health care service at the PAU clinic was a key issue. Although male doctors and nurses provided the ad hoc MMC service, there are no male nurses employed at the PAU clinic to provide ongoing or routine MMC services.

"PAU should employ male nursing officers to continue doing MC and provide other male specific men's health needs and advices".

"More male nursing officers are needed during MC clinic so they can do follow up visits".

Some participants said MC was a small outpatient procedure and it can be provided by nurses if they can be trained.

"I recommend training for male nurses because MC is simple and an easy procedure".

"Train nurses to perform this procedure because it is simple then having doctors to perform when PNG has shortage of doctors".

Finally, most men suggested expanding MMC services to more men and boys in schools and communities throughout PNG.

"*MC should be recommended throughout PNG because boys are cutting in unsafe places".*

"The MC services should be conducted in all schools and parts of PNG".

Discussion

Client's satisfaction evaluation is important when providing health care program. This helps in improving the quality of the service provision. This study evaluated the client's satisfaction of the MMC service provided at the PAU clinic. It evaluated the clients satisfaction on the information, treatment, and care provide before, during and after the MMC surgery.

Participant background information

This satisfaction survey has generated information about the perceived quality of care provided at the PAU ad hoc day clinic by participants from 13 different provinces in PNG with different socio-cultural and religious practices and background. More than half of the men identified as affiliated with the Seventh Day Adventist (SDA) church, which is not surprising given Pacific Adventist University is operated by the SDA church and most students are from SDA backgrounds. Almost half of the participants reported that MC is part of their traditional practice and these were mostly from the New Guinea Islands and Momase regions. A previous acceptability study of MC for HIV prevention confirms men from these regions reported MC as their traditional practice (MacLaren *et al*., 2015).

Just under half of the men in this study have an existing dorsal slit or other foreskin modification and attended the clinic to have the remaining foreskin removed. This scenario reflects the diverse range of foreskin cutting practices that exists across PNG (MacLaren *et al*., 2013). Also, consenting to remove the remaining foreskin may indicate that men in PAU

are well informed of the scientific evidence on the reduction of HIV contraction. This provides partial protection against HIV for these group of men.

The demographic information shows that unsafe foreskin cutting is no longer a practice guided by traditional or religious affiliations. It is now a common practice that is spreading across the different cultural and religious groups in PNG. Including foreskin cuttings in the schools and universities. Now that well educated men are beginning to take ownership of their sexual health, it is important for PAU clinic to provide regular sexual health information to reduce unsafe foreskin cutting and penile modification practices. Although, this is a PAU study, similar experiences of penile modification and foreskin cutting have been reported in other areas of PNG (Tynan *et al*., 2011). PNG's health authorities may also provide men's health services that incorporate and respond to local foreskin cutting and modification practices.

Participant knowledge about MC and HIV

The overall results of the men's knowledge survey about HIV, STI and MMC shows that men in this study lack basic knowledge about HIV prevention and STIs. Lack of knowledge by men about sexual health issues leads to unsafe sexual behaviours, which may result in contracting HIV or STIs. Although the PAU MC team provided awareness and information to the clients prior to the MC surgery, it is unfortunate that some men were not well informed. HIV education was a vital strategy used in Africa to provide basic information about HIV infection and the risks of acquiring it (Zungu *et al*., 2016). It is important for PAU's MMC clinic to strengthen awareness plans to provide basic and ongoing

STI and HIV information to the male clients. Sexual health education and awareness is not only important for PAU MMC clinic but it is equally important for PNG's health system to consider more broadly should they wish to provide MMC for HIV prevention in the future.

Male circumcision information provided before surgery

Information on MMC and HIV was provided to clients in groups prior to the surgery. The information was necessary because the MMC services were to be integrated with these HIV prevention measures. For example, prior to the surgery the clients would undergo voluntary counselling and testing (VCT) to examine their HIV status. It is important to treat STI infection prior to MMC surgery and also to rule out HIV + positive men from undergoing the MC service as per WHO recommendation (World Health Organization & UNAIDS, 2007).

Seeking clarification of information during the information dissemination session was an option available. However, feedback from participants indicated that this may not have taken place (for reasons which are unknown). A study on barriers and motivators to voluntary MMC in Zimbabwe showed that relevant information should be provided according to different age groups, for example between the young man and older men (Hatzold *et al*., 2014). Furthermore, a systematic literature search on MMC and HIV information and awareness in Africa also shows that boys younger than 18 years were less informed about other comprehensive packages and suggested separate information packages were provided for this group (Kaufman *et al*., 2016). PAU MMC clinic needs to identify barriers as to why a few participants were dissatisfied with the information received. Africa's experiences may not be applicable to the context at PAU but it is important that it should be

considered when providing group health education awareness on the benefits of MMC and other HIV services. Some men may prefer group sessions while some may prefer individual sessions. Also, consideration may be given to providing separate information sessions for married men and single men; the availability of space; and HCWs.

Information and services provided immediately prior to surgery and during the surgery

It is important to provide privacy and relevant information on the surgical procedure to clients undergoing MC surgery. This study indicates that the PAU clinic has been providing both the privacy and necessary information on the MMC procedure and needs to maintain this at the MC clinic.

It is also important to identify the reasons why few participants were less satisfied with the privacy and the information provided. This will remove any form of barriers to access MMC service at the PAU clinic. It is important to ensure men are sufficiently informed and have the ability to seek clarification before surgery. A study in Tanzania reported that group information sessions before the MMC procedure hindered men from accessing the MC service because of the shame factor (Boyee *et al*., 2017). PAU clinic or PNG's MMC program may consider a one-on-one explanation of the nature of the MMC procedure or provide the session stratified by different age groups (which were also seen to be effective in Tanzania and South Africa; Boyee *et al*., 2017; Grund *et al*., 2018).

The immediate post-surgical care was important to assess bleeding, pain and swelling while under the care of the health care workers at the clinic. This study identified that almost all participants were satisfied with the wound management, pain management, and the antibiotic provided, while very few were not satisfied with these services. This means that

PAU's MMC clinic had provided good post-surgical care for the majority of the clients. However, it is also important to evaluate the immediate post- operative care provided so all clients may enjoy the post-surgical care provided at the clinic. It is also important to provide ongoing training and upskilling programs for HCWs to provide the necessary care.

Discharge information confirmed that more than half of the participants were satisfied with the information on pain management, wound care, personal hygiene, dietary plans, when to resume sex, and when to seek assistance if they encountered complications such as bleeding, swelling, or no urine. However, similar to the earlier responses, very few participants were dissatisfied with the information provided for the continuity of care in the dormitories upon discharge from MMC surgery recovery at the clinic. Again this informs that PAU clinic has provided discharge information to clients. It is not clear why a few were dissatisfied with discharge information but it is crucial to improve on any barriers that cause dissatisfaction with this service. It is important that clients are well informed of the continuity of wound care when they are discharged from the clinic. A study conducted in several countries in Africa shows men from 10-19 years were forgetful, misinterpreting and disregarding provider's instructions or the information provided on wound care (Mavhu *et al*., 2018). This may be a similar experience faced by clients accessing PAU clinic. Intensive wound care management education would be preferable during the pre-surgical phase. This would lead to a requirement of less follow up care.

Although more than three-quarters of the participants were happy with information provided for the continuity of care, it is important that this information is clear and simple to follow so men may identify complications that may occur in the post-surgical period. A study

in Eswatini (Swaziland) recommended that telephone follow-up should be used or reinforce information given on possible adverse events to ensure information was well received and that for any emergency, phone triaging was seen to be feasible (Ashengo *et al*., 2014). Lack of proper information and discharge plans may also cause barriers to access MMC services for other men in the future.

Male circumcision service received post-surgery phase

It is important that clients return to their normal activities after surgery. In this study, clients were to fully resume normal activities and functions within six- eight weeks. With special consideration for the resumption of sex, WHO recommends men undergoing MC surgery should have an abstinence period of 42 days post-circumcision (World Health Organization & UNAIDS, 2007). This study reports that more than half of the participants were resuming their normal activities between six- eight weeks. However, very few men reported having unprotected sex in this timeframe, despite the information provided on the risk of acquiring HIV on the early resumption of sex post MC surgery. WHO recommends all men undergoing MC should abstain from sex until the wound is completely healed, and wearing of condoms was crucial to protect men from acquiring HIV infection (World Health Organization & UNAIDS, 2007). This reinforces the need for quality information and support for all men who receive MC services at PAU clinic as well as for PNG should MC be implemented in the future.

It is important to provide a culturally appropriate MMC program. This study reported that culturally appropriate events and privacy was provided and participants were very satisfied with the overall MMC services. A study in Zimbabwe shows men did not access MC services because of socio-cultural reasons and the authors recommended appropriate

culturally tailored MMC programs should be conducted in the health care facility (Chiringa *et al*., 2016). It is important for PAU clinic to maintain the already existing cultural practices that are integrated in the MMC service, and for PNG to consider integrating the cultural aspects of MC when introducing MMC for PNG.

Gender appropriate and skilled health care worker

Lack of male health care workers at the PAU clinic was a concern for the male clients in terms of access to information and provision of follow-up care. This was also raised by the PAU health care workforce evaluation of the MMC clinic (Section 6.1 of this chapter). It is culturally inappropriate for female health care workers to provide sexual health information and follow-up care. WHO recommends and supports that every MMC program provides appropriate socio-cultural programmes (World Health Organization & UNAIDS, 2008). Recruiting male health care workers is an important and essential element in providing MC in PAU and PNG.

Training of male nurses was reported to be an option to continue the provision of the MMC service. There is a demand for MMC and some clients thought if male nursing officers were trained then a proper routine MMC could be performed by nurses as a minor outpatient procedure. In cases like PAU, it is important to maximise the limited health workforce through using 'task sharing' and 'task shifting' approaches. Although female nurses are not allowed to provide direct care of the male client, they can provide other roles to ensure efficiency in the provision of MMC services (task sharing). In line with participant response about training male nurses, there is the possibility of task shifting, where RNOs could be delegated the role of performing MMC. Experiences in Africa show nurses were trained (task shifting) and accredited to provide MMC as part of their scope of practice due to limited

number of doctors (Curran *et al*., 2011; Perry *et al*., 2014). PNG may adopt the task shifting approach by training RNOs to perform MMC. Also, it might make sense in PNG to use the task sharing approach so women health care workers can assist accordingly (Chapter Five, Sections 5.1.5 and 5.2.7).

Conclusion

Almost all clients who have accessed the PAU MC clinic were very satisfied with the MMC services provided. However, the satisfaction status of the clients who did not participate in this research study are not known. The services provided during the pre-surgical, surgical and post-surgical phases were well received and were culturally appropriate. However, there were a few challenges that require improvement in the long term, around information and education processes, self-care in post-operative wound care and use of condoms and delay of post-surgical sexual activity. More intensive group education sessions were recommended so client can be well informed of all information provided throughout the MC service. Suggestions were made for the PAU clinic to provide a full time male health worker and to extend the MC clinic to a regular schedule, and that registered nurses could be trained to provide MMC services. In a broader approach, PNG needs to consider some of the issues and challenges highlighted in this study when formally introducing MC for HIV prevention into the country.

Summary of Chapter Six

According to the quality assessment performed, PAU ad hoc MC clinic has provided a safe and quality MMC service to its clients at the university campus. A few health system

gaps have been identified that require strengthening for ongoing ad hoc services and also for facility readiness for the formal implementation for HIV prevention service.

The next chapter discusses the views and experiences of the Enga health care managers towards MMC for HIV prevention in Enga. Their views were important because of the leadership and governance role they have in the different level of Engas health systems. Also the top-level managers experiences views on relevant policy issues on MMC in Enga's health system is important.

Chapter 7. Enga's health managers policy views on male circumcision

This chapter presents the views of the Enga health care managers on operational and policy issues relevant for implementing male circumcision for HIV prevention in the health care facilities in Enga Province. The chapter presents the qualitative results in a manuscript format. The literature cited in the manuscripts are in the thesis reference list.

Tommbe, R., Browne, K, Vallely, A, Larkins, S, MacLaren, D. Policy issues relevant to implementation of male circumcision for HIV prevention: Findings from health care managers in Enga Province, Papua New Guinea. Target Journal for publication: *Health Research Policy and Systems*. (Close to submission).

7.1 Manuscript: Policy issues relevant for MC implementation in Enga

Abstract

Study Background

Medical male circumcision (MMC) can reduce the risk of sexual transmission of Human Immunodeficiency Virus (HIV) from females to males. MC was recommended by the World Health Organisation (WHO) and The Joint United Nations Program on HIV/AIDS (UNAIDS) in 2007 as an additional strategy to the existing comprehensive HIV package. While other regions including Africa have implemented MC for HIV prevention, Papua New Guinea has not implemented MC despite high rates of HIV in some regions and provinces including Enga Province. This paper discusses the views and experiences of health care managers in Enga on policy matters relevant for possible implementation of MC for HIV prevention in Enga Province.

Methodology

This qualitative study based on participatory learning and action principles used a group discussion among 27 participants. Study participants were first level, mid-level and top level managers purposively selected from the health care centers and STI/HIV clinics, district and provincial health offices in Enga Province, PNG. Open ended questions prompted participants to discuss their views and experiences on MC for HIV prevention in Enga, relevant policy information for consideration, health system strengths and barriers/challenges experienced in Enga's health care facilities. Data were thematically analysed.

Results

Despite the absence of traditional penile foreskin cutting or MC practices in Enga Province, all study participants were supportive and willing to implement MMC for HIV prevention in Enga. However, there were enablers and barriers that were reported. The enablers included: supported the integration of MMC program with the existing HIV program; Standalone STI/HIV clinics were reported as better equipped to integrate MMC services; Shang Ring method of MMC being piloted in Enga. Enga Provincial health authority (EPHA) show strong support of MMC program.

While the barriers include: lack of knowledge of MMC by health workers and general public; socio-cultural and religious taboo on discussing sex and sexualities; no policy to guide Shang Ring program; lack of policy to no clear ownership and policy development of the MMC program; no policy in place to guide the Shang-ring program; no regulation and guidelines to ensure safe and voluntary access of MMC;

Conclusion

MMC for HIV prevention was acknowledged as an appropriate evidence-based intervention to be integrated into the existing HIV prevention measures in Enga Province. However, consideration should be given to: i) socio-cultural issues; ii) health system strengthening in a few health care facilities; and iii) establishing policy guidelines and regulatory measures.

Keywords: HIV infection, AIDS, medically performed male circumcision, health care managers, policy issues, Enga Province, Papua New Guinea

Study background

Global HIV status and prevention measures

Since it was first identified in 1981, HIV/AIDS continues to have devastating health effects globally (Smith & Whiteside, 2010). In 2019, global statistics report over 39 million HIV/AIDS related deaths and more than 36 million people living with HIV (Pandey & Galvani, 2019). The implementation of evidence-based prevention strategies including male and female condoms (Weller & Davis-Beaty, 2002); harm reduction for people who use drugs (World Health Organization, United Nations Office on Drugs and Crime, & UNAIDS, 2012); antiretroviral prophylaxis to prevent vertical transmission from parent to child (World Health Organization, 2010); and treating HIV-infected people in sero-discordant couples with antiretroviral drugs to reduce transmission to partners (World Health Organization, 2012), HIV remains a global challenge (UNAIDS, 2013a, 2013b).

Overview of the global male circumcision for HIV prevention

In addition to these strategies, male circumcision for HIV prevention is a recent evidence-based intervention with demonstrated effectiveness in preventing HIV transmission via heterosexual sex. Three randomised controlled trials in South Africa (Auvert *et al.*, 2005), Kenya (Bailey *et al.*, 2007), and Uganda (Gray *et al.*, 2007) confirmed that voluntary medical male circumcision (VMMC) performed by well-trained medical providers is safe and reduces the risk of heterosexual acquisition of HIV among men by 60%. In March 2007 the World Health Organization (WHO) and the United Nations Joint Programme on AIDS (UNAIDS) recommended that MC should be considered as part of the comprehensive HIV prevention

package in the heterosexual community where there is a generalised HIV epidemic and low rates of circumcision (World Health Organization & UNAIDS, 2007).

Since the recommendation of MMC for HIV prevention by WHO and UNAIDS, fourteen priority countries in the Eastern and South Africa sub-regions have circumcised approximately 18.6 million men (World Health Organization, 2018b). However, most countries in the Asia Pacific region, especially Papua New Guinea (PNG) have not integrated MMC for HIV prevention despite having HIV transmission via heterosexual sex and MC being practised in only some parts of the country (MacLaren *et al*., 2013).

Papua New Guinea (PNG) is the largest island nation in the Pacific region with an estimated population of 8 million people, compared to other countries in the region that have less than a million people (World Health Organization, 2016b). Also, PNG accounts for 90 percent of all HIV cases in the Oceania region which includes Australia and New Zealand (UNAIDS, 2013b). In 2018, 45,000 people were living with HIV compared to 34,000 in 2009. Of the HIV positive people, 29,420 were taking antiretroviral drugs. 2,100 new cases of HIV were reported annually, with an estimate of 500 AIDS related deaths every year (HIV AIDS Asia Pacific Research Statistical Data Information Resources AIDS Data Hub, 2018).

Male circumcision for HIV prevention research in PNG

The national HIV prevalence of PNG is 0.9%, but there is considerable variation in geographical distribution in the 22 provinces and four regions. Enga Province in the highlands region of PNG has the highest HIV prevalence of 1.7 % (National AIDS Council of Papua New Guinea, 2018; Papua New Guinea AIDS Data Hub, 2019). The HIV epidemic in

The HIV epidemic in PNG is mainly concentrated in the Highlands provinces (where MC is not traditionally performed) and the National Capital District (NCD). MC is not traditionally performed in the Highlands provinces. The New Guinea Island region has a HIV prevalence of 0.61% and MOMASE region 0.63%. MC is traditionally performed in selected locations across the New Guinea islands and MOMASE where the HIV prevalence is low (MacLaren *et al*., 2015). There is also high HIV prevalence among some key populations, such as: men having sex with men (MSM) in Port Moresby (8.5%); female sex workers in Mt Hagen (19%; Kelly-Hanku *et al*., 2018); partners of female sex workers; people in polygamous relationships having multiple sexual partners; and highway truck drivers exchanging cash, goods and services (National AIDS Council of Papua New Guinea, 2010). The continual new HIV cases across geographical location and population groups emphasises the importance of innovative evidence-based interventions to address HIV in these settings.

The PNG National Health Plan Strategies (NHPS) directs PNG to move from HIV awareness to evidence-based information and implementation in response to the epidemic (National AIDS Council of Papua New Guinea, 2010). Individuals and stakeholders have conducted HIV research to inform policy as well as improving treatment, care and support and provided evidence about other HIV prevention measures (National AIDS Council of Papua New Guinea, 2018). Several MC research projects over the last decade have informed policy makers and program developers about the possible implementation of MMC strategies for HIV prevention in PNG (MacLaren *et al*., 2013; MacLaren *et al*., 2015; Redman-MacLaren, 2015; Tommbe *et al*., 2013). However, MC for HIV prevention has not been implemented in PNG and has not been systematically integrated with the other prevention strategies. Additionally, there has been a lack of information on the policy aspects of PNG's health systems relevant to providing MMC for HIV prevention.

Why conduct policy related study on male circumcision in Enga Province?

Among several research studies conducted on MC for HIV prevention in PNG, a mathematical modelling study suggested MC should be conducted in high HIV burden settings and is not conducive for a nationwide rollout (Gray *et al*., 2014). "The correlation between high prevalence of HIV in regions where MC rates are low (MacLaren et al., 2015; National AIDS Council of Papua New Guinea, 2010), for example the Highlands region, indicated the importance of conducting this study in a province that reflected these prevalence statistics. Given that Enga Province in the highlands region has the highest HIV burden (1.7%), compared with the national prevalence (0.9%), and has low MC prevalence, this strategy may have a role in comprehensive HIV prevention and control in the Province. Prior to proceeding with this strategy, it is important that policy research is conducted among the health care leaders and managers in the province to understand their views and perspectives.

We specifically investigated the knowledge, experiences and attitudes about relevant policy and regulatory process that may influence decisions on implementing MMC service for HIV prevention in Enga.

