

Safe Practices and Methods of Sharps Waste Disposal
in Health Facilities
in the Western Highlands Province of Papua New Guinea

By
Sabina Benesa Kerepa

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Attestation of Authorship

I hereby declare that this submission is my own work and that, to the best of my knowledge and belief, it contains no material previously published or written by another person (except where explicitly defined in the acknowledgment), nor any material which to a substantial extent has been submitted for the award of any other degree or diploma of a university or other institution of higher learning.

Sabina Benesa Kerepa



Signature of Author

Date: 21 March 2014

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This study has been approved by the Auckland University of Technology Ethics Committee on the 26th of April 2013. Reference number 13/69. See Appendix A for details.

Abstract

Safe practice and use of appropriate methods for safe management and disposal of sharps waste are important infection control and prevention activities in health care facilities around the world including those in Western Highlands Province (WHP) of Papua New Guinea (PNG). With respect to health care workers, abiding to safe practices related to the use of sharps devices will create a safe environment for health care workers and their colleagues, their patients, the general public and the environment. In particular, the unsafe practice and disposal of sharps poses a risk of blood borne virus (BBV) infections particularly hepatitis B virus (HBV), hepatitis C virus (HCV) and human immunodeficiency virus (HIV) all of which can be fatal.

Health care workers have a part to play in adhering to and following safe practices delineated by the appropriate guidelines and policies. Likewise, management and administrators have a part to play in providing guidelines and supporting safe methods of practice.

Studies in many countries have identified the contributing factors and proposed certain policies and measures to be undertaken in the health facilities in their countries with respect to safe practice with sharps devices and appropriate disposal methods. However, no previous studies have been found that have identified the factors that promote proper practices and disposal activities related to sharps devices in an urban and rural health facilities in PNG. This study sets out to fill this gap.

The study was carried out using qualitative methodology (semi structured interviews) with clinical health care workers who used sharps in their day to day practice. The findings were analysed using a thematic approach.

The significant results included lack of regular in house and induction training, poor knowledge about BBV infections, a lack of a reporting protocol for needle stick and sharps injuries and unsafe practice as well as poor sharps waste management activities. This led to a feeling of powerlessness amongst health care workers.

Recommendations from the research include the need to involve clinical staff in the production of a new infection control and sharps waste management manual, introduce and implement the infection control and sharps waste management programme to the rural health facilities, conduct regular training to both urban and rural health care workers,

management team of health services in WHP to improve and support with consistent provisions in terms of sharps waste disposal items and methods to both urban and rural settings. If successful, this could be made available to all the health facilities in PNG.

Chapter 1. Introduction

This thesis investigates practices involving sharps devices and the methods health workers in health facilities in the Western Highlands Province (WHP) of Papua New Guinea (PNG) utilise for their disposal. This research explores the reasons why current practices may not be optimal, and provides recommendations and possible solutions related to future policy in this area. Within a health care context, sharps are devices, used for patient care services. Sharps play a vital role in health care, and can save lives. However, they can be clean or contaminated and due to their pointed edges, corners and projections they can also be hazardous. This is because they are capable of piercing through human flesh and therefore have the potential to inflict pain and injury (Oxford English Dictionary & Thesaurus, 2008). Furthermore, those that are infected with human blood are potentially extremely dangerous because if not disposed of properly, they can transmit diseases, including more than 20 blood borne viruses (BBV). The main blood pathogens that could be transmitted from unsafe and inappropriate disposal methods include Hepatitis B virus (HBV), Hepatitis C virus (HCV) and Human Immunodeficiency Syndrome (HIV) infections (Blenkharn, 2009; Hutin, Hauri, & Armstrong, 2003; Prüss-Üstün, Rapiti, & Hutin, 2005; Tate Jr, 2007). These have the potential to cause premature death. They have the potential to affect family members, work institutions and their staff and volunteers which can directly or indirectly, negatively impact the community and society (Blenkharn, 2009; Bryan, 2006; Gabriel, 2012). Due to unsafe injection practices within health care facilities, it has been estimated that between eight and 16 million HBV, 2.3-4 million HCV and 80-160 thousand HIV infections occur every year globally (Simonsen, Kane, Lloyd, Zaffran, & Kane, 1999). A study conducted by the World Health Organisation (WHO) in 2000 showed an increase in the incidence of these diseases wherein 21 million people contracted HBV infections (32% of all new diseases), whilst two million with HCV (40% of all new infections and 260,000 (5% of all new cases) with HIV arose or occurred from contaminated syringes and needles (Manga, Forton, Mofor, & Woodard, 2011).