Study methods

Study setting

The study was conducted in Enga Province in three different locations; a symposium conducted at Sopas, the Enga College of Nursing campus, one-one interviews at the Endakalipin stand-alone STI/HIV/AIDS clinic at the Wabag General Hospital, and a

feedback session for the top level management held at the Enga Provincial Health Office conference room.

Study methods

This qualitative study used three data collection methods based on community-based participatory research principles. They were: (i) participatory discussion groups as part of a one day HIV Symposium in Sopas, (ii) focus group discussion with the Provincial Health Authority, and (iii) one-on-one interview with one health centre manager who piloted the Shang Ring device in Enga.

Step one: In July, 2019, we conducted a one -day HIV symposium in Sopas, Enga Province. The symposium was hosted by RT to bring together different levels of health care managers from the six districts in Enga and the provincial health executive in one location to share ideas about MMC for HIV prevention and the policy considerations for Enga Province. The symposium was structured as a series of presentations followed by participatory discussion groups so that attendees could actively discuss the information in the presentations and its relevance for HIV prevention in Enga Province. Presentations covered sexual health and past research findings on MC for HIV prevention conducted in Enga, PNG (Gray *et al*., 2014; MacLaren *et al*., 2013; MacLaren *et al*., 2015; Tommbe *et al*., 2013; Tynan *et al*., 2012; Vallely *et al*., 2011), and literature reports from countries in Sub-Saharan Africa (Auvert *et al*., 2009; Bailey *et al*., 2007; Byabagambi *et al*., 2015; Gray *et al*., 2007; Hatzold *et al*., 2014; Ledikwe *et al*., 2014; Odoch *et al*., 2015; Sheldon *et al*., 2012; Uthman *et al*., 2011). The presentations were done over three hours by three separate presenters (RT, DM, and KB). The brief reports and presentations were provided as predisposing activities to get

the participants to think about the topic so they could effectively discuss in the participatory discussions. Study tools used were:

i. Written notes on butchers' paper.

ii. Voice recording of group discussion.

Step Two: A MMC for HIV prevention information session was conducted at the provincial health office to provide research evidence to leaders from the Enga Provincial Health Authority. After the session a focus group discussion was conducted with the leaders of the Authority.

Step three: An in-depth one-on-one interview with a first level manager at a stand-alone STI and HIV clinic was conducted to investigate a pilot in Enga of a new program to use the Shang Ring device for male circumcision.

Data collection process

Prior to the data collection, RT visited the provincial health office after gaining permission from by the Chief Executive Officer of the Department of Health in Enga Province. The investigator (RT) discussed the study with the acting provincial disease controller of the province. Invitation letters were sent to 20 first level, mid-level and top level managers of the health care centers, to district and provincial health administration offices. Information about the nature of the study as well as the ethical rights of participants and consent forms were sent with the invitations. Upon reading the information the invitees were to sign the consent forms and sent them back to the disease controller to inform the investigator if they wish to volunteer in the study. Interestingly, a total of twenty-seven health

care managers participated in the study. Twenty-two participants attended the HIV symposium, and five more attended the feedback session. Information sheets and consent forms were provided upon arrival for the additional participants who joined the study.

Step One: HIV Symposium: Twenty participants were purposively selected from a diverse range of managers whom we thought could provide us with the detailed information on the basis of their expertise or knowledge of MMC and management of the program. These are people who due to their position are looked up to for their opinions and experience in the health care system in Enga Province. These participants were likely to have knowledge or experience that is relevant to policy development on MMC program for HIV prevention in Enga.

A participatory approach methods was used in data collection. Participatory method is designed to have ownership or the sense of responsibility for the decision made amongst the group of representatives in the community (Jull, Giles, & Graham, 2017). Participatory approach aims to influence the decision process which impacts people's life and is commonly used at the community level for planning to identify issues affecting their wellbeing (Bergold & Thomas, 2012; United Nations High Commissioner for Refugees, 2006). In this study, the participants expressed their views about their challenges, potential, and their understanding of problems and any solutions for implementing MMC for HIV prevention in Enga's health care facilities. Through managers of all levels participating in the discussion, insights were generated for policy relevant to Enga's context in terms of MMC for HIV prevention. The participatory method provided a space for the different level of managers to openly discuss and shared information.

Data were collected from the participatory discussions following the brief HIV/STI presentations. Six groups were formed according to the six districts in Enga and one group comprised the provincial health care managers and technical advisors. Written open-ended questions were given to each of the groups to discuss and present the findings of their discussions. Butchers' papers and markers were given to capture their discussion and aid their presentations. English was used throughout the participatory discussion and presentation. However, participants used Tok-Pisin to clarify certain views. Tape recorder was used to record all group presentation and discussion. Forty-five to 60 minutes were given for individual group discussion and 10-15 minutes was given to each group to share their discussion.

Step Two: MMC for HIV prevention information session with the Enga Provincial Health Authority: A participatory method was also used in Step Two with the top level managers. More insights from the top level managers were collected during this step with the CEO of Enga Provincial Health Authority and directors and technical advisors. In this step, five people attended the sessions and participated in the focus group discussion. During this step, we presented the results of Step One to the top level managers for 15 minutes. Almost an hour was used in the group discussion of the results that had been presented. The presentation and discussion were conducted in English. All discussions were tape-recorded with consent from participants.

Step Three: One-on-one interview is a common method used in health and social research. It is basically a conversational interaction between two people but requires proper skills by the researcher to collect in-depth and valuable information to understand perceptions

and experiences of a given study topic (Ryan *et al*., 2009). The interview was recorded in English with one participant for 45 minutes.

A one- to-one interview was conducted after the symposium because one of the symposium participants was involved in a pilot study evaluating the use of the Shang Ring device for MMC in the stand-alone STI/HIV clinic that he managed. The interview sought specific information on progress and the plan of this pilot project and to understand how it was being integrated into the HIV prevention strategy. The questions included how the top level Provincial Health Authority managers were involved in the pilot study and how it was guided by policies from the NDOH and National AIDS Council.

Data analysis

The group discussions and presentations were tape-recorded by DM with consent from the participants and scribed by KB. Written points on the butchers' paper were kept, photographed and added to the data. All the recorded data were transcribed verbatim by RT. Each transcript was examined manually, line-by-line.

In Steps One and Two a deductive analysis approach was used. The main themes were focused on the policy questions relevant for Enga Province. These questions and themes were drawn from the WHO Health Systems Building Blocks Framework. The codes and quotes were categorized under the main themes provided by the participants (Bradley *et al*., 2007; Fereday & Muir-Cochrane, 2006).

In Step Three an inductive analysis approach was used. An open coding was used to enable themes to emerge directly from the data collected during the one-one interview.

Themes were identified according to the codes and categories that emerged from the one transcript (Fereday & Muir-Cochrane, 2006; Vaismoradi, Jones, Turunen, & Snelgrove, 2016).

Ethics

Ethical clearance for this study was obtained from the PNG National AIDS Council's Research Advisory Committee (RAC) and PNG National Department of Health Medical Research Advisory Committee (PNGMRAC).The study was also approved by the Pacific Adventist University's Research and Ethics Committee (PAUREC) and James Cook University's Human Research and Ethics Committee (JCUHREC; Chapter Three, section 3.9).

Study results

This section presents the overview of numbers who participated and the themes that emerged from the factors influencing MMC policy for Enga's health system; attitudes and beliefs towards MMC; health system strengths in MMC provision; barriers and challenges for the health system in terms of MC provision; and suggestions for policy consideration.

Socio-demographic characteristics of participants

A total of 27 health service managers took part in this study. Seventeen of them were male and 10 were female (Table 1). Of the management level, three were top level managers, 11 were middle level managers and 13 were first level managers. Most of the managers were

health extension officers (13), followed by nursing officers (9), medical officers (2), and community health care workers (2).

Table 7.1 Demographic description of study participants

Gender		Level of Management			Health Profession			
Male	Female	First level	Middle level	Top level	Doctors	Health Extension Officers	Registered Nursing Officers	Community Health Worker
17	10	3	11	3	2	13	9	3
Total participants = 27								

Attitudes and beliefs towards MC

Themes that emerged from the participant's attitudes and beliefs were health practitioners willingness to offer MMC services and lack of knowledge from HCWs and the community about MMC for HIV prevention; awareness of

"Enga will have to lead the way"

Due to the high rate of HIV experienced in the province, there was a strong view expressed at all levels of management that there should be a willingness to implement MMC for HIV prevention in the province. The first level managers were keen to provide MMC in their respective clinics because of: high HIV rate in Enga; increase in new HIV cases screened frequently in the clinics; perceived ineffective progress on the existing HIV prevention measures; and perception that MMC could easily be integrated because of the existing comprehensive HIV prevention measures.

"Sapos evidence em stap pinis bilong wanem yumi wastim taim stap na ol lain bilong mipla bai dai long AIDS", translation *"If there is scientific evidence, then why are we wasting time and allowing our people to die of AIDS"* (first level manager).

"*MC should be implemented in Enga because of the increase rate of HIV in the Province. I do not know why we are wasting our time - MC has already been recommended by WHO and UNAIDS. If PNG or other provinces are not implementing it, Enga will have to lead the way"* (first level manager).

Although there are HIV prevention comprehensive package at the STI and HIV clinic. one participant expressed:

It seems the existing prevention methods we have in the country aren't effective because we find new cases popping up every week or at times months in the clinic. We have all the prevention methods like abstain from sex for young people, be faithful to one sexual partner, use of condom for non-regular sexual partner and others have gone into deaf ears or we do not know. I strongly support the idea of circumcision (first level manager).

*We have existing stand-alone STI/HIV clinic in some districts which are already providing HIV and STI services and also other health care centers have the HIV prevention measure integrated in the routine outpatient services and refer cases if needed be. So having MC incorporated into our existing HIV prevention measures, I see is a way forward (*Middle level manager).

What else would we say, if the implementers are keen and that we have the existing HIV prevention measures in place, then we why not integrating MC with the other preventive measures... we at the top level are willing and we are in support to provide MC because of our high rate of HIV rate in the province (top level manager).

"A totally new idea"

Despite this enthusiasm, it was commonly reported that there was a lack of knowledge about MMC for HIV prevention amongst other health care managers, health care workers and the general public in Enga. Participants described that greater awareness about MMC for HIV prevention was needed across the province to inform people of the MC for HIV prevention strategy recommended by WHO and UNAIDS.

*MC for HIV prevention is totally a new idea to many health workers in the province. They are not aware of this strategy. Also, the local communities are not aware of it. Even before attending this participatory group I was not aware of the concept of MC can reduce the risk of transmitting HIV (*first level manager).

*People are not aware of MC for HIV prevention. It will be a challenge and we will need more resources such as money, staff, transport, media, time and many more will be required to do proper awareness throughout the province. Like what we have for Polio in the last few weeks, which has drained our resources (*middle level manager).

"The idea behind MC for HIV prevention needs to be communicated well to inform the general public and the health workforce once the policy established" (top level manager).

"Circumcision is not part of Enga's traditional culture"

Circumcision as practiced in other parts of PNG, are not part of Enga's traditional culture. However, managers report high level of acceptability and strong beliefs in medically performed circumcision.

> *Traditionally we do not circumcise men but other provinces in PNG provide circumcision as their cultural rituals for men. We also learnt that Engan boys are cutting their foreskin but we would say they may learn from boys from other cultures while they are in school. We would like to have the medical circumcision done to our men for HIV prevention reasons and for hygiene purpose* (middle level manager).

In Enga, there is a strong culture where sex and sexuality is a taboo and is not discussed openly in mixed gender groups. These are discussed in isolation among groups of men, or groups of women. Even their genitals are not exposed to any others except their spouse. Due to the cultural taboo many raised concern that awareness about MMC must be done in a respectful manner and female health care workers should not become part of the MMC team.

> *Culturally MC is not our tradition, and we also have a strong taboo that sex or any sexual relation topics are inappropriate to discuss publicly and is only discussed in private. For example, in haus-man only (men's house) or if it was for the women it was only in haus meri (women's house) so it is embarrassing to speak about it and for young men to access facility when female officers are around at the clinic is unacceptable... we need to have male health care workers in MC clinics* (first level manager).

Culturally it is inappropriate to publically disseminate information on circumcision so we need to best find suitable strategies to provide awareness and information to general public... for example, not allowing female health worker to provide awareness because this will shut off the men from receiving the information (first level manager).

Circumcision is not part of Enga's culture and it will pose shame and anxiety for men to access MC service, for this reason we need to provide massive awareness program throughout the province. This needs to be done as soon as the policy is readily available (top level manager).

Similar to the cultural taboo, religious aspects of MMC may have an impact on information dissemination because sex and sexuality were seen as sacred and not often discussed in church.

Sex and its related topics are not discussed in church. It is seen as a sacred thing and is discussed between the married couple alone. Providing MC awareness in public I guess will not be received well by churchgoers… therefore we need to be careful of our audience when running awareness (middle level manager*).*

"In difficult remote locations we will consider other plans so men can access MC services"

The participants described that accessing MMC services from the health care facilities in remote locations of certain districts may not be possible due to transport, logistics issues, non-availability of health workers, or socio-cultural issues. However, on a positive note,

options were considered so men from rural and remote villages may not be denied of the MMC service.

> *It will be challenging to provide MC in rural places like Maramuni, Laplam because of the difficult terrains. We have no road link, no electricity, very few or no health workers in the health facilities, inconsistency in maintaining medical supplies and equipment. MC service will not be easily access in these locations. In such difficult remote locations we will consider other plans so men can access MC services (*first level manager).

> *Those of us working in the rural and remote districts have frequent problems in terms of power, water, medical supplies and supply chain, tribal conflicts/fights disrupting services. Policy makers need to provide suitable ways that would allow men from difficult geographical locations to access circumcision services (*first level manager*).*

> *Policy makers need to consider the accessibility of such services. Not every men access health care services unless they are ill. For this reason would men come all the way to seek MC services from distant places? Such questions needed to be considered. If we have the MC service in other health centers then we can create referral for these men to go to those established MC service* (first level manager).

Participants were asked about the existing health system strengths that could support the provision of MMC for HIV prevention in the province. The following main themes were identified: strong support in managing the program and funding for MMC by top level

managers; starting the MMC program in stand- alone STI/HIV clinics where there is adequate space, equipment and supplies, man-power, reporting and monitoring systems; integrating funding in the HIV program; and availability of other health care agencies to support the implementation of the MMC program.

"We will embrace MMC if first level managers think MMC is a way forward to address HIV prevention"

Top level managers were positive and supportive of MMC provision in Enga. They reported that they will support and manage the MMC program in whatever capacity they have at their level but may not develop the policies and protocols as this is usually the role and responsibility of the National Health Department.

"I know Enga Provincial Health Authority (EPHA) is supportive of every health program and they will be willing to support the MC program" (first level manager)

> *I have more than 3000 registered HIV positive in my clinic, that worries me a lot, while I understand the top level authorities would be much more concern with the policies and other protocols to be established. At the end of the day, I believe the top level management will be willing to accept and manage the MMC to be rolled out in the province* (first level manager).

*"If all health care workers think MMC is a way forward to address HIV prevention in the province then we need to embrace this strategy and to integrate it with other preventive strategies as they have reported"(*top level manager*).*

"We have funding limitation but there is potential for reallocation"

Participants were hopeful that funding would be made available when MMC service is established.

"*No funding available at present to cater for MC but can be considered in the annual activity plan for proper budgeting at the year-end if MC is to be provided*" (middle level manager).

*"I do not think MC will cost much if it is integrated with the existing HIV prevention measures" (*middle level manager*).*

"Funding of MC program will come from the NDOH or national AIDS council (NACs), following the similar process in financing the existing HIV prevention program" (top level manager).

"We can start small….": strategies to facilitate implementation"

Participants were willing to implement MMC program with improved skilled human resources, finance and expansion of reporting and monitoring of the MMC program.

> *We can start small in implementing MC in the established STI/HIV clinic, and then we can extend the program into the peripheral...once the MC for HIV prevention policy is effective, we can manage the program in whatever capacity we can provide. This includes equipment's, supplies, human resources, etc. We also have church health*

facilities and NGOs like 'IGAT Hope' who is already partnering with us in the other HIV preventive programs and they will continue to assist us in the provision of this program if their capacity can allow (top level manager).

We have existing stand-alone STI/HIV clinic in some districts which are already providing HIV and STI services with less problems. If MC is integrated into the existing HIV program in the clinic, we will need few additional resources to cater for MC service alone because we have the space, electricity, water, reporting and referring system and other basic that are already in the clinic…MC will be easily incorporated in these facilities (middle level manager).

*"We have HIV Counselling and Testing (HCT) and antiretroviral (ART) services, in the STI/HIV clinics already and we can include MC in this package…our clinic has access to good water, electricity, and a minor theatre to provide MC" (*first level manager).

We have most of the theatre equipment in place, some of them will be used to do surgical MC but we can add onto this list if we need more specialized equipment…. We also have a good and effective supply chain that monitors and provide drug and medical supplies in our clinic (first level manager).

Apart from the space, equipment and medicine supplies, it was reported that most of the stand-alone MC clinics were confident that they well trained HCWs who could perform surgery and qualified HIV counsellors and data management personnel.

"We have a qualified male health officer who can perform MMC in our clinic and skilled personnel who are able to monitor our data….we also have trained HIV counsellors in our entire STI/HIV clinic" (first line manager).

Some participants shared that they have adequate number of staff in their STI/HIV clinic but will have to recruit more should MMC be implemented.

"There is adequate staff in our clinics for now but we may require additional staff if we provide MC service in the future" (first level manager).

Most participants indicated that stand-alone clinics do have a reporting, monitoring and referral system in the clinics, and that MC program will follow the same process

*"The new on-line reporting system set up by NDOH and its developmental partners in Enga, I see is the way forward for the current reporting system" (*top level manager).

Monitoring and evaluation of the MC program can be done through the same reporting strategy in National Health and Information System. This will not be a problem in Enga because of the established system that connects our reporting and monitoring system through National Department of Health (middle level manager).

Health care workers in the province know where to refer cases for further diagnostic and confirmation test for HIV…especially, those that do not have the STI and HIV

clinic. Also inpatient cases are referred to STI/HIV clinic for a follow up blood test and counseling. In MC case similar process will be integrated to the overall referral network (middle level manager).

"We can inform our partner agencies to assist us:" the role of health care partnerships"

Health care partnership was a strength reported mostly by the top level managers. The Enga Provincial Health Authority have partnerships with faith based agencies, NGOs and mining companies that assist in providing health care services in the province. It was identified that MMC services can be provided through similar collaborations as delivered in other existing health care program.

We can inform our partner agencies to assist us to implement MC program. They are already engaged in some of the HIV prevention program and when inform of this program, they will integrate it into their health care facilities as well. The health services in Enga are provided by the government and church agencies like Catholic, Lutheran, and Baptist churches, also we have NGO like IGAT Hope and mining clinic like Paiam hospital in Pogera (top level manager).

In addition to the strengths identified, managers reported a range of health system challenges and barriers in in implementing MMC. Some of the challenges and barriers were: ownership of the MMC program; financial issues; challenges with limited resources such as inadequate space, equipment and medicine supplies and issues with logistics and supply chain in some remote health care facilities.

Ownership challenges: "…Enga provincial government can take ownership"

Managers indicated that ownership of the MMC program was an issue. Most first level managers and middle level managers in the districts and health care facilities described that EPHA should take ownership of the MMC program, while the top level management highlighted that the ownership of any health care program including MMC appropriately comes under the NDOH or the NACS.

> "*Enga's provincial health authority (PHA) has the power because of the recent provincial autonomy. I am not sure whether this power can allow them to take ownership of the MC program too. Just my thought"* (first level manager).

> *"I suggest we develop the policy guide and provide MC in our own context and let Enga provincial government can take ownership of this program".* Another middle level manager supported this: "*Enga PHA must take the ownership to provide MC as a HIV prevention measures to address the high rate of HIV in this province"* (middle level manager).

However, the top level management reported that ownership of MMC program will be governed by the NDOH or either the NACS.

> *"I would rather say NDOH and NACS take the ownership of the MC program because all the HIV prevention program are govern by them but EPG will manage the implementation of the program"* (top level manager).

"Finance can be a huge problem, now that the country is going into economic crisis"

Most participants reported that financing a new program like a MMC service can become an issue given that the country is going into economic crisis and that the existing health care services in the remote and rural facilities already experience issues in procurement of the necessary medical supplies. As such a MMC program may add financial burden to the existing health care services in rural and remote locations.

> "*Finance can be a huge problem, now that the country is in economic crisis and I am wondering additional program in MC might be a burden*" (middle level manager).

> *Financing health care program has been an ongoing issue in some of the health care facilities. Especially in drug procurements... financing additional new program, together with the ongoing program is a challenge... especially, if the limited budget is not appropriately managed* (first level manager).

Other participants raised concerns that budget made available at the national level does not reach the implementation sites for certain new and ongoing programs, adding pressures to implementers on the ground.

> *"Sometimes budgets are made in millions but when it comes to reality, it's reduced to its expectation that leaves us the implementers to suffer more on the ground to provide basic services" (*middle level manager).

"We do not have enough resources to perform MC in the remote health care facilities"

Some of the participants reported that MMC provision will be challenged in remote health care centres because of inadequate space, electricity, equipment and supplies to provide MMC. Others reported that they are already challenged in providing ongoing health care services due to supply chain issues and MMC may become additional burden to cater for both the existing and the new programs in these health care facilities.

"We do not have enough health workers, equipment, medicine and many other things to do circumcision. Not only health service resources but other things like water and electricity will be a problem" (first level manager).

We will face challenges in supplying adequate amount of gauze, bandage, antibiotics, and sutures and so forth in our clinic"*…we do not have minor theatre or a space like the stand-alone clinic do perform MC …we also do not have constant electricity and a sterilizer to sterilize our instruments* (first level manager).

"*We need essential and basic supplies for other routine service... we also note that we do not have adequate equipment specifically to provide MC services*" (first level manager).

*"Supply chain has been a challenge when supplies are not constantly provided for certain health care program on time" (*first level manager).

"*Transport for referrals is a problem in the sub health centres. How will we refer patients to seek further treatments in the health centre or hospitals if our clients require referrals? Especially, when there is a complication" (*first level manager).

Shortages of the health care workforce in remote health care facilities was a common challenge in the remote districts. The HCWs are most times absent for work or leave the facility because of issues with work condition..

"We do not have many health workers in some of the rural health care facilities. At times there are physically not present at work place" (first level manager).

"Most HCW's don't prefer working in the remote health facilities because of the welfare of their children and themselves. So when they leave for breaks they do not return to work" (middle level manager).

Emerging MMC practice in Enga

During the participatory discussion, one facility level manager reported that a new technology, the Shang Ring device, was being piloted in Endakalipin stand-alone STI/HIV clinic in Enga. This stimulated robust discussions among all level of managers. Four themes that emerged from the Shang Ring discussion during the symposium and one-on-one interview were: i) National AIDS Council's initiative to roll-out MMC using Shang Ring for HIV prevention; ii) Shang Ring device for MMC procedure was new knowledge for the Enga health care managers; iii) Shang Ring not effective for all types of foreskin; and iv) perceived health system strengths and challenges of Shang Ring implementation at the Endakalipin clinic.

National Aids Council initiatives: "I was invited by NAC to attend Shang Ring training"

At the Endakalipin STI/HIV clinic the National AIDS Council have initiated the training on Shang Ring method of MC for HIV prevention strategy.

I am happy that circumcision is being discussed in this forum because it coincides with the training I received recently. I was invited by NACs to attend Shang Ring training. Two participants from each of the provinces were invited. We were informed that we were going to be trainer of trainers in our respective provinces".
*"I have been trained on how to apply Shang Ring. The course has been conducted for two weeks. We were also asked to do insert 200 Shang Ring each in our clinics. Right now I am waiting for the kits to come from NACS office (*First level facility manager).

New knowledge for health care managers in Enga: "Shang Ring is news to us"

All other managers reported that the Shang Ring device used for MC was totally new knowledge for them, but the notional acceptability was high among different level of managers in the room.

Shang Ring is news to us. We do not know whether it is a surgical procedure or what equipment they use etc. we need to be very well informed. We need to be aware of this method well. Otherwise we will start referring patient to Endakalipin clinic only (middle level manager).

The facility level manager of the Endakalipin STI/HIV clinic indicated that the top level managers are not aware; however his immediate supervisors were aware of the invitation and his attendance to the Shang Ring pilot training. He stated:

> *I have not directly communicated with the Enga's top level management team but in fact the request letter for me to attend that workshop was given through the office of the CEO and my immediate director so they are aware and hopefully they have reported it to the top management* (first level manager).

During the feedback report and discussion the top level management described their lack of awareness of this program but were keen in supporting the program if it was effective. One top level manager said:

> *We are not aware of the Endakalipin clinic involvement of the Shang Ring methods being piloted in Enga Province. However, if this method works for Enga then it's best to start somewhere and we will need to be informed of how effective the program is with the pilot program* (top level manger).

> *It is good to start somewhere, this has not come to our notice but I am assuming that NACS must have started this method of circumcision as a pilot program throughout the country. This also alerts us to re-look at how we can sustain Shang Ring method in the long run* (top level manager).

Efficacy with dorsal cuts: "Shang Ring will not work for men with existing dorsal cuts"

Interview data suggested that Shang Ring implementation was easy, less time consuming and could be performed by nursing officers and community health care workers. Unfortunately, it was also suggested that this form of MC method was not suitable for all forms of foreskin only used with full foreskin intact.

> *Shang Ring will not work for men with existing dorsal cut or slits and injected penis. It is not good to send men who wish to remove their remaining skin away when they come to seek help from us. We need to provide MC using methods that are suitable to them"… "All circumcision methods be tried out and not only Shang Ring. This will provide men with different option. For example, MC surgery can remove remaining foreskin from men who have dorsal cuts (first level manager).*

The effectiveness of the protective mechanism of the dorsal split was questioned by many health managers

> *From your research presentation earlier on we were informed that splits and full circumcision have similar HIV protection effects as per one of the study conducted in our very own Endakalipin clinic. Can this be confirmed thoroughly before we inform people to choose from both forms of foreskin cutting? If there is more research on this we need to be informed prior to trialling out the different methods"* (top level manager).

Concern were raised to implement other forms MMC if Shang Ring was not suitable for men with dorsal slit.

Enga needs to pilot all the different methods of male circumcision and identify the methods that are applicable, efficient and cost effective to provide in our health care facilities (top level manager).

Perceived health system strengths and challenges for Shang Ring implementation

The Endakalipin STI/HIV clinic facility manager raised several possible health system challenges and strengths on issues surrounding the implementation of Shang Ring. Policies and implementation guidelines were important factors that needed consideration.

I am not sure whether the MC policies are in place to guide my practice. I did not think to ask NACs but I will call and check". *"I will start with the awareness on circumcision and Shang Ring first through radio Enga, which is not a problem because I have been airing other STI program through the same means*".

It is important to have the policies and protocols in place prior to implementing Shang Ring. We don't know whether the Shang Ring is a pilot study or an endorsed program initiated by NACS. They need to communicate with the top level management of these new HIV program… which one comes first circumcision information or Shang Ring? (top level manager).

National AIDS Council need to communicate the relevant policies and programs with the PHQ on the Shang Ring method and other male circumcision aspects of training or implementation that is being carried out so we are aware of the programs to support the programs on the ground (top level manager).

Awareness and information dissemination on Shang Ring was also reported during the focus group discussion.

> *General awareness of the circumcision is important. People need to make inform decision to come forth. I have not heard any awareness of the Shang Ring on male circumcision for HIV Prevention. I guess the Endakalipin clinic will provide awareness when the Shang Ring kits arrive in the Province* (top level manager).

The Endakalipin clinic reported adequate space, well reporting system, and a good referral network for complications. However, the challenges highlighted were manpower, organizing Shang Ring and the other STI and HIV clinics; and continuation of funding the Shang Ring program.

> *We have the space at the clinic, with good running water and electricity, we also have a good reporting system in place and for any complication our clinic is situated close to the operating theatre where management will be easier". "At the moment the Endakalipin HIV/STI clinic has inadequate staff in comparison to the 3,000 plus HIV positive case to 5 full time workers. Shang Ring will be an additional service integrated so we will require one to two more staff*

> *It's going to be a challenge initially to integrate Shang Ring with the routine operational schedule of existing. We have certain ART days; I will try to schedule circumcision alternate from the ART days. Like Mondays, Wednesdays, Fridays, in*

the afternoons would be proper. I have observed that most men come in the afternoon to visit the clinic so I will make my time available during these times.

Funding Shang Ring will be a problem. For now we will entirely depend on NACs to supply Shang Ring kits. If they run out then we need to male plans with EPHA to sustain the program.

Despite the health systems challenges, it is possible to implement Shang Ring as the first MC method in Enga for HIV prevention method.

Any health care program begins small and expands afterwards. Likewise it's good to start the MC for HIV prevention strategy with the Shang Ring and we can continue to use other methods as well. But we need to pilot others just like the Shang Ring". He further reported: *If Endakalipin clinic staff has been trained to become the trainer of trainers, then it's a way forward for Enga where they can expand to other STI and HIV centres and facilities as per discussed earlier (*top level manager).

Possible policy recommendations for MC implementation

Health managers identified several factors for policy consideration towards introducing MMC services in Enga. These suggestions were categorized under the following themes: regulatory and standard operational guidelines; strengthening of health services; and stakeholder involvement in policy development.

Regulatory and standard operational guidelines for MC services

Participants reported that it is vital to establish legal and ethical principles to guide MC service delivery. Also, they described that every activity in providing MMC services should be guided by standard operational procedures to ensure safety and quality of the MMC service.

> *MC involves surgery and this requires process such as patient's consent, confidentiality, and their rights to know the information on MC such as the advantages and disadvantages of MC so they are informed well…the legal and ethical rights of the patient must be guided (top level manager).*

> ***"****Guidelines for all health care programs are important and this must be considered by the policy developers if they wish to introduce MC for HIV prevention program".* Another middle level manager stated*: "Authorities need to develop standard operational guidelines that will guide the implementers on how to do male circumcision and other procedures involved in MC program"* (first level manager).

Some managers further described policies on accrediting health care workers to perform surgical MC procedures that need to be safeguarded by rules and laws

> *The policy developers need to consider the lives of staff that are providing MC. Their safety as health workers is important. Policies that will encourage them to work without fear. Especially if nurses and CHWs are performing MC we need to safeguard because initially only doctors and HEOs are trained to conduct surgery* (first level manager).

Strengthening of health services in some health care facilities

Strengthening needs of the health care facilities vary between health care facilities and the location of these facilities. There is strength in some of the larger and customized HIV/STI clinics and problems identified in some of the remote and isolated sub-health centers. Inadequate health workforce in rural and remote areas was a big concern in the health service.

> *Human resource is a big problem in some of the health care facilities and to have new program, policy developers need to strategize how well we need to utilize health workers who are already overloaded in these facilities and where will we source new health workers* (middle level manager).

> *"Policy makers need to include how the management will provide training for its staff to perform and care for clients undergoing MC procedures" (*first level manager*).*

Participants suggested MC to be integrated with other HIV preventative programs for cost-effectiveness. Some suggested that the costing be incorporated into the annual activity plan for HIV/AIDS program.

> *Circumcision will be a new program in the system. Policy developers need to come up with cost effective measures on how best we can financially sustain this program. We suggest best way is to integrate this to become a HIV prevention program so we can budget together with the other HIV prevention program* (first level manager).

Policy makers must be aware that there is already existing HIV prevention program in place and therefore we suggest if funding for MC program be incorporated into the annual activity plan for HIVAIDS program. Especially for staff training, space, MC instrument and equipment's and medicine supplies be included into annual activity plan (AAP), this will allow the budget to address the necessary equipment we need to provide MC in the clinics (middle level manger).

Participants further identified that the procurement of equipment and other medical supplies needed strengthening at the health care facilities prior to implementing MMC.

Regulation of the flow of medical goods and supplies from central supplies to the point of care must be effective. Because we constantly have issues with shortage of antibiotics, analgesics, even anti-retro drugs which make it difficult to provide health care service and we most times turn down our patients (middle level manager).

A few managers highlighted that a MMC services may use the same monitoring and reporting system with other HIV/STI services in the clinics.

*"Reporting process of MC need to be spell out well whether it will follow the same process of reporting for the existing HIV prevention or it will have a specific process in reporting" (*middle level manager*).*

Involvement of stakeholders in policy development

Including the views and suggestions of stakeholders in MMC policy development was a frequent theme that emerged from the discussions. Most participants described how health leaders need to work with leaders both within the health sector, other government sectors and community leaders for any public health program.

> *It is important for the policy developers to involve other service providers because they are the ones who are partnering with us to provide such service. For example, agencies like the NGOs and private health clinic will be implementing MC with us, so their views need to be included in the decision making level, just like our other program on TB and immunisation* (middle level manager).

> "*We should involve the other government sectors such as education so they can include MC in their existing sexual and reproductive health in the curriculum and also involve radio NBC for awareness*" (middle level manger).

> *We should involve our community leaders so they can assist us to do awareness and information dissemination on the ground. They know what is best for their community and with HIV existing in the community for long period. They will be willing to support their men folk in the villages and community* (firs level managers).

> *"Our government and political leaders needed to involve at the decision making level so they support at the implementation level. We also we need people living with HIV to be included in the decision making process"* (middle level manger).

Infant circumcision for long-term HIV prevention in Enga

MMC for children was reported as a possibility for long term HIV prevention strategy in the province

> *I would recommend that if male circumcision is seen to be effective among adult men, then we need to consider implementing it for every infant and children. Especially when they are not sexually active. This I believe will cover all our male population in the future and as such I believe the HIV rate will effectively be reduced (top level manager).*

Discussion

Enga health care managers at all levels reported in-depth information on policy relevant for Enga's health systems in implementing MC for HIV prevention. In some areas of discussion their opinion and views were similar while they varied in other areas.

Attitudes and beliefs towards male circumcision

This study generated rich and contextually informed views and understanding of the beliefs and attitudes towards MC from Enga's health care managers. Foreskin cutting is not Enga's traditional practice, neither is the concept of MMC for HIV prevention known to all health care workers. Despite the new concept, health managers were willing to support the program in whatever capacity they could. The results show that the acceptability and willingness to support MMC among different level of health care managers in the province was great.

The kind of support reported may vary in different parts of the province and at the national level in PNG. While the support was dynamic, the study result indicated that the managers lack of knowledge on MMC for HIV prevention. Not only were the health care workers unaware of the MMC for HIV prevention measures but the community in Enga were also unaware of this information requiring a culturally sensitive massive awareness campaign. This means resources such as money, manpower, transport and other logistics involved in awareness are required to carry out the awareness prior to implementation.

Similar cases of acceptability and lack of knowledge on MMC were reported in South Africa (Phili *et al*., 2014). It was described that there was high acceptability of MMC amongst the health care workers but most did not fully understood the link between MMC and HIV prevention. Further there was a lack of knowledge on MMC and health care workers had misconceptions that MMC would increase HIV among men. This became a hindrance to MMC service in Africa (Phili *et al.,* 2014). It is important to provide clear and complete information about what is known and unknown about MMC and HIV prevention in Enga so they are well informed when accessing MMC services.

The socio-cultural aspects of MMC are important in determining effective strategies when developing MC polices for HIV prevention. Even though MMC is not traditionally performed in Enga, concerns were raised about cultural and spiritual taboos and sacredness in discussing and exposing information on sex and sexuality. This may become a barrier to access to the MMC program. Similar issues have been described in Botswana, where traditional MC values and traditions were not met in medical MC, both in the awareness program and implementation (Katisi & Daniel, 2015). Awareness programs were using sexualized languages which were not appropriate in public. The secrecy, timing, and rituals

practiced in traditional settings were also not met by the biomedical marketing (Katisi & Daniel, 2015). A study conducted in one of the rural districts in Zimbabwe showed that men did not access MMC services for social-cultural reasons such as feelings of worthlessness, shame, and the labelling of men with MMC as promiscuous (Chiringa *et al*., 2016)**.** Similarly, a study in Malawi reported that men were not comfortable with female clinicians performing MC because traditional MC practice involves secrecy of MC rituals and exposure of sexual organs to female health workers was inappropriate (Umar *et al*., 2013). It might be possible for Enga Province to learn from the lessons of implementation in Africa and deal proactively with the cultural acceptability of implementation of the MMC program in Enga.

Accessing health care services in rural PNG can be difficult with the challenging geographical terrain in some parts of the country, especially where there is no road link and air transport is infrequent. This becomes a barrier to providing basic services including health care services (World Health Organization, 2016b). The results from this study confirm difficulty in accessing routine health care services in the remote districts in Enga due to the lack of a road link, which poses challenges in transmitting electricity, transporting basic medical supplies, and other basic services to these locations. Barriers in accessing basic services in the remote and rural periphery do not only become a health issue but a socio-economic issue that needs sector wide approach. It is important for EPHA to consider a central location or health facilities where men from the remote districts can access the MMC service.

Shang Ring: An emerging MC practice in Enga

The Shang Ring device introduced as a pilot study in Enga was a new knowledge for the health care managers. Although the information was totally new, and created a sense of unawareness, they were briefed about the method and how it linked into the bigger picture of the MMC program. It is important that the relationship between the program developers and the top level management is intact so any health program can be easily supported. From Africa's experiences, top level support and trusting relationship is crucial for an effective VMMC program (Dickson *et al*., 2011). Although there was question about the communication process, Enga's top level managers were supportive of the pilot program and suggested that Shang Ring can be used in the initial MMC phase and later can involve other MMC methods.

Perceived challenges from the pilot STI/HIV clinic included no clear indication of policy and guidelines to direct Shang Ring implementation, and that awareness and information were necessary to provide accurate information to the public prior to conducting the pilot. It was further highlighted that a suitable arrangement would be required to ensure the routine programs would not collide with Shang Ring implementation. WHO and UNAIDS cautioned that every MMC program should avoid interrupting the ongoing routine services at the health facilities (World Health Organization & UNAIDS, 2008). Furthermore, additional workforce would be needed to share the workload with the ongoing STI and HIV routine programs in the clinic. It is possible to train the male nurses and CHWs to apply Shang Ring as a task shifting approach, which is easier than the surgical removal of foreskin. By doing so the facility can maximize the roles and functions of the limited health care workers in the clinic. This approach of task shifting worked well in Africa in health care facilities that had limited surgeons to perform MMC (Sheldon *et al*., 2012).

On a positive note, the facility manager highlighted that Endakalipin STI/HIV clinic had adequate space, electricity, and water in the clinic. The referral systems were well established and for any complications it was easy to refer clients to surgeons and medical officers. There was also a reporting system in place for other STI/HIV programs and if MMC program was integrated then could use this existing reporting mechanism.

During the feedback session, the top level managers were also aware that Shang Ring method of MMC would not work for men with dorsal slits of the foreskin. Also, the cost involved in sustaining Shang Rings was questioned. This triggered questions on the accessibility of MMC for men with dorsal slits. With this consideration, top level managers recommended appropriate MMC methods to be piloted in Enga prior to implementing a MMC service. This will provide evidence of what MMC devices/methods are applicable to Enga's setting and the cost-effectiveness of MMC methods. Africa's experiences on cost-effectiveness shows little difference in the cost of the actual methods but the cost increased of the comprehensive HIV prevention package (Kim *et al*., 2015; Uthman *et al*., 2011). It is crucial for Enga to be informed that MMC implementation is likely to increase the operational costs in existing HIV prevention measures because of its integrated services. For example, STI medications and HIV testing kits would be compulsory in the screening process prior to having MC. Piloting the different MMC methods and the cost-effectiveness of each method is important to provide the needed evidence.

Furthermore, concerns about policy protocols and guidelines were raised on Shang Ring program. Managers recommended NACS and NDOH should inform the provincial health office of the status of the MMC program as they require clear instruction and information to implement this program. If Shang Ring was endorsed by NACS and NDOH,

then this needed to be communicated well at the top level so continuation of Shang Ring and other MMC awareness and program can be planned and implemented. As emphasised by WHO and UNAIDS all MMC programs including Shang Ring should have clear guidelines and regulations in place to safeguard both the clients and the care provider (World Health Organization & UNAIDS, 2008).

Readiness of the health system in Enga

To determine the readiness of the health system to implement new health programs such as MMC for HIV prevention, we sought the views of health managers about health system strengths and challenges that may impact MMC services in Enga. Even though MMC is categorized as a minor surgical procedure and the provincial hospital and district health centers can provide MMC services with few additional resources, it is important to understand the context in which MMC services can be offered, and the limitations, particularly beyond the provincial centers in small rural and remote health posts. This will help inform strategic decisions around where to prioritize the limited resources in terms of: health workforce, equipment and supplies, infrastructure and other resources in these remote and isolated settings. It is also important to understand the cost-effectiveness of implementing MMC with other routine health care programs with minimal interruption of services in these settings. For example, if MMC is costly and is likely to add more burden to ongoing health care programs than it may be considered only in the bigger centers.

The managers in this study indicated positive views of the strength in Enga's health system, while a few challenges were also reported. In the broader picture, most top level managers reported the strengths of Enga's health system, while the middle and the first level

managers, especially the facility managers highlighted the challenges for the health systems including governance and funding, service delivery, health workforce, equipment and medical supplies. These challenges were mostly experienced in the remote settings of the districts in Enga. Top level managers need to address these issues to strengthen the health system prior to the implementation of MMC.

There was uncertainty in views about the ownership and funding of the MMC program. First and middle-level managers were keen for Enga Provincial Health Authority (EPHA) to take ownership of the program, to ensure it was implemented in a contextually informed way. However, the top-level managers saw the ownership and funding as the responsibility of the NDOH and NACS and EPHA will only support and manage the implementation of MMC program together with its partner agencies. Tynan's study concurs with this ownership view, affirming that responsibility of funding and governing of MMC may come from NDOH but that it requires support from all levels of government (Tynan *et al*., 2012). One of the strategic actions taken by Tanzania to scale up their VMMC program is proper coordination, leadership, management, and funding of the VMMC process (Mwanga *et al*., 2011; Lissouba et al., 2010). Prior to the commencement of MMC in Enga, the ownership, and the funding of the MMC program should be established so implementing partners and stakeholder are well informed for greater outcomes of the MMC service.

The results indicate that participants strongly supported integration of MMC with the existing HIV prevention services in the stand-alone STI and HIV clinics. The stand-alone clinics are connected to the main district hospital and health centers. The clinics have a separate building with specialized trained staff that provides exclusive STI and HIV services. However, the challenges of health workforce, equipment and medicine supplies were mostly found in sub-health centers with no stand-alone clinics where STI and HIV services are

incorporated into the routine outpatient clinics. Also challenges in accessibility were common in remote health care centers.

Top level managers were keen to pursue the MMC program in well-established settings and to expand when other facilities were ready to implement. These findings suggest staged implementation of a MMC service may be appropriate, rather than large-scale MMC services as implemented in the Sub-Saharan Africa, where there are enormous resources in financing health workforce, equipment and supplies (Curran *et al*., 2011; Edgil *et al*., 2011; Lissouba *et al*., 2010). However, large scale MMC may be considered in the future should there be high demand in MMC among men in Enga and PNG. It is recommended that health system in Enga should adapt lessons from Africa's experience in health systems strengthening approach to roll out mass circumcision.

Suggestions for MC policy

Results from this study show no existing MMC policy and implementation of MMC in Enga. A relevant MMC policy framework to govern the provision of MMC services can either become a stand-alone policy or be encapsulated into existing HIV prevention measures. According to WHO and UNAIDS, the main aim of policy development is to ensure the MMC program is safe and of high quality, and is accessible and available to every eligible man who volunteers to undergo MMC service (World Health Organization & UNAIDS, 2008). WHO and UNAIDS further highlighted that policy formulation and approval can become difficult and time consuming and is not necessary if the basic elements of an enabling environment allow the scale-up of accessible and acceptable male circumcision services (World Health Organization & UNAIDS, 2008). Waiting for national government to develop policy may be slow and will inhabit nimbleness. Therefore, it is

possible for EPHA and NDOH to discuss way forward to develop relevant policy and clinical practice guidelines that are essential in guiding implementation and ensuring scale-up proceeds efficiently and in timely manner.

The current prevalence rate in PNG does not support a national MMC policy but it is appropriate to focus efforts in areas of high prevalence such as Enga (Grey *et al.,* 2014). NDOH need to decentralize clinical governance processes to support this. Some countries in Africa felt that it was necessary to have a specific policy for MMC to ensure appropriate mobilization of the resources to enable rapid scale-up (World Health Organization & UNAIDS, 2008). Similar to Africa'sVMMC program, appropriate laws and regulations are important so that MMC services are accessible and provides safely without discrimination and that implementers were guided and protected by laws (Mwanga *et al*., 2011).

Financial resources are crucial to introduce MMC services for HIV prevention. This will require additional and efficient use of existing resources and commitment by government and donors. These findings indicate that there was awareness that financing the MMC program would become a burden to the health system. However, on a positive note, participants suggested that MMC can be incorporated into the existing HIV prevention program for cost-effectiveness. Participants felt that donor funds should be transparent from the donors, governing body of the MMC program and the implementers to ensure outcomes are achieved. Bilateral and multilateral donors should consider MMC as an evidence-based intervention for HIV prevention and allocate resources accordingly. Studies in Africa found VMMC to be cost-saving but more funding was required for the comprehensive HIV prevention package (Uthman *et al*., 2011). The cost of an MMC service at the point of

delivery can be a barrier to men accessing safe MMC services. It is crucial for Enga or PNG to estimate the resources needed, develop cost plans and allocate resources for MMC without taking away resources from other existing health care programs. Also, it is important to ensure the existing resources are used as efficiently as possible and that enough resources are allocated to sustain the program in the long run.

Stakeholder involvement in policy development is vital to ensure positive outcome of the MMC program. Participants in this study indicated that policy and program developers mostly exclude significant leaders from the start of the program, especially those in the public health care program. From Africa's experience (Mwandi *et al*., 2011), EPHA and NDOH should seek support from the implementing partners, funding partners, government and community leaders to participate in policy development to seek their cooperation and trust to enhance an effective MMC program.

Favourable policy guidelines for human resources and patient rights in providing MMC services need to be considered. Study results highlighted an awareness of inadequate staffing, as well as unaccredited health care workers performing MMC in some health care facilities, and suggested that policy development involve guidelines on training and upskilling of front line health care workers (nurses and community health care workers). Men undergoing surgery needed to be guided by ethics and surgical guidelines. It is recommended for Enga or PNG to follow the key elements of a national MMC policy provided by WHO and UNAIDS (World Health Organization & UNAIDS, 2008). The key elements of the MMC policy involve human rights issues such as consent, confidentiality, and discrimination. The MMC policy also covers issues of quality assurance to safeguard the certification and

accreditation of health care workers and facilities in all sectors, and the procedures in place for malpractice (World Health Organization & UNAIDS, 2008).

Health systems in developing countries are generally weak and there is a shortage of skilled health workforce, equipment and supplies, challenges in monitoring and evaluation processes, particularly in the most remote locations (World Health Organization, 2007a). This study also indicated that health service delivery was challenging in some health care facilities, while others had resources to provide MMC at a smaller scale. This poses the question of the safety of MMC provision in areas with challenging health care settings where less equipment, expertise and providers were available. Studies in Kenya have shown that when circumcision is performed in settings under aseptic condition, by properly trained health personnel, complication rates are low. However, high rates of complications are reported in poorly-equipped facilities with incompetent health care personnel (Evens *et al*., 2014; Omondi Aduda *et al*., 2015). Strengthening health services at all levels is a vital element of increasing access to safe MC services in PNG.

Infant and child circumcision is a suitable approach for Enga to address HIV reduction at a population level. If VMMC is seen to be effective in reducing the risk of contracting HIV, then it is important to circumcise infant and children at this early age so when they reach their sexual debut they are less likely to contract the virus. This approach may reduce HIV in a general population and is seen to be a long term HIV prevention measure. WHO and UNAIDS not only encourage VMMC but also recommend countries consider providing MC services amongst neonates and infants as a longer-term HIV prevention strategy (Weiss, Dickson, Agot, & Hankins, 2010).

Study strengths and limitations

This study had the strength of being led by a strong Engan health care worker and doctoral candidate. The approach to data collection was culturally appropriate and rigorously applied. The participatory method of discussion has limitations, but it was the ideal option for this study because of the distance, security, time and funding which did not allow the investigators to travel to districts, rather having all participants in one location. More evidence is required on the needs analysis of stand-alone STI/HIV clinics to inform EPHA of the appropriate allocation of resources that may be required in introducing MC. Furthermore, a feasibility study is required on the different MMC devices to ensure appropriate measures are in place for all men to access MMC services.

Further, studies are required to estimate the cost-effectiveness of different MMC methods and the cost involved in the other HIV prevention measures especially when these are integrated during the MMC implementation period.

Conclusion

Enga's health care leaders and managers were willing and supportive of introducing MMC in the health care facilities. They acknowledged the strengths and challenges of the health system and were positive that they could initially provide MMC in some of the stand-alone STI/HIV clinics that have existing comprehensive HIV prevention packages and expand to other health care facilities according to readiness. While they are keen to provide MMC, they indicated that NDOH and NACS should take ownership of MC program and provide the regulatory and standard operational guidelines for MC service delivery.

Confirmation of the protective mechanism of dorsal slits for the HIV virus is crucial prior to MMC service implementation so men can make an informed decision on MMC when accessing the MMC clinic. Also, it is important to establish appropriate MMC devices and methods prior to implementing MMC in Enga. An EPHA needs assessment of the stand-alone health care facilities is required to provide an understanding of the basic resources available and what resources will be required to provide MMC. This will assist in managing the limited resources in the province without burdening their existing program of health care services. Finally, NDOH and NACS need to consider the regulations governing the legal and ethical aspects of client and health care workforce involved in MMC program; stakeholder involvement in policy formation; and socio-cultural implications of MMC service delivery.

Summary of Chapter Seven

This chapter reported the r Engan health care managers' views on the operational and policy issues relevant for implementing the MMC for HIV prevention. It discusses managers' attitudes, the strengths and challenges of Enga's health systems, and the relevant polices for consideration to plan and guide the MMC program. This chapter further identifies the readiness of Enga's health care facilities to provide MMC as an HIV prevention strategy and the emerging Shang Ring method for performing MMC.

Chapter Eight is the discussion chapter of the thesis. This chapter discusses and integrates the results of the four chapters. The discussion then provides the response to the overall study aims and objectives.

Chapter 8. Discussion

Does Papua New Guinea's health system have the capacity to provide medical male circumcision in high HIV prevalence settings?

Medical male circumcision is a relatively simple, quick and safe procedure when performed under aseptic conditions by a skilled health care worker with appropriate equipment and medical supplies. Such conditions do not always prevail in low and middle-income countries (LMIC) like PNG, where the health system is fragile and constantly challenged by both infectious and chronic diseases. This section of the thesis discusses the results from the four studies that investigated the capacity of the PNG health system to provide MMC in high HIV prevalence settings in PNG. The flow chart below shows a brief summary of the thesis.

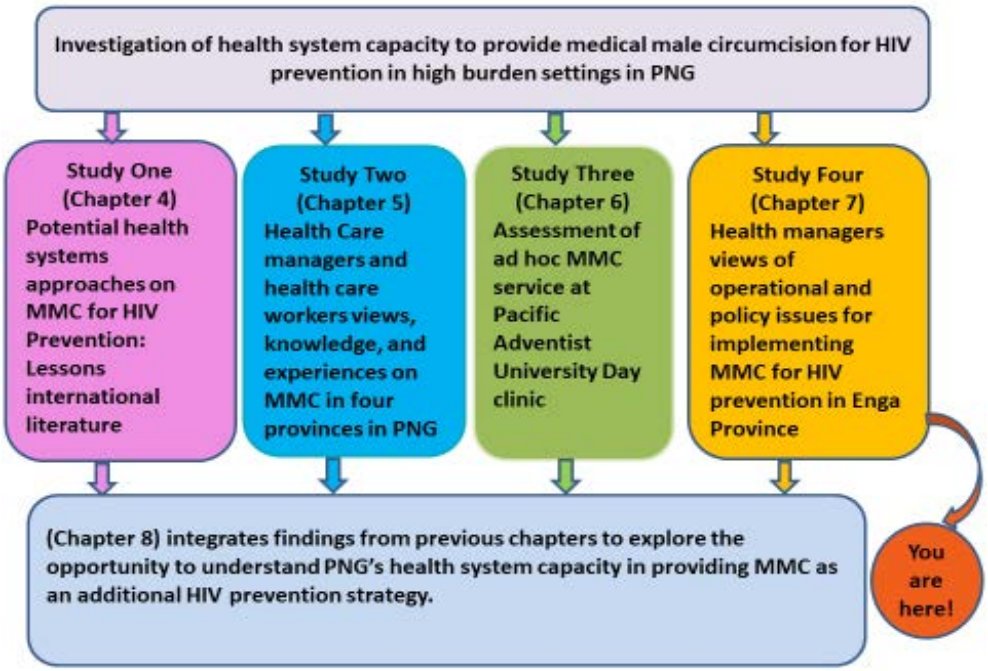

Figure 8.1 Summary flow chart of the thesis

Before I explicitly discuss the results of my four studies using the WHO Health System Building Blocks I will provide a brief summary of the key results.

Chapter Four outlined lessons from VMMC programmes from Africa for the PNG health systems. PNG needs to consider necessary and appropriate measures to strengthen the health system prior to implementing a MMC program. Key elements include: strong leadership and governance; adequate financing; effective and efficient health service delivery; adequate and skilled health care workers; adequate medicine and equipment supplies; and a proper information system.

Chapter Five demonstrated that frontline health care workers across the four study sites were performing dorsal foreskin cutting. The foreskin cuttings were performed both inside and outside of the health facilities. Health workers were willing to provide MMC with proper training and certification. Health workers required detailed information and knowledge about the role of medical MMC in HIV prevention. Health care managers were supportive of MMC provision for HIV prevention in their facilities but were concerned about the inadequate resources in terms of: workforce, finances, space and infrastructure, equipment and medicine to support the safe provision of MMC services.

Chapter Six reported findings from an evaluation an ad hoc MMC service at Pacific Adventist University Health Clinic that used the WHO MC Quality Assessment Toolkit. This study showed that the PAU clinic met most criteria of the MMC standards. However, there were challenges in human resources (addressed through a task-sharing approach); need for an information hub for male clients to access proper sexual health information; and limited follow-up care for post-surgical clients.

Chapter Seven reported findings from health care managers in Enga Province and showed their willingness and support for the integration of MMC services within existing HIV comprehensive packages provided by stand-alone STI and HIV/AIDS clinics. They recommended that the NDOH and NACS should develop policy and standard operating procedures to guide safe, high quality MMC services in Enga Province.

In this chapter, I apply a systems thinking approach to integrate my results using the WHO Health System Building Blocks (World Health Organisation, 2007a). Using this approach, I finish investigating the health system capacity and operational feasibility to provide safe MMC for HIV prevention in high prevalence regions in PNG.

Figure 8.2 World Health Organization Building Blocks (World Health Organisation, 2007a).

Overall the studies reported in this PhD have shown that MMC for HIV prevention could feasibly be implemented in high HIV prevalence settings in PNG. However, many health system challenges were identified and addressing these would improve safety and efficacy of the implementation. In the following sections I will review the findings against each building block of the health system.

8.1 World Health Organisation Health System Building Block1: Leadership and Governance

Ownership and governance of the health system is essential to the delivery of any health care program, including MMC services for HIV prevention. Policy makers in PNG must take ownership of any future MMC for HIV prevention program at the national or provincial level. There was strong support by front line HCWs to promote and implement MMC in the health care facilities. Most HCWs recommended that NDOH or PHAs should take the lead role in formally establishing a MMC for HIV prevention program in high HIV burden settings. Athough MMC for HIV prevention is not a formally established program in PNG, health care workers within the PNG health system are actively involved in traditional and contemporary foreskin cutting. This is done through both formal and informal arrangements, by HCWs working with little or no policy guidance and/or regulation.

However, the current PNG health system does not have a structure or governance model that provide the provincial health authorities with autonomy and opportunities for the development of local-level health policy and practice (Australian Government Department of Foreign Affairs and Trade, 2011). One such province is Enga in PNG's Highlands region; the location of study component four of this PhD, and a setting with among the highest burden of HIV in the country. Health care managers in Enga had divided opinion over who should

assume the responsibility for the MMC program in Enga. First and middle level- managers recommended the Enga Provincial Health Authority (EPHA) should take ownership of the program in the province. However, the top-level managers indicated that as ownership and funding is the responsibility of the NDOH and NACS, EPHA (together with its partner agencies) will only support and manage the implementation of MMC program.

NDOH taking ownership of any future MMC for HIV prevention program and planning is important to ensure national coordination while still allowing management of implementation at the provincial level. This model has been proven successful in VMMC programs in Eastern and Southern Africa, where country ownership and continual leadership translate research into national policy and programs (Dickson *et al*., 2011; Mwandi *et al*., 2011). Achievements and challenges in terms of the ownership and governance of MMC services in Africa provide relevant models for planners in PNG to note when implementing the MMC program.

Policy and standard operational guidelines are important for any health care program including an MMC program. These direct the governance, guide the management of the program and provide guidelines and procedures for the implementers of the program. While the PAU facility had no formal national written policies or standard guidelines, public health, surgical services, and nursing care guidelines were all successfully adapted. This shows that elements of PNG's health system can integrate existing guidelines and procedures to provide MMC services. The health care workers were aware of the absence of specific MMC operational guidelines but were supported and guided by public health, surgical and nursing care guidelines to provide comprehensive male circumcision services which were performed to a high standard.

MMC policy and guidelines are essential to guide the MMC program. There were conflicting views over who should develop these important documents to guide the MMC service. First level managers suggested that EPHA could develop the standard operation procedures and incorporate the MC services into programs delivered under the existing HIV policy. However, the top-level managers reported that it was up to the national level to decide whether to integrate the MMC policy with the existing HIV prevention policy or to develop a stand- alone MMC policy. Acknowledging the tension between the two views, it is important for NDOH, NACS, and PHA's to discuss the future implementation of MMC to address the high burden of HIV in the provinces.

WHO and UNAIDS state that policy formulation and approval can be difficult and time-consuming and in the presence of such constraints, health planners and workers can be guided by the existing public health and surgical policies and may develop guidelines when time permits to ensure all MMC standards are met (World Health Organization & UNAIDS, 2008). This suggests that it is a reasonable approach for PAU clinic or the health facilities in Enga to provide a MMC service till the national government formally introduces MMC into the existing comprehensive HIV package in PNG in relevant high burden settings. Perhaps a more robust approach would be for PHA to develop clear interim policy on evaluation of a pilot or demonstration scheme that would provide an overarching framework for changes in clinical practice in the province. Lessons learned from this experience would then be amenable to broader scale-up to other high-prevalence provinces in the country, and for this policy to be formally adopted nationally.

UNAIDS (2008) also recommended that countries delivering MMC programs need to formulate the laws that regulate and govern the implementation of medically performed MMC. They may also need to consider the position of professional societies and medical and nursing regulatory authorities who may have strong views on task sharing and task shifting to enable such a program to proceed to scale. For example, vasectomy is now provided by trained RNOs and CHWs in PNG and it is possible that the Shang ring device and other MMC methods could be similarly introduced in PNG.

Stakeholder involvement in policy development is vital to ensure a successful MMC program. Policy and program developers often neglect to consult significant leaders from the start of the program, particularly from the public health care program. Gaining support from leaders of broader sectors, political leaders and community leaders is part of the way forward for successful MMC programs. Experiences from across Africa demonstrate that successful VMMC programs for HIV prevention depend largely on countries' ownership of the program and partnered leadership with both donors and implementation agencies (Mwanga *et al*., 2011). Policy and program developers in PNG should involve political, government, NGO, FBO, and community leaders to participate in policy development to seek their cooperation and trust to enhance an effective MMC program.

PNG has a decentralised health system where funds are mostly controlled by the National Department of Health (NDOH) and administration and leadership of the program is provided at the provincial level (Australian Government Department of Foreign Affairs and Trade, 2011). Given the fragmented governance in administration of the health system in PNG, there must be strong and clear support and ownership of the program at both levels of government prior to implementation at the national level.

The need for developing the policy and legal guidelines was highlighted in every component of this study. The impetus was strong because of ongoing unauthorised and informal foreskin cutting. In our experience, much of this informal cutting was dorsal slits rather than MMC. Other studies in PNG have also documented unauthorised foreskin cutting conducted by unaccredited health care workers and non-health care workers (MacLaren *et al*., 2013; Tynan *et al*., 2014). These demonstrate that some health care facilities have already taken the initiative to provide MMC and as such require formal accreditation to provide MMC in the formal health care systems of PNG. It is also important that NDOH addresses the unauthorised MC services provided in health care settings for quality control of services and work towards staff accreditation processes for delivery of MMC procedures into the future.

8.2 World Health Organisation Health System Building Block 2: Financing

Financing and sustaining the MMC program is an essential element in the health system response to HIV prevention. Already PNG is financially challenged in providing basic primary health care services, let alone other HIV programs including HIV prevention programs. The need for adequate funding and support was a common theme that emerged throughout this PhD study. Facility-level managers described experiencing financial pressure just in order to maintain existing health care programs and were worried the integration of MMC service may add an additional burden to the already constrained budget.

The ad-hoc MMC program at PAU was co-funded by the university and the National Capital District health (a government body) through subsiding medicine and equipment supplies. PAU clinic used funding to hire doctors. To reduce the cost of hiring a doctor, there

is the possibility of arranging NCD doctors to perform MMC as part of their monthly routine visits to PAU clinic. However, in the long term, this arrangement may not be feasible because of the limited number of doctors in NCD and PNG (National Department of Health Papua New Guinea, 2010). One of the long-term measures is for PAU to take a task shifting approach through training male RNOs and CHWs to provide MMC services at the clinic. A task shifting approach may work for other health care facilities in PNG who may provide MMC services in the future. This may include non-operative methods, such PrePex or Shang ring as discussed in Enga study (Chapter 7).

Enga Provincial Health Authority (EPHA) indicates willing support to assist NDOH in any capacity, including the provision of financial resources to implement any future MMC for HIV prevention program. This is possible as noted by Tynan *et al.* (2011) in East Sepik Province (ESP) where formal MMC implementation has been supported by the provincial government. If MMC for HIV prevention is implemented in higher burden settings, it is important to seek funding from donor support in PNG because the MMC program may not be budgeted for in the mainstream STI and HIV programs. Seeking financial support, especially from Global Funds for AIDS, Tuberculosis and Malaria is a potential approach for MMC program. While seeking support from donor funds, it is also important to consider the impacts of such grants. As demonstrated by the literature, international funds were helpful in countries with an inability to fund projects themselves. However, they also became a major challenge in a few priority countries in Africa, where funding agencies abruptly ceased supporting the program (Katisi *et al*., 2016; Ledikwe *et al*., 2014). On this note, PNG may seek support from donors. However, it is important for NDOH or PHAs to consider re-allocation of existing funding to support MMC and other HIV programs to minimise interruption for sustainability.

The cost of a MMC service at the point of delivery can be a barrier for men in accessing safe MMC services and this needs to be considered. It is crucial that health care managers at facilities in high HIV burden settings such as Enga estimate the resources needed, develop cost plans and allocate resources for MMC without taking away resources from existing health care programs. Also, it is essential to ensure the existing resources are used as efficiently as possible and that enough resources are allocated to sustain the program in the long run. Resourcing and priority setting for HIV prevention must be informed by broader evidence that includes estimates of population impact and cost effectiveness of alternative strategies and packages of strategies. Examples of these strategies include, PrEP; HIV treatment as prevention; HIV voluntary testing and drug resistance monitoring. Enga's managers have also indicated that they can integrate the MMC program with the existing Public Health Service re-allocation of existing funds.

8.3 World Health Organisation Health System Building Block 3: Service Delivery

The essential components of service delivery are founded on strong and well planned evidence-based policies; strong governance and financial viability; well-maintained infrastructure; properly trained health care workers; and a reliable supply of medicines and technologies to provide effective and efficient care and treatment to the clients (UNAIDS, 2010). Consistent with elements of WHO's Health System Building Blocks for effective service delivery, WHO and UNAIDS advised that MMC can be provided at all levels of the health system so long as there is availability of a mini-surgery room, resuscitation equipment, existing measures for infection control and competent health workers (UNAIDS, 2008). My PhD studies show that most health care facilities met the WHO's minimum required

conditions to provide MMC. However, there are other essential elements required in service delivery.

My program of research identified several key elements that need to be considered in service delivery should MMC be implemented in high HIV prevention settings in PNG: i) regulation of foreskin cutting practices; ii) awareness and health education programs; iii) socio-cultural appropriateness of the MMC program; iv) integration of MMC with other HIV prevention measures; v) accessibility of MMC service; vi) appropriate use of MMC devices; and vii) collaboration of health care agencies for MMC implementation. Each of these will be discussed in turn below.

Regulation of foreskin cutting practices

Managing the widespread demand for MMC and the prevalence of unregulated cutting is essential for PNG's health system. MC performed by unaccredited HCWs can be unsafe, especially when performed outside health care facilities in a non-sterile environment without supervision by a medical officer or health extension officer (HEO) accredited to perform MMC (MacLaren *et al*., 2013). Blood loss and infection are common complications. Complications can occur from procedures performed both inside and outside the health care facilities. Men with remaining foreskin from previous dorsal cuts and/or penile modifications attended the PAU clinic to undergo MMC, indicating that even men with per-existing foreskin cuts may want to have the MMC procedure. This informs PNG's health authorities (provincial and national government) to regulate foreskin cutting to ensure safety for the men accessing these informal services provided at the health care facilities. It is also important for NACS and NDOH to communicate with the study team who are currently researching the protective efficacy of the dorsal slits, and consider previous studies conducted in PNG

(MacLaren *et al*., 2015 & Vallely *et al*., 2015). This will help men to make informed decisions or choices between different types of circumcision that include dorsal slit that may be easier for the CHWs and RNOs to perform.

Awareness and health education programs

Creation of awareness and dissemination of evidence-based information on MMC for HIV prevention is crucial to embed a new program for service delivery. It is important for both the health care workers and the general public in the community to be well informed about the health advantages of MC and access to the MMC service.

Awareness-raising on MMC for HIV prevention is necessary prior to implementing MMC for HIV prevention in PNG. It was recognized that much of the foreskin cutting in health care facilities were performed for reasons other than HIV prevention. Hence MMC for HIV prevention is new knowledge for both the health workers and non-health care workers. Therefore awareness campaigns are needed prior to the implementation of any future MMC programs. The need to address the lack of knowledge on MMC is supported by previous studies in KwaZulu-Natal, South Africa (Phili, 2014).

Lack of information on MMC for HIV prevention was a common theme throughout my PhD study. Participants highlighted that information and awareness about MMC for HIV prevention is needed by both HCWs and the general public, as it was a new concept in terms of HIV prevention in PNG. Specifically, men undergoing MMC surgery at PAU reported that culturally appropriate sexual health information was needed for them to be well informed about MMC as well as about STIs. The participants in the PAU evaluation suggested the formation of a male sexual health hub or information center so men could access information, care and support without discrimination and fear. This is an important recommendation

because results identified that men in the community had very little information about general sexual and reproductive health. Men with very little information about sexual health and sexual satisfaction engaged in numerous forms of foreskin cutting and penile modification, with some leading to serious complications. Foreskin cutting and penile modification (injection, insertion, and attachments) occurs across PNG (MacLaren *et al*., 2013; Tynan *et al*., 2012; Vallely *et al*., 2011).

Practically, results from this study suggested a dedicated men's health service or clinic to disseminate HIV and other sexual health information in PNG. Promoting MMC through male clinics as part of family health services and sexual health services, or establishing culturally relevant programs in individual communities such as through meeting at "Haus Man" (secluded men's meeting house/space), or churches or at schools may be important. As well as information, men can also seek care and support from these centers. A recent study about re-establishing safer MC integrated ceremonies for HIV in rural PNG shows high level of support from community leaders to have a men's community hub in the villages where safe MC can be incorporated into initiation ceremonies (Manineng *et al*., 2017).

Integration of socio-cultural practices

One of the integral parts of planning service delivery in PNG is understanding the socio-cultural background of the health workers and their clients. Incorporating culturally appropriate MMC services was a common theme that emerged throughout this PhD. Some participants were not supportive of traditional foreskin cutting because of the associated unsafe practices. However, others supported the integration of traditional foreskin cutting with MMC in health care facilities with consideration of the cost and the cultural rituals and events that are embedded in the traditional foreskin cutting process. Some people emphasised

the sacredness and taboo involved in the discussion of sex and sexuality in public areas and also raised concerns that culturally it was inappropriate for female HCWs to be involved in MMC program. Similarly, appropriate socio-cultural factors were integrated across VMMC scale-up programs in Africa to avoid barriers for men in the community to access MC services (Katisi & Daniel, 2015).

PNG has a diverse cultural background with traditional foreskin cutting across different cultures. Hence, cultural issues and knowledge about cultural taboos and practices need to be incorporated when developing polices and standards for VMMC provision. The integration of traditional knowledge and practice may create a demand for VMMC among men to achieve the desired reduction in HIV incidence in PNG. It is important that socio-cultural aspects of MMC should be integrated in PNG's MMC implementation program, because clear evidence of the need to meet sociocultural expectations has been confirmed in the three field study components and Manineng's (2017) study about re-establishing safer MC integrated ceremonies for HIV in rural PNG.

Consideration must also be given to cultures in the high prevalence provinces where foreskin cutting is not a traditional norm but where, in recent years, men engage in a range of contemporary foreskin cutting and modification practices. The reason for foreskin cutting varies between traditional and contemporary practices. For example, initiation rituals can be part of the traditional cultures, while enhancing masculinity is a reason for many men to participate in contemporary foreskin cutting practices. Even though cultures that are traditionally non-foreskin cutting may not have rituals and ceremonial significance, consideration must still be given to any sexuality related taboos when planning to integrate MMC into HIV prevention services in these areas.

The role of male circumcision in comprehensive HIV prevention

Consistent with WHO's (2012) recommendation to integrate MMC with comprehensive HIV prevention measures, health care managers and front line HCWs in my studies also suggested similar opinions about integration of MMC programs. The HIV prevention services were fragmented in health care facilities where other routine health care programs were implemented. For example, some facilities provided VCT services yet referring HIV-positive clients to other centres for treatment. However, the stand-alone STI and HIV clinics fully administered all HIV prevention measures. While integrating the MMC program, PAU clinic faced challenges in providing additional antibiotics, STI treatments, HIV testing kits, space, privacy, time, and qualified health workforce to administer the full range of HIV prevention measures together with the MMC service at any given time. This led to disruption of the routine health care services where clinics were closed for two days to provide MMC services. Consideration must be given to the optimal ways to provide MMC without interrupting routine health care services.

Experiences of integrating MMC with other HIV prevention measures at PAU's routine day clinic would vary from recommendations relevant to Enga Province on implementing MMC in the stand- alone STI and HIV/AIDS clinic. It is likely that integrating MMC into stand-alone STI and HIV/AIDS clinics in Enga may not interfere with the routine health care programs as it did in PAU's clinic. Also, the introduction of the Shang-ring device in stand-alone STI and HIV clinics may be a faster and less complex process than the surgical MMC procedure performed at PAU. Experiences of VMMC scale-up in Africa were proven to be cost-effective when integrated with other HIV prevention programs (Uthman *et al*., 2011). However, if the integration of MMC is found to be cost effective, more funding

will be required for comprehensive HIV prevention packages because of the increased demand for MMC (Uthman *et al*., 2011). More research is needed to investigate the cost-effectiveness of MMC if it is to be implemented in high HIV prevalence settings. This is needed to minimise the impact MMC will have on other routine HIV comprehensive services in the health facilities.

Accessibility of male circumcision services

Accessing health care services in rural PNG is mostly limited by difficult geographical terrain, especially where there is no road link and air transport is infrequent. Furthermore, there are challenges and barriers to accessing services in areas where the lower level health facilities have closed and there is a lack of investment in rural health facilities. (World Health Organization, 2016b). In the remote districts in Enga province, difficulty in accessing routine health care services due to an absence of a road link poses challenges for providing electricity and transporting basic medical supplies and other basic services to these locations. Apart from the difficult terrain, tribal fights among nearby tribes living in proximity to the health centre pose a further barrier to accessing health care facilities. Provision of MMC in the rural and remote districts in provinces such as Enga will be exposed to similar challenges as the existing and ongoing health care services in these settings. These issues provide challenges for the provision of MMC in such remote locations. Consideration of access to MMC services is essential when planning MMC programs. These barriers in the remote and rural periphery do not only become a health issue but a socio-economic and human rights issue that needs a sector-wide approach. Therefore, political and other government sector involvement in providing roads and bridges, maintaining law and order and many more issues need to be addressed.

Appropriate use of male circumcision devices

Special consideration should be given to the use of non-invasive and invasive MMC devices in PNG, and what is appropriate because of the various existing foreskin cutting practices. This will provide options for males who access MMC services to choose, especially those with existing dorsal slits. Service providers participating in the VMMC scale-up in Africa are successfully using three main methods to perform MMC; the surgical MMC procedure, Pre-Pex and application of the Shang Ring device (Kigozi *et al*., 2014; Tshimanga, Mangwiro, *et al*., 2016). The non-invasive devices were conveniently used by the non-surgeons, especially male registered nurses, in a task shifting approach (Barone *et al*., 2014). The Shang Ring and Pre-Pex both had minimal adverse event profiles compared to surgery and applying the devices was easy to teach and learn. Also, the wound healing time was faster than the forceps guided removal of foreskin (Kigozi *et al*., 2013; Tshimanga, Hatzold, *et al*., 2016).

During my field study in Enga (Chapter 7) it was reported that the National AIDS Council (NACS) of PNG had a pilot project on use of the Shang Ring device as a method for MMC for HIV prevention measures, and this has involved several STI and HIV/AIDS clinics in PNG including Enga's Endakalipin clinic. Experiences gained from the pilot study may assist to extend this method to other STI and HIV/AIDS clinics in Enga. There was no clarity on the policies and guidelines and the funding commitment to the Shang Ring device at the time of my study in Enga, or its suitability for men with existing dorsal slits.

Non-invasive device use in Africa has shown great potential in resource limited settings, and this might be applicable to PNG. It is important for PNG to do feasibility studies on the use of different devices before recommending the most appropriate and cost effective methods

applicable to PNG's settings, especially given the high prevalence of dorsal slit and other cuts in the population

Health agency collaboration

Implementing and delivering effective, safe and high quality MMC services depends on the cooperation of health agencies to implement the program with the leveraging of all existing health system levels in aspects of service delivery. The MMC service requires support from various local and international programs and implementing partners, Although PNG may not implement a large-scale MMC program for HIV prevention across the entire country, it is important to have program partners for the MMC service that may provide a wealth of experiences, knowledge, resources and support for MMC implementation in selected high HIV prevalence locations. Strong partnerships with international stakeholders, national and community leaders in implementing VMMC in Africa were reported to be effective (Dickson *et al*., 2011; Mwanga *et al*., 2011; Sgaier *et al*., 2014). International program partners and other stakeholders and NGOs have been partnering in other sexual health and HIV/AIDS programs in PNG (National Department of Health Papua New Guinea, 2010). We can draw similar lessons from these experiences to communicate with these organisations to become partners in the MMC program for HIV prevention.

VMMC scale-up in Africa involved cooperation between state, non-government organisation (NGO), and private health organisations through formalised joint collaboration in service delivery (Lissouba *et al*., 2010; Sgaier *et al*., 2014; Wynn *et al*., 2015). This cooperative approach could be easily adopted in PNG because of similar partnerships and existing collaborative mechanisms for other sexual and reproductive health programs. Examples such as Preventing Parent to Child Transmission of HIV (PPTCT) and vasectomy

program for family planning already exist (PNG National Department of Health, 2010; Tynan *et al*., 2014). Currently almost all health agencies in PNG are involved in some HIV programs but the feasibility of taking on VMMC activities for HIV prevention is uncertain. It is important for PNG's health system to involve all the implementing partners in the discussion of the future MMC program in PNG, especially the FBOs and the private health care agencies that provide health services in the rural enclaves where mining and agricultural companies are established.

8.4 World Health Organisation Health System Building Block 4: Human Resource

Training and retaining qualified staff to perform MMC in under-resourced health workforce settings is crucial for MMC programs for HIV prevention. Given the social and cultural preferences that MMC be conducted by men, it is vital for PNG to train and equip its limited male health care workers in high burden provinces, to provide safe, quality MMC services. Throughout my PhD study, most health care facility managers recognised the need for additional skilled and accredited health workers for MMC implementation.

Drawing on African studies, strengthening human resources has been a key priority in the implementation of VMMC services for HIV prevention (Bertrand *et al*., 2014; Curran *et al*., 2011). With the challenges of limited specialised health care workers, the VMMC scale-up program in Africa has utilised two main approaches in optimising the volume and efficiency of VMMC program. These were 'task shifting' and 'task sharing' (Bertrand *et al*., 2014).

The strategy of 'task shifting' to increase human resource capacity has been identified from Africa's VMMC scale-up as an effective measure to maximise qualified staff with some

relevance to the context in PNG (Barone *et al*., 2014; Perry *et al.,* 2014; Galukande *et al.,* 2012 & 2013; Sheldom *et al*., 2012 & Bertrand *et al*., 2014). Learning from experiences in Africa, a task shifting approach in PNG will increase the availability of qualified health care workers to perform MMC for HIV prevention. This could involve shifting the functions normally performed by the medical doctors to RNOs and CHWs in areas where medical doctors are very few, given that doctors represent only 3% of PNG's total health workforce (National Department of Health Papua New Guinea, 2010; World Health Organization & National Department of Health Papua New Guinea, 2012; Worth *et al*., 2012).

A task shifting approach will provide opportunities for the front line HCWs to be accredited to perform safe and quality MMC services, including using the non-surgical devices which are more easily applied by the RNOs and the CHWs. The task shifting approach will increase the volume of qualified and skilled RNOs who represent 30% of the front line health care workers in PNG, whilst CHWs represent 35% (National Department of Health Papua New Guinea, 2010; World Health Organization & National Department of Health Papua New Guinea, 2012; Worth *et al*., 2012). The front line health care workers (RNOs and CHWs) have been performing foreskin cuttings (although many procedures are outside formal scope of practice) both within and outside the PNG health system for many years. The task shifting role will certify and accredited them to formally conduct surgical circumcision or apply non-invasive measures for MMC for HIV prevention.

Shifting of roles may seem straight forward but consideration must be given to the training and the accreditation of the program. The training needs to be specifically conducted to ensure competency based certification and post-training skills maintenance for health care workers. Previous studies show that training provided for health care workers to perform vasectomy involved a large amount of money and placed a burden in terms of post–training

follow-up (Tynan *et al.*, 2012). This resulted in very few health workers certified to perform vasectomy, the rest were not certified because of a lack of practical supervision or transfer elsewhere and unavailable for follow-up (Tynan *et al*., 2012). Similar issues may arise if the MMC training package is not implemented and monitored well.

A task sharing approach is also seen as an effective method to maximise the limited health care workers in PNG. In a task sharing approach, specific roles are divided among the team of health care workers according to their specialties or availability (Curran *et al*., 2011). Some large-scale VMMC programs in sub-Saharan Africa have successfully trained male nurses to perform roles in VMMC provision to share roles and responsibility. Task sharing approach for organising the health workforce is utilised in other health care delivery in PNG. As evident in my PAU study (Chapter six) and the literature review (Chapter Four) Task - sharing model can also be used in PNG's MMC program because it is effective, efficient, and safe in achieving high number of MMC in less time although no privacy was maintained for patients (Bollinger *et al*., 2014; Curran *et al*., 2011; Perry *et al*., 2014; Sheldon *et al*., 2012).

Task shifting and task sharing approaches are innovative models seen as effective strategies to maximise the efficient use of the limited health workforce. Papua New Guinea (PNG) has been utilising these methods in some existing HIV prevention and other health care programs and it is important to incorporate these models in the MMC program.

Task shifting and sharing models of organising health care workers should be carefully considered and deliberately inform human resource allocation in PNG. Governments and planners of MMC initiatives in PNG need to develop training programs that are supported by regulatory and legal frameworks to perform MMC. If CHWs and RNOs

in PNG are trained to apply non-surgical devices, which are very suitable for men with no form of existing foreskin cutting, then the training need to demonstrate flexibility to also provide a service for men with existing dorsal cuttings who wish to fully remove the remaining foreskin.

Gender sensitive health care programs such as MMC require ensuring a client's privacy. This becomes more sensitive in cultures that maintain strict secrecy, such as PNG where it is culturally inappropriate for female health care workers to perform MMC surgery. (Kelly, Kupul, Nake Trumb, *et al*., 2012; MacLaren *et al*., 2013). This scenario may provide a barrier for implementation of a MMC program in PNG because a large proportion of the existing health workforce is female (National Department of Health Papua New Guinea, 2010). It is important that program developers plan how to maximise the limited number of male health workers in PNG.

Implementation of MMC for HIV prevention will require significant expansion of human resources. The training of heath care work force is in line with the national key strategy in increasing human resource in PNG's health system (National Department of Health Papua New Guinea, 2010). The extension of the health workforce may not only benefit MMC program but will benefit the delivery of other primary health care programs in the country. Performing formal MMC means an increase in services which will require a greater workforce and qualified and specialised health workers to provide counselling, anaesthetics, surgery and use of non-surgical devices, along with other specialised jobs to ensure safe MMC procedures.

8.5 World Health Organisation Health System Building Block 5: Access to Essential Medicine

Access to essential medicine and supplies is important to provide MMC for HIV prevention, especially supplies for MMC and the other related HIV prevention measures that are integrated with the MMC services. These include STI treatments, condoms, and rapid test kits for HIV testing. Low- and middle-income countries (LMIC) often have challenges in procurement, distribution and stock management, which require strengthening of inventory systems to sustain the provision of medicine and equipment supplies. In the context of a MMC service, it is important to have a functional procurement, distribution, and stock management system to maintain a steady supplies. PNG has ongoing issues in its supply chain and procurement system to provide for its existing health care programs and having to establish MMC for HIV prevention may increase the ongoing burden (National Department of Health Papua New Guinea, 2010).

My PhD study revealed that while some health care facilities have basic medicine and equipment supplies, others were challenged in the procurement and the maintenance of on-going supplies. Despite the challenges, the operational MMC service in my PAU study (Chapter Six) shows surgical MMC services were provided within their allocated resources. Additional medicines and supplies were ordered from the government medical store during the MMC clinic periods only. The clinic administration funded basic antibiotics and analgesics when government stores were out of stock. PAU's experience shows that with careful management health facilities in PNG can provide MMC with existing resources and can source medicine and equipment supplies elsewhere. It is important to perform an individual needs analysis for each health care facility in the high HIV prevalence settings to

establish what resources are required prior to implementing MMC (Edgil *et al*., 2011; Rech, Spyrelis, *et al*., 2014).

Similar to experiences in Africa (Jennings *et al.*, 2014; Byabagambi *et al*., 2015), some health care facilities in PNG had adequate supplies of medicine and equipment, and MMC related supplies while others had limited supplies or none. Those health facilities that had adequate supplies were mostly NGOs and private facilities which tend to maintain and control their supplies and logistics more efficiently than the state facilities. Establishing logistics, supply chain and procurement for VMMC program is essential for MMC implementation in PNG.

MMC program developers in PNG may incorporate the use of the Expanded WHO Recommended Commodity List in procuring and maintaining specific MMC supplies (World Health Organization, 2009a). The WHO Commodity List include stock for other HIV prevention measures such as HIV testing kits, condoms and anti-retroviral drugs (Edgil *et al*., 2011). Drawing from experience in Africa, it is essential for the program developers in PNG to provide training and upskilling of personnel to monitor and pre-order stocks using the WHO Commodity List. Apart from medicine and surgery related equipment and supplies for MMC, it is crucial for the PNG health system to incorporate infection control supplies in the commodity procurement system (Ledikwe *et al*., 2014). Already there is a constant shortage of necessary medicine and equipment supplies in many state and faith based health facilities in PNG (Australian Government Department of Foreign Affairs and Trade, 2011; National Department of Health Papua New Guinea, 2010). Given the vulnerable health system, significant investment in equipment and negotiation of supply chains is needed prior to implementing MMC services in high prevalence settings in PNG.

8.6 World Health Organisation Health System Building Block 6: Health Information Systems

Monitoring and evaluation plays an important role in any health care delivery program, including the provision of MMC services. This provides evidence-based feedback for planning and administration to improve the health care program. In the context of PNG, for my PAU study (Chapter Six) where there was no formal MMC for HIV prevention program, records were all kept in the general outpatient case register. The follow up and review notes were written in the client's personal clinic records which may not be accessible by health care workers. This poses problems where records of follow up complications and adverse events would not be easily accessible when sending routine monthly reports to the higher health authorities. It is important to have separate registers and folders for each participant that accesses MMC so evaluation of the service for further improvement is straightforward. Poor record keeping and other challenges in monitoring and evaluation of the VMMC scale-up in Africa are recorded in the literature. Drawing from experiences from across Africa, it is essential for the PNG health system to provide staff training on record keeping and reporting to improve information system for MMC programs (Byabagambi *et al*., 2015). Planners in PNG could learn from Africa's ongoing monitoring and evaluation program about MMC services to establish a viable recording and reporting process for MMC services.

PNG may be well advised to use the WHO recommended quality assessment tool for VMMC program implementation but this will require adjustment for situation and context (Dickson *et al*., 2011; World Health Organization, 2009a). The WHO Quality Assessment Tool has been utilised in my PAU study (Chapter Six), where it was modified to fit the PAU study settings. The tool could be modified further if MMC is formerly established in PNG's health system. Africa's experiences in VMMC scale-up studies suggest that PNG will

require quality information to guide evidence-based decisions on the allocation of resources or for continual support by health system leaders and funding agencies (Uthman *et al.,* 2010; Byabagambi *et al*., 2015). For example, NDOH or PHAs in the high HIV prevalence settings may require data for funding MMC programs while the ground level staff require local data for ongoing quality management of the MMC programs.

Maintaining information systems is likely to be a challenge in the rural and remote health facilities in high HIV prevalence settings in PNG. Identified challenges in monitoring and evaluation of health sector activity in rural PNG, include: inadequate communication processes; unreliable transport systems; little or no availability of computers and stationary in health care facilities; and unclear standard tools for reporting and receiving feedback in most settings (Tynan et al., 2012). In such settings it is important to find the best possible way to record and report MMC services provided. For example, health care managers in Enga Province (Chapter Seven) have established monitoring and evaluation systems in place with existing HIV and other health care programs. The integration of monitoring and evaluation of a new MMC program into the existing HIV recording and reporting system is therefore possible. However, Enga health care processes may not be easily adapted to MMC programs in the very remote geographical settings in the province where most of the challenges highlighted by Tynan *et al*., (2012) are evident. It will be important for policy makers in PNG to plan carefully to improve the response to existing challenges whether at the health facility level or at the inter-sectoral level in improving information systems.

It is important for health care planners in PNG to modify and adapt the use of the WHO's Quality Assessment Toolkit to guide the monitoring and evaluation of the MMC program. The first stage of this process has been demonstrated through the use of the tool in

my PAU study (Chapter Six). While using the WHO tool for evaluation of the program, it may also be possible to integrate the recording and reporting of MMC program with other HIV programs. Furthermore, upskilling of health workers for accurate recording and reporting is vital to collect quality information to improve MMC service delivery and to inform both the government and the stakeholders.

8.7. Study Strengths and Limitations

This study had the strength of being led by myself, as a Papua New Guinean national from Enga Province in the highlands region. I am also a senior health care practitioner, a senior lecturer, and doctoral candidate with educational experiences within the health system. In addition, I have previous experiences in conducting research as part of MMC for HIV prevention studies in PNG. Thus I fully understand the study background and the research gaps identified in the previous MMC studies.

This study provided much new information and reflections on MMC from various sources of study results, including: i) review of the published literature to draw lessons applicable for PNG; ii) relevant information from front line health care workers and all level of health care managers; iii) a satisfaction assessment of men undergoing MMC; and iv) assessing an operational MMC clinic in PNG. The approaches to data collection were culturally appropriate and rigorously applied. This study has produced considerable evidence within the scope of study but there are knowledge gaps I have identified which now need to be addressed prior to broader implementation of MMC for HIV prevention. These include:

- On a broader scale, we still need to understand the wider health service epidemiological impact, cost effectiveness, and budget impact of MMC and other HIV prevention strategies such as PREP and HIV voluntary testing in PNG.

- Also further research is needed on the protective effect of other forms of foreskin cutting that already existing in PNG's formal and informal health system. This will allow appropriate regulation with a broader menu of choices for men seeking MMC for HIV prevention.
- Furthermore, a feasibility study on the different non-surgical MMC devices and surgery is required to ensure measures are appropriate to PNG's context.

8.8 Conclusion

This study suggests that in general there is sufficient health system capacity to provide MMC at a health care facility level in high HIV prevalence settings. This study also shows high acceptability of MMC among health care workers and health care managers. However, consideration should be given to how best to strengthen the health system challenges limiting readiness to implement MMC services. While, improving and strengthening the health system it is also important that program developers consider the socio- cultural appropriateness of MMC implementation and how best to disseminate information and increase awareness.

From the evidence provided, it is important that the PNG NDOH, NACS, and PHAs in high HIV burden provinces take ownership of the MMC program to formally endorse the program and introduce it into PNG's health system. This will reduce unsafe cutting that may increase the risk of HIV and at the same time reduce the risk of transmitting HIV via the heterosexual route of transmission in high burden provinces and regions in PNG.

Having completed this large body of research, I now reflect on my PhD journey in Chapter Nine.

Chapter 9. Reflection of my PhD Journey

There is satisfaction beyond the mountain

The road to a PhD can seem like an unreachable mountain when you first begin to climb, and as you get closer to the peak, you will encounter a more challenging windy path. Rest assured there is fulfilling life beyond the mountaintop.

Figure 9.1 Satisfaction beyond the mountain

My motivation for getting a PhD was fairly straightforward. I was a senior lecturer in the School of Health Science at Pacific Adventist University (PAU), with over twenty years teaching experience. Yet, I had a nagging sense of being underqualified for my job, and a desire to prove to myself that I could rise to the intellectual challenge of a PhD. The thought became stronger when I became involved in HIV research based at PAU, undertaken collaboratively with international research partners. I found joy in the love of learning and resolving pressing scientific and social health and HIV problems for my beautiful country, Papua New Guinea (PNG). To one day achieve the highest education level and graduate with a PhD was my dream, so I could be a role model for my daughters: they would understand the importance of lifelong learning and how their new knowledge would impact the lives of family members and surrounding communities and PNG as a nation. My dream came true when I received a scholarship from James Cook University (JCU) in 2016.

Life as a PhD candidate was not as easy as I expected when leaving my family, tribe, and the shores of PNG in 2016. I only came to realise upon my enrolment at the student

admissions office, that the PhD journey was a long road with numerous milestones to achieve along the way. There were no short cuts on this journey; the process was guided by strict signposts. I had to complete one phase to achieve the next. At the same time, I realised that I was competing against the timeframes set by the university and my scholarship conditions.

PhD life was like a roller coaster ride, it brought mixed emotions of uncertainty, confusion, stress, anxiety, frustration, sadness, fun, excitement and laughter in the span of four years. I hope that my experience does not scare anybody away, rather encourage individual who embark on this journey.

As I began my PhD journey, I was a bit naive and unrealistic during the early phase. I thought I would be able to plough through relatively quickly. I did not give sufficient account of the impact that certain factors would have upon my PhD journey, with the dominant ones being:

Family-life balance - balancing the competing demands of my family commitments with the PhD timeline was extremely difficult at times and resulted in long weeks and months away from my PhD studies.

Cultural obligations - as a daughter to a clan and a tribe and a mother/wife to another clan and tribe, I was culturally obligated to participate in important ceremonies back in the village in PNG.

Learning new methodologies in the research process - each new idea learnt was important to every milestone I had to achieve. Reading and grasping the ideas took time and was challenging.

Field study in my home country and the ethics process - studying in Australia and conducting research in PNG required total commitment and follow-up for the ethics and other processes to be finalised prior to conducting fieldwork.

Financial situation – being awarded a scholarship was beneficial for me at the initial phase of the study. However, it was a dilemma when my scholarship ended before my candidature and I needed to become self-supported.

Impact of COVID-19 - the initial COVID-19 lock-down phase in Australia affected my mental, social, and physical status. To be apart from family members in PNG was an experience I will never forget, and closure of my university limited access to my work station. I was unable to attend church services and unable to catch public transport to go to shops because the fear of catching the virus was unbearable

Although I had challenges as per highlighted, I also had joyous moments with great support network to complete my PhD study.

My first year was more than an orientation into the PhD life. I learnt that my enrolment to the University did not mean I was already a PhD candidate. I had to prove to the JCU Graduate Research School I was capable of undertaking doctoral research for the next four years. To reach the point of confirmation of my candidature, I had to provide a substantial piece of writing and attend professional development classes to learn more about research methods and the research process. It took me almost a year for my PhD candidature confirmation. Doing the literature review was a pain in the neck - literally, but it was worth

having the pain and the experience because my research topic would be incomplete without having background information and support from other publications.

Before I knew it, I was in my second year of candidature. At this time, I had a better handle on things in terms of what I was doing, and was meant to be doing, with regards to my research topic. My second year went faster than the first, bringing its own challenges. Even though my formal learning was taught in English, I realised that academic writing was not as easy as I thought. I had sleepless nights working on my manuscripts to make sure they made sense in the academic world. Conducting research in my own country was another challenge I encountered. There were delays in ethics approval. Numerous emails and constant phone calls were made to check on progress; I was wishing I was in PNG to physically monitor the application progress, especially when I had to seek clearance for my study from four different ethics boards.

Also in the second year, I received an emergency call from PNG, stating that my husband (Arnold) was involved in a near-fatal car accident. I returned to Port Moresby to attend to my husband's health care needs. Arnold was on high dependency care when I arrived. My stress level was high when I saw him. Two things came in my mind: he was either going to lose his life or, if he was to recover, it was going to be a slow process. To me and my children's joy, my husband survived but as anticipated, he stayed in the hospital for almost three months. Whilst taking care of him at the bedside, I brought my laptop and was working around the clock to keep up with my study so I could progress with whatever milestone I was to accomplish at that time. For the next three months after Arnold was discharged from hospital, I was nursing him at home. Trying to cope with my study and

nursing a dependent husband over these six months was very difficult. It was with relief that my husband fully recovered and I was able to return to Australia.

Towards the end of 2018, I had to go to PNG to collect my data and to be around for my daughter Bianca's wedding preparation. The night before leaving for PNG, I received a call from PNG that one of my younger sisters Julie Koiya Pelen passed-on and this was three weeks before Bianca's wedding. Straight after the burial of my late sister, my mother in-law died, a week before Bianca's wedding. Weddings and funerals are two big events with cultural obligations to fulfil in my society. These experiences were unbearable, I was physically, mentally and financially over stressed. Communication in such time is important. I informed my study advisors of the incidents that were happening during my fieldwork.

In the middle of 2019, I took a leave of absence to coordinate the collaborative research study funded by National Health and Medical Research Commission (NHMRC) of Australia with James Cook University, University of New South Wales and Pacific Adventist University. I was the PNG coordinator and a co-investigator when this study was initially planned, prior to my PhD study. Around this time, a bundle of joy changed my world of motherhood into that of a grandmother. My first grandchild Benicia Hadassah Tiehl Paki was born on the 8th of October 2019, which was 10 days prior to my birthday. That was indeed the most beautiful and priceless fiftieth birthday gift I have ever received.

I was back at JCU campus to complete my thesis write up in 2020. Just a month into my study progress, I received sad news that my father in-law passed on. I travelled back to PNG to show my final respect for my late papa. My stipend scholarship for three and half years ended in late 2019 and had financial challenges in 2020. However, with God's

providence, I received support from various organisations and individuals for the remainder of my candidature. Having a financial backup plan is an important element to consider, especially if you are an international student.

During this final phase of my candidature, the deadly infectious COVID-19 greatly impacted my study progress. In accordance with the Australian government health directives, the University shut down for some months and I could not access my postgraduate workstation. Furthermore, I was living in Australia without my family. When travel restrictions were due to be enforced, I needed to make a decision within 24 hours to stay in Australia or return to PNG before the international borders closed. I decided to stay in Australia because I was in the final stage of write-up. I knew if I returned to PNG the circumstances would be so complex that I would not be able to complete my thesis in a timely manner. Although I continued my write up, the uncertainty and pressures of being away from my family, and potential harm of COVID-19 on my family and community, distorted my ability to concentrate on my writing.

It was a nice feeling when I successfully presented my pre-completion seminar. However, my excitement had to come to a stop as I knew I must submit my thesis after six months of the pre-completion milestone. More work was on my plate, more sleepless nights, a painful neck and headache until I completed the thesis.

Addressing challenges

I did not allow the obstacles to drown me because I knew I came for a purpose, and that was to work hard and return home with the award of the Doctor of Philosophy. I guess, I

had an intrinsic motivating factor that consistently drove me to push from within. I always reminded myself that I would survive the challenges.

Support and guidance

I would say the most important factor in surviving and thriving in my PhD journey was having great support networks and guidance. Advisors became my strength, they became my family away from home. I developed a trusting relationship with them. I could openly discuss my personal, family, financial and academic issues and challenges with them. I recommend students to find supportive advisors at the beginning of their study.

There were ongoing sessions on research methods, process, and skills in academic writing that were offered by university. It is important to register in these classes because they provide much needed knowledge and skills to guide your PhD program. Peers and colleagues who are also undertaking PhD studies are a great social network, they are able to offer support from sharing useful research tips to offering assurance when needed.

Staying connected with my home university was great. As a staff member, they provided advice and support whenever it was needed, including ethics follow up, financial and family support.

Do what works for you

I am a night person; my mind is alert and is shaper at night than in the morning. I find it quieter with fewer disturbances at night. Meetings with my advisors were normally conducted just before lunch or in the afternoons.

Preparing for life beyond the PhD

The process I followed to complete my PhD was a learning curve that has prepared me for a life after the PhD. Apart from preparing me to be an independent researcher, the PhD also provided a bigger picture of working as a team. Research and publications are not something you work in isolation but it is collectively achieve.

On a brighter picture, the PhD journey provided me with project management skills. I have learnt how to plan, organize, work within strict timelines, to delegate, and to maintain effective communication skills. I have also learnt ways to mentor future postgraduate students by reflecting skills learnt from my great advisors.

The completion of my PhD does not mean that I know it all. However, the experience has equipped me to better navigate the challenges and opportunities that await me beyond the mountain. I have learnt and grown during this time and I walk away prepared as a naïve independent researcher knowing that my support networks of experienced researchers are together in my next chapter in life. Every path I have taken has led to my learning and brought to me where I will be tomorrow. I am glad I chose to undertake the challenge of pursuing a Philosophical degree. This PhD journey has made me more resilient and determined. I have also come to realise that I started my PhD journey with a small topic that expanded in four years. Putting these ideas into a thesis is an achievement in itself and evidence of my PhD journey from 2016-2020.

From my PhD study reflection, I have provided a summary of general study tips for women in PNG and the Pacific who wish to pursue a PhD study abroad.

Tips for women from Papua New Guinea and the Pacific Island Countries considering a PhD journey:

- Be prepared to remove your position, status, or roles you have in your home country and get ready to fit into the student shoes.
- Prior research experience (Masters by Research; Honours; Certificate in Research Methods; or at least involvement in research projects in your home country) to get oriented in the research process.
- Choose a topic that you love and that is of current or ongoing concern in your country or around the globe.
- Focus on your study from the beginning to the end. Avoid distraction if possible.
- Secure funding for scholarship and have a financial backup plan.
- Know about processes and contact details of your local ethics committees prior to embarking on overseas studies.
- Work within the candidature and scholarship timeframe.
- Attend all support sessions offered to guide you in your research journey.
- Have trusted advisors and develop a well and mutual relationship based on this trust.
- Communicate progress with the advisors, including your personal and family dilemmas if possible.
- Set time to communicate with your family.
- Set time for your daily exercises and choose healthy food.
- Interact with your peers, colleagues or your country folk and don't work in isolation. Create a circle of friends and family.
- No procrastination
- Trust in God that together, you will complete the PhD

Figure 9.2 Tips for women students from PICTs

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Appendices

Appendix A: Health service providers survey – Parts 1 and 2

Acceptability of Male Circumcision for HIV Prevention in PNG Study

A Joint JCU, PAU, DWU Study 2010-2012: NHMRC Project Grant 601003

Is male circumcision an acceptable and feasible intervention to reduce HIV transmission in Papua New Guinea?

HEALTH SERVICE PROVIDERS SURVEY

PART 1

TO BE COMPLETED BY HEALTH PRACTITIONERS

This study is being carried out to assess of the acceptability and feasibility of male circumcision as an intervention to reduce HIV transmission in 4 sites in Papua New Guinea. This section of the study aims to document the knowledge and experience of male circumcision of health practitioners. It also aims to document the capacity of the health services to perform male circumcision in 4 sites in Papua New Guinea. Therefore we would like to learn of your experiences with male circumcision (if any) and your opinions about providing male circumcision at health facilities. Please answer the questions as truthfully as possible. Your name is not recorded on this survey and you will not be referred to personally when reporting the results. You are free to refuse to answer any questions but we would appreciate your giving us truthful answers to the questions you do answer.

Part 1 of thus Survey asks questions about your knowledge and experience of male circumcision. Part 1 is for all health care practitioners in the health facility to complete. Part 2 of this Survey asks questions about the infrastructure and equipment at this health care facility. It is on a separate form and will be given to the Officer in Charge of this health care facility to complete.

The questions in this survey are based on Service Availability Questionnaire published in *Male Circumcision Situation Analysis Toolkit* WHO (2009)

Survey Number ☐

Part 1: Health Practitioner Survey

Province: _____District: _____

Name of Health Care Facility: _____Date: _____

Type of facility (hospital, health centre, sub health centre, day clinic, aidpost, private clinic, etc.)

_____

Your Gender: Male_____ Female_____

1. What is your health profession? (please circle)
    a. Medical officer
    b. Health Extension Officer
    c. Nurse
    d. Community Health Worker
    e. Other (Specify) _____

2. What is your specialty, if any?_____

3. How long have you been practising (medicine/nursing/community health care)?_____

4. How long have you been working at this facility?_____

5. What type of organization do you work for? (please circle)
    a. Government
    b. Church-based
    c. Private
    d. Other (specify)_____

6. Have you ever performed a surgery on a male foreskin, (including circumcision, slit of foreskin etc)?
    Yes_____ No_____

7. If 'Yes', how many times have you ever performed surgery on a male foreskin (including circumcision, slit etc)?_____ ____ (total)

8. In the last 12 months, have you performed any surgery on male foreskin (including circumcision, slit etc)?
    Yes_____ No_____
    a. If 'Yes', how many surgeries have you performed? _____
    b. How many of these were performed at this health facility? _____
    c. What styles of circumcision have you performed (list the different styles)_____
    _____
    _____

9. Have you ever performed other roles relating to surgery to the foreskin (circumcision, slit etc)?

Yes_____ No_____

Please circle your role/roles.

a. Assisting the clinician during the procedure b. Patient screening

c. Preoperative or postoperative preparation and care d. Counselling

e. Other: _____ (Specify): _____

10. How many surgeries to the foreskin have you ever assisted in? _____ (total)

11. In the last 12 months, have you assisted in any male circumcision, foreskin slits etc?

Yes_____ No_____

a. How many male circumcision or slits have you assisted in the last 12 months? _____

b. How many of these were performed at this health facility? _____

c. What styles of circumcision were you performed (list te different styles) _____

_____

12. What were the reasons the foreskin surgery (circumcisions, slits etc) were performed **inside this health facility**

a. Medical indications _____Number in past 12 months_____

b. Religious practice _____ Number in past 12 months _____

c. Cultural practice _____ Number in past 12 months _____

d. Patient preference _____Number in past 12 months _____

e. Other reasons (Specify) _____Number in past 12 months _____

f. Unknown _____ Number in past 12 months _____

13. In the last 12 months, have you performed male circumcision or foreskin slits **outside this health facility**? Yes_____ No_____

14. (i) If 'Yes', where did you perform the male circumcisions or foreskin slit?

a. In another health facility

b. In a private clinic

c. In a village

d. Other (Specify): _____

(ii) If Yes, what style of circumcision or slit did you perform? (list number of each style in the last 12 months)

a. full circumcision (round cut) _____Number in last 12 months_____

b. dorsal slit (straight cut)_____ Number in last 12 months_____

c. Other style/s (specify) _____Number in last 12 months_____

15. What were the reasons foreskin surgery (male circumcision, slits etc) were performed **outside this health facility**?

a. Medical indications _____Number in past 12 months_____
b. Religious practice _____ Number in past 12 months _____
c. Cultural practice _____ Number in past 12 months _____
d. Patient preference _____Number in past 12 months _____
e. Other reasons (Specify) _____Number in past 12 months _____
f. Unknown _____ Number in past 12 months _____

16. What were the ages of the males you circumcised/slit foreskin?

a. Infant (0–<1 year) _____Number in last 12 months_____
b. Child (1–9 years) _____Number in last 12 months_____
c. Adolescent (10–17 years) _____Number in last 12 months_____
d. Adult (>18 years) _____Number in last 12 months_____

17. How much money does it cost for a male circumcision/slit foreskin?

In a Public health facility_____
In a Private health facility _____
Outside a health facility_____

18. What additional costs might apply for men undergoing male circumcision – please give details?

a. antibiotic _____Cost_____
b. dressing_____Cost _____
c. return visits_____Cost_____
d other (please give details) _____Cost _____t

19. What training have you received to perform male circumcisions/slit foreskin? (state where you received training and the type of training eg at medical school, while assisting surgeon, from traditional doctor/healer in village etc)

_____
_____
_____
_____

20. If you were to be asked to perform / assist in male circumcisions, would you need additional training?

Yes_____ No_____

21. If 'Yes', what training do you think you should receive? (circle more than one of appropriate)

a. Theoretical (e.g. lectures or reading about male circumcision)
b. Practical clinical training (i.e. performing male circumcision)
c. STI diagnosis and treatment
d. Infection prevention
e. Counselling
f. Comprehensive (all of the above)
g. Other (please specify)_____

22. In your opinion, does male circumcision provide health benefits for men?

a.Yes
b. No
c. Makes no difference

23. Do you agree with the following statements? (Circle the appropriate answer)

a. Male circumcision helps to improve hygiene	Yes / No / Don't know
b. Male circumcision reduces risk of STI	Yes / No / Don't know
c. Male circumcision reduces risk of HIV infection	Yes / No / Don't know
d. Male circumcision prevents HIV infection entirely	Yes / No / Don't know
e. Male circumcision increases risk of HIV	Yes / No / Don't know
f. Male circumcision reduces risk of penile cancer	Yes / No / Don't know
g. Male circumcision increases sexual pleasure	Yes / No / Don't know
h. Male circumcision reduces sexual pleasure	Yes / No / Don't know
i. Men who are circumcised are more promiscuous	Yes / No / Don't know
j. Women prefer men who are circumcised	Yes / No / Don't know

24. Have you seen surgery to the foreskin (including circumcision, slit etc) performed **inside a health facility** that resulted in complications or adverse events? Yes_____ No_____

How many of these complication have you ever seen from circumcision **performed inside a health facility**?

a. Excessive bleeding_____Number _____
b. Infection_____Number _____
c. Disfigurement_____Number _____
d. Impotence_____Number _____
e. Other (Explain)_____Number _____

25. Have you seen surgery to the foreskin (including circumcision, slit etc) performed **outside a health facility** that resulted in a complication or adverse event? Yes_____ No_____

How many of these complications have you ever seen from circumcision **performed outside a health facility**?

a. Excessive bleeding_____Number _____
b. Infection_____Number _____
c. Disfigurement_____Number _____
d. Impotence_____Number _____
e. Other (Explain)_____Number _____

26. In your opinion, who should be permitted to perform male circumcisions? Circle the appropriate number on your level of agreement

Health Professional	**strongly agree**	**agree**	**neither agree nor disagree**	**disagree**	**strongly disagree**
Male Doctor	**1**	**2**	**3**	**4**	**5**
Female Doctor	**1**	**2**	**3**	**4**	**5**
Male Health Extension Officer	**1**	**2**	**3**	**4**	**5**
Female Health Extension Officer	**1**	**2**	**3**	**4**	**5**
Male Nurse	**1**	**2**	**3**	**4**	**5**
Female Nurse	**1**	**2**	**3**	**4**	**5**
Male Community Health Worker	**1**	**2**	**3**	**4**	**5**
Female Community Health Worker	**1**	**2**	**3**	**4**	**5**
Traditional or Religious circumciser	**1**	**2**	**3**	**4**	**5**
Other (specify)_____	**1**	**2**	**3**	**4**	**5**

27. In your opinion, what is the best age for male circumcision to take place?

a. Infants (0–<1 year)
b. Children (1–9 years)
c. Adolescents (10–16 years)
d. Young men (17–24 years)
e. All ages _____
f. What are your reasons for choosing the age group/s above? _____
_____
_____

28. In your opinion, should health facilities in this district/catchment promote male circumcision services?

_____
_____
_____

29. In your opinion, what would be the major difficulties or challenges in providing male circumcision to a large number of males in this district/catchment ?

a. _____

b. _____

c. _____

30. If male circumcision were promoted in this district/catchment, would you be willing to offer male circumcision services? Yes_____ No_____

31. Do you have anything else that you would like to say about male circumcision or the provision of male circumcision services?

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

THANK YOU FOR COMPLETING THIS QUESTIONNAIRE

Acceptability of Male Circumcision for HIV Prevention in PNG Study

A Joint JCU, PAU, DWU Study 2010-2012: NHMRC Project Grant 601003

Is male circumcision an acceptable and feasible intervention to reduce HIV transmission in Papua New Guinea?

HEALTH SERVICE PROVIDERS SURVEY

PART 2

TO BE COMPLETED BY OFFICER IN CHARGE OF HEALTH FACILITY

This study is being carried out to assess of the acceptability and feasibility of male circumcision as an intervention to reduce HIV transmission in 4 sites in Papua New Guinea. This section of the study aims to document the knowledge and experience of male circumcision of health practitioners. It also aims to document the capacity of the health services to perform male circumcision in 4 sites in Papua New Guinea. Therefore we would like to learn of your experiences with male circumcision (if any) and your opinions about providing male circumcision at health facilities. Please answer the questions as truthfully as possible. Your name is not recorded on this survey and you will not be referred to personally when reporting the results. You are free to refuse to answer any questions but we would appreciate your giving us truthful answers to the questions you do answer.

This is Part 2 of this Survey and asks questions about the infrastructure and equipment at this health care facility and is for the Officer in Charge of the facility. Part 1 of this Survey asks questions for health professionals about knowledge and experience of male circumcision and is on a separate form.

Please note: The questions in this survey are based on Service Availability Questionnaire published in *Male Circumcision Situation Analysis Toolkit* WHO (2009)

Survey Number ☐

Part 2: Health Facility Survey

Name of facility:_____ Date:_____

Province: _____District:_____

Type of Facility (hospital, health centre, sub health centre, day clinic, aidpost, private clinic etc.)

_____

Position at health Facility (CEO, officer in charge etc.) _____

1. What is the approximate catchment population served by this facility?_____

2. What is the average number of patients per day?

   a. Inpatient _____

   b. Outpatient _____

3. What are the religious and ethnic backgrounds of the clients served by this facility?

List religious and ethnic groups and the approximate number of clients from each group per day.

Religion

a._____ _____ Number per day _____

b. _____ _____ Number per day _____

c. _____ _____ Number per day _____

d. _____ _____ Number per day _____

e. _____ _____ Number per day _____

f. _____ _____ Number per day _____

Ethnic Group

a._____ _____ Number per day _____

b. _____ _____ Number per day _____

c. _____ _____ Number per day _____

d. _____ _____ Number per day _____

e. _____ _____ Number per day _____

f. _____ _____ Number per day _____

4. How many of the following medical personnel work at this facility?

   a. Doctors: Male_____ Female_____

   b. Health Extension Officers Male_____ Female_____

   c. Nurses: Male_____ Female_____

   d. Community Health Workers: Male_____ Female_____

   e. Other clinical staff (specify):_____ Male_____ Female_____

5. Does this facility have basic surgical facilities?

   a. Surgical theatre(s): Yes_____ No_____

   b. Outpatient minor surgical / procedure room(s): Yes_____ No_____

   c. Functioning surgical and emergency equipment: Yes_____ No_____

6. Does this facility have reliable electrical power? Yes_____ No_____

Indicate the source

a. Connected to mains power_____

b. Generator_____

c. Solar power

c. Other (specify)_____

7. Does this facility have an adequate water supply? Yes_____ No_____

Indicate the source or sources.

a. Running water from city supply_____

b. Running water from a village supply _____

c. Other (specify)_____

8. Does this facility offer services for individuals with sexually transmitted infections?

Yes_____ No_____

a. Is there a dedicated STI service (i.e. STI clinic)? Yes_____ No_____

b. Are STI services integrated (e.g. in outpatient services)? Yes_____ No_____

9. Does this facility offer counselling and testing for HIV? Yes_____ No_____

a. Is there a dedicated counselling and testing service (i.e. VCT clinic)? Yes_____ No_____

10. Does this facility offer family planning counselling and services? Yes_____ No_____

11. Does this facility have sterilizing equipment in working order?

a. Autoclave: Yes_____ No_____ Number_____

b. Pressure cooker: Yes_____ No_____ Number_____

c. Other means: Yes_____ No_____ Number_____

12. Does this facility have adequate supplies for basic infection prevention?

a. Chlorine or other appropriate decontaminant: Yes_____ No_____

b. Gloves (surgical, examination, for cleaning staff): Yes_____ No_____

c. Waste disposal (sharps boxes, contaminated waste containers, etc.):

Yes_____ No_____

13. In the past 12 months, were the following routinely carried out at this facility?

If 'Yes', how many?

a. Caesarean section: Yes_____ No_____ Number_____

b. Minor surgeries, e.g. surgical wound repair Yes_____ No_____ Number_____

c. Vasectomy or tubal ligation: Yes_____ No_____ Number_____

14. Does this facility carry out HIV testing? Yes_____ No_____

a. If yes how many tests during the last 12 months?_____

15. Does this facility provide condoms? Yes_____ No_____

a.if yes, how many condoms were distributed in the last 12 months?_____

16. Does this health care facility perform male circumcision? Yes_____ No_____

If 'Yes' go to Question 17

If 'No' to Question 24

17. How many male circumcisions were performed in the last 12 months?_____

18. How many male circumcisions were performed on each of the following groups over the same 12-month period?

a. Infant (0–<1 year)_____Number in last 12 months_____

b. Child (1–9 years)_____ Number in last 12 months _____

c. Adolescent (10–17 years)_____ Number in last 12 months _____

d. Adult (>18 years and over)_____ Number in last 12 months _____

19. Indicate the approximate number of male circumcisions done for the following reasons in the last 12 months.

a. Medical indications_____ Number in last 12 months _____

b. Religious practice_____ Number in last 12 months _____

c. Cultural practice_____ Number in last 12 months _____

d. Personal preference_____Number in last 12 months _____

e. Other reasons (specify) _____Number in last 12 months _____

f. Unknown_____ Number in last 12 months _____

20. What type of counselling do male circumcision patients routinely receive as part of the procedure?

a. Pre-procedure counselling about the male circumcision procedure:

Yes_____ No_____

b. Pre-procedure counselling about risks and benefits of male circumcision:

Yes_____ No_____

c. Counselling about HIV and STI prevention: Yes_____ No_____

d. Post-procedure counselling about postoperative care: Yes_____ No_____

e. Post-procedure counselling about HIV risk reduction: Yes_____ No_____

f. Post-procedure counselling about resumption of sexual activity:

Yes_____ No_____

g. Counselling about other male reproductive health topics: Yes_____ No_____

(Specify) _____

21. Who provides this counselling (circle more than one answer possible)?

a. The clinician performing the male circumcision: _____

b. A nurse or other worker assisting in the procedure: _____

c. A counsellor: _____ _____

d. Other: _____ (Specify) _____

22. What is the normal cost for male circumcision at this facility?

a. Infant male circumcision:_____

b. Child male circumcision:_____

c. Adolescent male circumcision:_____

d. Adult male circumcision:_____

23. What additional costs might apply for men undergoing male circumcision – please give details

a. antibiotic _____Cost_____

b. dressing_____Cost _____

c. return visits_____Cost_____

d other (p lease give details) _____Cost

_____t_____

24. If male circumcision were to be promoted in this area, in your opinion could this facility provide male circumcision services? Yes_____ No_____ Uncertain____

Please explain answer:_____

_____

25. What might the facility need in order to introduce or increase the number of male circumcisions?

a. Equipment and instruments, eg surgical tables or operating instruments?

Yes_____ No_____(explain your answer) _____

b. Medications

Yes_____ No_____(explain your answer)_____

c. Disposable equipment and supplies (e.g. anaesthetics, sutures, gloves, syringes/needles)?

Yes_____ No_____ (explain your answer)_____

d. Extra surgical/procedure room to perform the surgery? Yes_____ No_____

e. Staff training?

Yes_____ No_____ (what type of staff and type of training): _____

f. Which type of staff is currently authorized to perform male circumcision? (Dr, HEO, Nurseetc)

_____

h. What else would be needed? _____

26. Do you have anything else that you would like to say about male circumcision or the provision of male circumcision services?

_____

_____

_____

THANK YOU FOR COMPLETING THIS SURVEY

Appendix B: Observation and inventory checklists for PAU MC service

Observation checklist for PAU MC service

Item	Yes	No	Comments
Clinic building is safe			
Spacious with minor surgery room			
Privacy for MC counselling and surgery			
Clean & tidy			
Electricity			
Running water			
Sinks and hand wash dispensers			
Toilet/bathroom			
Sealed container for sharps			
Disinfection for cleaning and sterilisation			
Safe waste removal measure			
MC surgery equipment's			
MC related medications			
Adequate health care staff			
Availability of all HIV prevention comprehensive package			
Availability of documents related to MC standards and procedures			
Minimal interruption with routine clinic			

Audit of the equipment and medicine supplies as per WHO toolkit inventory document.

This audit was carried out using the WHO inventory checklist by WHO for male circumcision.

Brief Assessment of PAU Clinic in preparation for MC by NHMRC Study 2018

Equipment and Items	In stock	Number of item required	A tick mark is placed for items to be ordered either through state area medical store or NHMRC study project
Sterile gloves (size 7,7 ½, 8, 8 ½)			
Examination gloves			
Utility gloves			
Surgical masks			
Surgical caps			
Disposable aprons			
Betadine/iodine bottles			
Gentian violet			
Gauze rolls			
Cotton rolls			
Petroleum jelly impregnated gauze			
Adhesive plaster roll			
Gauze bandage			
Crepe bandage			
3.0 chromic catgut absorbent			
Vicryl 3-0 and 4-0			
3/8 circle reverse – cutting needle			
Taper 4/8 circle needles			
Normal saline bottles/bags			
30 gauge needles			
27 gauge needles			
21 gauge needles			
18 gauge needles			
10- ml syringe			
5 – ml syringe			
2 –ml syringe			
Safety pins			
Instrument trays			
Drapes with 5 cm hole			
Drapes to cover trays			
Galipot for antiseptic solution			
Kidney dishes			

15 ml 1% plain lidocaine (without adrenaline) anesthetic solution or Marcaine			
Curve scissors			
Straight scissors			
Needle holders			
Blade holders			
Scalpel blades			
Straight forceps			
Curve artery forceps			
Toothed forceps			
Non toothed forceps			
Sponge holding forceps			
Retractors			
Towel clips			
Bedsheets to cover patients			
STI treatments			
Reagents for rapid HIV testing			
Adult emergency supplies checklist			
Equipment and items	**In stock**	**Number of item required**	**A tick mark is placed for items to be ordered either through area medical store or NHMRC study project**
Pocket mask with one-way valve			
Ambu bag with valve and mask			
Oxygen mask			
Assorted adult airways			
Suction machine			
Tongue depressors			
Atropine 0.6 mg/ml ampoule			
Adrenaline (1 in 1000 solution, 1 mg in 1 ml ampoule.			
Rectal diazepam 10 mg in 2.5 ml suppositories.			
50% dextrose			
Hydrocortisone 100 mg			
Aminophylline			
Intravenous saline			
Intravenous cannulas size 16, 18 & 22, 24 & 26.			
Tourniquets			
Alcohol swabs			
Adhesive tape			
Sterile water for injection			

Appendix C: Interview guide for PAU MC service assessment

Interview guide for assessing PAU Male circumcision service using WHO Quality Assessment Toolkit checklist

Standard 1. An effective management system is established to oversee the provision of male circumcision services

1. Are there general health policies available on confidentiality, privacy and informed consent?

2. Do staff know the policies on confidentiality, privacy and informed consent?

3. Do clients know the policies on confidentiality, privacy and informed consent?

4. Are there job descriptions for staff delivering male circumcision services?

5. Do staff know their expected roles and responsibilities?

6. Are staff evaluated at least annually?

7. Is continuous supervisory support provided?

8. Are staff available to meet the needs for: i) counselling clients; ii) performing surgery; iii) Infection control; iv) supply management; v) record-keeping.

9. Is there a process for scheduling appointments?

10. Is there a process for planning the effective use of operating rooms?

11. Are efforts being made in communities to support the provision of male circumcision services?

12. Have particular efforts been made to help young men overcome barriers to receiving the service?

13. Has a reasonable fee been set for the service?

14. Are efforts made to overcome myths and misconceptions that act as barriers to accessing services?

15. Are efforts made to schedule service hours in response to the needs of the majority of men in the community?

16. Does the facility have a system to receive and address client feedback?

17. Does the quality improvement team meet regularly?

18. Does the quality improvement team meet regularly?

19. Does the team review quality and safety information and implement actions to improve the service?

Standard 2. A minimum package of male circumcision services is provided.

1. Are HIV voluntary testing and counselling services (VCT) available on site?
2. Are up-to-date HIV testing and counselling guidelines available?
3. Are HIVAIDS testing and counselling provided according to the guidelines?
4. Are all clients routinely offered HIV testing?
5. Are HIV testing services routinely offered to clients' partners and to parents bringing in their children?
6. Is there a laboratory quality control process?
7. Is syndromic management of STIs provided on site?
8. Are STI syndromic management guidelines/protocols available?
9. Is treatment provided to patients with STIs according to guidelines?
10. Is individual risk reduction and safer sex counselling provided on site?
11. Are risk reduction and safer sex counselling guidelines available?
12. Are risk reduction and safer sex counselling provided according to the guidelines?
13. Are male condoms readily available in the facilities?
14. Are female condoms readily available in the facilities?
15. Are male and female condoms promoted and provided to all sexually active clients during consultations?
16. Does the facility organize the services to ensure that client flow through the clinic is smooth and that clients can easily access all minimum package services?
17. Are all MC staff aware of the components of the minimum package and do they know where to direct clients to access the different services?
18. Are all opportunities used at every MC service delivery point to promote and check if other parts of the minimum package have been delivered?

Standard 3. The facility has the necessary medicine, supplies, equipment and environment for providing safe circumcision services of good quality

1. Are emergency resuscitation guidelines and protocols readily available in the operating rooms (ORs)?
2. Are emergency resuscitation equipment/supplies and medicines easily accessible?
3. Is there a system for checking and maintaining the emergency resuscitation supplies/equipment and medicines?
4. Are there sinks, running water and non-reusable towels available for staff to wash hands in all consulting rooms?
5. Are clean non-reusable towels and soap available for washing hands after use of the toilet?
6. Are plastic goggles, aprons (or gowns) and non-sterile and sterile gloves available?
7. Are non-penetrable containers for disposing of sharps available and no more than two-thirds full?
8. Are medical waste containers available, labelled and with lids?

9. Are the essential medicines available for post-exposure prophylaxis (PEP)?
10. Does the waiting room have adequate ventilation and sufficient lighting, space and seating?
11. Do the consultation /examination and HIV testing rooms have adequate ventilation, sufficient lighting and space?
12. Do the consultation / examination and HIV testing and counselling rooms and changing
    rooms ensure privacy?
13. Is there a designated room for performing surgical procedures?
14. Do the theatre / operating rooms have adequate temperature control and ventilation and sufficient lighting and space?
15. Does the postoperative care area have adequate temperature control and sufficient lighting and space?
16. Is the operating room equipped with an adequate table, instrument table/trolley and a floor made of materials that are easy to clean and disinfect?
17. Is there an adequate area for performing the surgical scrub?
18. Does the layout of surgical suites allow for effective flow of both patients and clinicians?
19. Are toilets available for staff and clients and in a sanitary condition?
20. Are fire safety measures in place?
21. Are the different areas for providing services clearly signposted?
22. Is the facility clean overall?

Standard 4. Providers are qualified and competent.

1. Is there a process for determining whether clinicians have valid qualifications/licence/ registration to practise?
2. Is there a process to verify the competence of all staff hired to provide male circumcision
   services?
3. Is the competence of staff providing counselling as a part of male circumcision services
   routinely and periodically assessed?
4. Is the competence of staff performing history-taking skills as part of male circumcision
   services periodically assessed?
5. Is the competence of staff performing physical examinations as part of male circumcision services periodically assessed?
6. Is the competence of staff performing surgery or components of surgery as part of the male circumcision services periodically assessed?
7. Has a training needs assessment been done in the past year for staff providing male circumcision services?
8. Is there a staff training and development plan for staff providing male circumcision services?
9. Has the staff training and development plan been implemented?
10. Has the effectiveness of the training activities been evaluated?

Standard 5. Clients are provided with information and education for HIV prevention and male circumcision.

1. Are clients provided with information and education about male circumcision which include the following?: risk and benefits; surgical procedure; partially protective nature; necessitating maintenance of other HIV prevention strategies
2. Abstinence period of at least six weeks post-operation to allow for wound healing
3. Are clients who are seeking male circumcision provided with information and education about STI screening and HIV testing?
4. Are clients' partners or parents bringing sons for MC provided with this information?
5. Are clients provided with printed materials that they can take with them to reinforce the verbal information on male circumcision, STIs and HIV prevention and testing?
6. Are clients' partners or parents provided with printed materials that they can take with them to reinforce the verbal information on male circumcision, STIs and HIV prevention and testing?
7. Are male sexual and reproductive health materials available which provide information and education?
8. Are MC client teaching aids available in the counselling rooms?
9. Is there a process to verify that the client or parents/guardians of minor children understand the surgical procedure to be undertaken and the potential risks and complications before signing the consent form?
10. Is there a signed surgical consent form on each client's record?

Standard 6. Assessments are performed to determine the condition of clients.

1. Is a medical history obtained to assess any surgical contraindications for clients undergoing male circumcision?
2. Is a physical examination performed to assess for surgical contraindications on all clients undergoing male circumcision?

Standard 7. Male circumcision surgical care is delivered according to evidence-based guidelines

1. Are male circumcision surgical guidelines available?
2. Is the surgical procedure performed according to standard guidelines?
3. Was a sterile dressing applied?
4. Are efforts made to protect clients' privacy and dignity during surgery?
5. Are guidelines available for managing complications during and after surgery?
6. Are standard guidelines followed for the management of emergencies and complications?
7. Are guidelines available for immediate postoperative care?
8. Are the patient's postoperative vital signs and condition monitored according to a standard protocol?
9. Is the patient's pain assessed and managed in an appropriate manner postoperatively?

Standard 8. Infection prevention and control measures are practised.

1. Are policies and procedures available for the following?: Hand-washing; Surgical scrub; Gowning and gloving; Decontamination; Disinfection; Sterilization; Cleaning of operating
   rooms; Traffic flow; Handling of needles and sharps.
2. Are infection control measures practised according to guidelines and procedures?
3. Are there designated individuals responsible for infection prevention activities including?

Standard 9. Continuity of care is provided.

1. Does the facility have a protocol on referrals to other services?
2. Is contact information available for referral facilities?
3. Are client referrals documented?
4. Is adequate written information on the patient's condition provided to the referral facility?
5. Is the patient given postoperative instructions on the following?
6. Does the facility have standard protocols or guidelines for postoperative review?
7. Are the protocols for follow-up carried out?
8. Do clients routinely return for follow-up visits?

Standard 10. A system for monitoring and evaluation is established

1. Does the clinic keep a general client register?
2. Does the clinic have a surgical register/log that records the date, patient's name, age, procedure, type of anaesthesia, surgeon and comments?
3. Does the clinic compile the information from these registers for reporting/evaluation purposes?
4. Is there a process for reviewing the data for all the different areas of service delivery?
5. Are services planned and improved on the basis of the data and information?
6. Is there a system for recording all adverse events?
7. Is there a systematic process for investigating moderate or severe adverse events in order to determine causes?
8. Have actions been taken to prevent future adverse events of this nature?
9. Are discussions held with clients who have experienced adverse events about how these were managed?
10. Is there a process for assessing missing or erroneous data?

Appendix D: FGD guide for PAU MC service assessment

Investigating MC services in PAU Health Care Clinic

Focus group discussion among PAU health care workers and administrators

1. Do you think PAU clinic has the capacity to provide routine MC clinic? Yes/No

   Provide reasons for your answer

   - Surgical equipment
   - Medical supplies
   - Other HIV prevention package (ABC,VCT services & STI management, HIV treatment prophylaxis)
   - Infection control (waste management, water, disinfectant etc.)
   - Space, ventilation and lighting
   - Privacy
   - Manpower
   - Finance
   - Cultural aspects, especially men from traditional MC practising area
   - MC program management

2. What would be the possible hindrance to provide MC in PAU clinic? List and explain

3. If PAU clinic provide MC Service to male folk routinely. How would you organise the services given your limitation. Especially when you do not have a full time MO?

4. If PAU clinic provided the routine MC clinic, do you think it will be a burden to the existing HIV prevention package?

5. Do you have other comments regarding the clinic facility in providing MC services?

6. Do you have recommendations should MC be conducted as routine services in PAU clinic?

Appendix E: Information and consent forms PAU MC clinic assessment

INFORMATION SHEET

PROJECT TITLE: **"Assessing Pacific Adventist University clinic on male circumcision service provision"**

You are invited to take part in a research project on the assessment of Koiari Park campus clinic in providing adult male circumcision. The study is being conducted by Rachael.Tommbe on "Assessing Pacific Adventist University clinics on male circumcision service provision". The outcome of this study will assist the PAU clinic staff to improve or maintain the MC service provided in this clinic.

You are invited because you are a clinical staff and or a management staff of the Koiari Park campus health care clinic. We will need response in regards to the governance, resources in terms of finance, health work force, equipment's and supplies for MC services and also seeking your responses on the availability of other STI and HIV program in the clinic. The questions asked will be guided by the WHO MC services assessment toolkit checklist. We will provide detailed step by step information on how to proceed should you agree to participate in this study.

A consent form will be provided for you to sign should you wish to participate in an interview. Question and response time will range from 10 minutes to 45 minutes of your time.

Taking part in this study is completely voluntary and you can stop taking part in the study at any time without explanation or prejudice.

Your responses and contact details will be strictly confidential. The data from the study will be used in research publications and reports. You will not be identified in any way in these publications
.

If you have any questions about the study, please contact **Rachael.Tommbe and Dr David MacLaren.**

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If you have any concerns regarding the ethical conduct of the study, please contact:
Human Ethics, Research Office
James Cook University, Townsville, Qld, 4811
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Appendix F: Information sheet and MC client satisfaction survey form

INFORMATION SHEET

PROJECT TITLE: **Assessing Clients satisfactory status on male circumcision service provision at the Pacific Adventist University clinic"**

You are invited to take part in the male circumcision (MC) satisfaction survey because you have recently undergo male circumcision surgery at the PAU clinic. We are inviting you to assess your satisfactory level of the MC service provided in this clinic. The study is being conducted by Rachael. Tommbe and the outcome of this study will assist the PAU clinic staff to improve or maintain the MC service provided in this clinic.

If you agree to be involved in the study, you will be invited to complete a questionnaire, which asks you about your satisfactory level of the services you have received before, during, and after the male circumcision procedure in the clinic. The questionnaire should only take 10 to 20 minutes of your time to complete. You are not allowed to write your name on the survey form.

Taking part in this study is completely voluntary and you can stop taking part in the study at any time without explanation or prejudice.

Should you feel disturbed by any of the sexual or its related questions in the questionnaire, please feel free to quit at any time or should you require counselling please contact the sexual health counsellor (Ms June Wala) at the koiari Park clinic or Pacific Adventist University student counsellor (Edna Wori) or any of the health care and research staff you feel comfortable to approach.

Your responses and contact details will be strictly confidential. The data from the study will be used in research publications and reports. You will not be identified in any way in these publications.

If you have any questions about the study, please contact **Rachael Tommbe or Dr David MacLaren.**

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If you have any concerns regarding the ethical conduct of the study, please contact:
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Male Circumcision Client Satisfaction Survey PAU Clinic

Instruction:

i. **Please read your information sheet prior to participate in this survey.**
ii. **Completing this survey indicates your consent and voluntary participation towards this study.**
iii. **Do not write your name on this survey form. If you can remember your code then please write your study code number**

A. Demographic Questions

Write your response on the space provided for Questions 1-4.

1. How old are you? _____years

2. What is your marital status? _____

3. Which Province do you come from? _____

4. What is your religion/Christian denomination? _____

Tick the appropriate response in the box for questions 5-10.

5. Does your culture practice traditional circumcision?

- ☐ Yes
- ☐ No
- ☐ Not sure

6. What was your foreskin status prior to the MC surgery?

- ☐ Uncut foreskin (Foreskin is not been cut and completely covers the head of the penis)
- ☐ Split/Straight foreskin cut (Foreskin had been cut but was partially covering the head of the penis)
- ☐ Other types of foreskin cut (Cowboy style etc. Please specify _____

7. Did you have an insert into your penis (ball bearing etc.) before the surgery?

- ☐ Yes
- ☐ No

8. Did you inject substance (baby oil) to your penis before the surgery?

- ☐ Yes
- ☐ No

9. Have you ever had sexual intercourse prior to the surgery?

☐ Yes

☐ No

10. Have you had sexual intercourse after surgery?

☐ Yes

☐ No

11. If yes, how many days or weeks after the surgery? _____days/weeks (circle the appropriate time frame)

B. Questions on satisfaction of MC surgery services.

How satisfied were you with the services provided before, during and after MC clinic at PAU. Place a tick in the appropriate level of satisfaction next to each statement.

Service before the male circumcision clinic	**Satisfied**	**Neutral**	**Unsatisfied**
10. Information about the benefits of male circumcision			
11. Information about the disadvantages of male circumcision			
12. Information about the relationship between male circumcision and HIV infection			
13. Information about the confidentiality and privacy of the male circumcision procedure			
14. Information about the male circumcision surgery procedures			
15. Information provided before the voluntary counselling and testing (VCT) service process			
16. Information about the availability and use of condom			
17. Information about the availability of HIV and STI services			
Services during the male circumcision clinic	**Satisfied**	**Neutral**	**Unsatisfied**
18. Privacy maintained by staff during voluntary counselling and testing			
19.Privacy maintained during physical examination			
20.Privacy maintained during surgery			
21. Explanation of MC surgery procedure by surgeon			
22. Explanation of side effects of anesthetic drugs and other drugs involved during.			

23. Explanation of potential adverse effects (bleeding, swelling, pain and infection) by the surgeon/nurse.			
Services after male circumcision clinic	**Satisfied**	**Neutral**	**Unsatisfied**
24. Care provided on the surgery wound			
25. Administration of pain relief			
26. Explanation of the antibiotic provided			
27. Advise on personal hygiene			
28.Advise on dietary plans			
29. Advise on resuming normal sexual function			
30. Advise on how to identify complication and when to seek assistance from health care staff			
31. Advise on Follow ups and appointment review plans			

C. Questions on post-surgery activities

32. How long did it take to resume your normal activities after surgery?

- ☐ Less than 1 week
- ☐ 1 week
- ☐ 2 weeks
- ☐ 3 weeks
- ☐ 4 weeks or more. Specify please _____

33. Have you had sexual intercourse since the circumcision? "If your answer was 'Yes' then also respond to questions 34-36".

- ☐ Yes
- ☐ No

34. How many days after MC surgery did you first have sex?
Provide the number of days _____

35. Was the wound totally healed when you first had sex after surgery?

- ☐ Yes
- ☐ No

36. Did you use condom when you first had sex after surgery?

☐ Yes
☐ No

37. Did you take part in any cultural rituals before or after MC surgery at PAU clinic (e.g. feasting or celebrations with your family, disposal of foreskin process etc.)?

☐ Yes
☐ No

Please explain your response in detail

……

……

38. Overall, are you satisfied with the outcome of your surgery?

☐ Yes
☐ No

39. What could we have done better on the provision of male circumcision in PAU clinic?

……

……

……..

40. What else would you like to tell us about the male circumcision services we have provided?

……

……

……..

Appendix G: Information sheet and consent form Enga health managers

INFORMATION SHEET

PROJECT TITLE: **"Enga Provincial health leaders/managers views on operational and policy issues relevant for implementing MC for HIV prevention in Enga's health facilities".**

You are invited to take part in a research project in a form of attending a mini conference to discuss your views on male circumcision as an additional HIV prevention strategy in Engas' health care facilities. The study will be conducted by Rachael. Tommbe. The outcome of this study will provide evidence based information on operational and policy issues relevant for implementing MC for HIV prevention in Enga.

You are invited because you are a senior health care staff and you oversee or play a crucial role in the management of the Sexual Health Program, especially STI and HIV program in Enga Province. There are no direct benefits for you as an individual participating in this study. However, this study will indirectly benefit the people you serve in your catchment because it helps discuss approaches to prevent HIV.

If you agree to be involved in the study, you will be invited to attend series of presentations, which will be followed by small group discussion and group presentations. The discussions and presentations, with your consent, will be audio-taped, the entire program will take 4 to 5 hours of your time. The presentations and discussions will be conducted at Provincial Health Head Quarters conference room.

Taking part in this study is completely voluntary and you can stop taking part in the study at any time without explanation or prejudice.

Your responses and contact details will be strictly confidential. The data from the study will be used in research publications and reports. You will not be identified in any way in these publications.

If you have any questions about the study please contact Rachael. Tommbe and Dr David MacLaren for assistance.

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Appendix H: Discussion and interview guides Enga health managers

JAMES COOK UNIVERSITY AUSTRALIA

Enga Participatory presentation and discussion points from 6 Districts

Questions for the Group Discussion

1. From your perspective- should male circumcision be considered as a part of the HIV prevention strategy in Enga?
2. What are some of the things that planners and policy makers need to think about if they are planning an MC program in Enga?
3. What are some of the health systems strengths you have in your districts and provincial health facilities in providing male circumcision for HIV prevention in Enga?
4. Are there any barriers or challenges in your health system that may become a barrier in providing MC for HIV in Enga Province?
5. Over all- What is your view on MC as one of the additional HIV prevention in Enga?

One-on-one interview Question: Enga study.

1. What is your view on MC for HIV prevention in Enga?
2. Can you tell me of your view on the Shang ring method of MC and the training program you have attended recently?
3. Is Shang ring going to be integrated together with the other HIV prevention measures in place?
4. Do you have adequate resources to support the implementation of Shang ring and the support from the Enga provincial health authority (EPHA)?
    - Human resources
    - Time
    - Space
    - finance
    - Awareness
5. Is there any policies and standard guidelines of Shang ring procedure?
6. Is there any referral network or system available should there be any complication of Shang ring?
7. Is EPHA aware of the Shang ring methods of MC?
8. What are your views of other MC methods?
9. As the facility manager of the Endakalipin clinic, Is there any challenges, issues and recommendation you would like to make on MC methods to be adopted and implemented in Enga?

.

Focus group discussion among Enga health managers

1. What is your general view of the study feedback results?

2. Most participants (Health care workers) suggested MC be incorporated with the other existing HIV preventative strategies in Enga. What is your view on this regard?

3. Now that you have a PHA governing system in Enga's health sector. Do you think you have the capacity to own, develop and facilitate the MC for HIV prevention program in Enga? Discuss in terms of:
    - Finance
    - Management & guidance
    - MC service delivery
    - Human resources
    - Equipment & supplies
    - Monitoring & evaluation

4. Endakalipin clinic is in preparation to deliver MC using Shang ring to implement MC in partnership with the National AIDS council. What is your view on this?

5. Do you have any more challenges or recommendations on MC for HIV prevention in Enga?

Appendix I: Ethics approvals


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