These viruses do not only infect the general public, they pose a clear and present danger to health care workers. Approximately three million health care workers globally are at risk of BBV infections during and after using sharps devices (Gabriel, 2012; Prüss-Üstün et al., 2005). In the United States (US) it is estimated that 600 to 800 thousand needle stick injuries are reported annually (Gillen et al., 2003). Furthermore, in Europe over one

million health workers experience injuries every year from sharps related accidents (Gabriel, 2012). As countries that have appropriate guidelines, training and relevant resources still experience sharps related injuries, several studies have been carried out to identify contributing factors (Prüss-Üstün et al., 2005; Wilburn, 2004). Although little research has been carried out to investigate this important health care issue in developing countries such as India (Blenkharn, 2009). In addition, no previous studies have addressed this serious concern in PNG.

1.1 Background information about PNG

Papua New Guinea, a developing country in the Western Pacific Region, is located north of Australia. In 1975 PNG gained independence from Australia and since then the country has made some progress with regard to its social and economic development. A recent study revealed the population of PNG to be 7.2 million (Papua New Guinea population, n.d). In 2011 it was estimated the country's population growth rate to be 2.24% per annum and while 87% of the people live in rural settings, 13% live in urban areas (Population growth in Papua New Guinea, n.d; World Health Organization, 2013). Almost 97% of the land in the country is owned by traditional landowners. Those who live in rural areas are able to sustain themselves through farming and fishing even though they have limited cash income (Power, 2001).

Papua New Guinea has 22 provinces and is geographically divided into four regions. The Highlands region is comprised of seven provinces including Western Highlands Province (Central Intelligence Agency, n.d). (Refer Figure 1). The country (especially the Highlands region including WHP) is scattered with big rivers, thick forest, mountains and rugged terrain. As roads do not extend to some remote rural areas, many people must walk to access important services, including transport hubs and medical assistance.



Figure 1. Map of PNG including Western Highlands Province (WHP) (Mount Hagen is the capital City of WHP)

Source: <https://www.cia.gov/library/publications/the-world-factbook/geos/pp.html>

1.1.1 Health care system in PNG

Health care services in PNG are provided by the Government, church-based organisations and the private sector (Papua New Guinea Health Service Delivery Profile, 2012). Government health facilities include the provincial hospitals which are located in urban settings and in some health centres, sub-health centres as well as aid posts in rural areas (Garner, Thomason, & Donaldson, 1990). Whilst the hospitals in each province are under the control of the National Government, health centres, sub-health centres and aid posts are under the provincial and local level government. In addition to the funding they receive from the government, these facilities are also supported by aid agencies, such as AUSAID, an organisation which provides some additional finance, logistics and infrastructure. Church-run health facilities organised under the PNG Council of Church Health Services provide almost 50% of health services, both in rural as well as in some urban areas (Garner et al., 1990; Papua New Guinea Health Service Delivery Profile, 2012). However, they are partly supported by the Government, in terms of workforce, finance and logistics, and they work in partnership to provide basic health services to the general population. Private organisations include non-governmental or international organisations such as the Susu Mama Clinic and Marie Stopes International which are located in certain urban areas (Marie Stopes International Countries, n.d; Post courier, 2012). They also collaborate with the Health Department and Provincial health facilities in terms of implementing some of the national health strategies such as family planning and breast feeding. Other privately owned health facilities located in the main towns and cities operate on a 'for profit' basis, therefore only those people who can afford transport

to these facilities and the cost of treatment can use them (National Health Plan 2011-2020, 2010; World Health Organization, 2013). In 2010 the Government developed a strategic health plan for PNG, in line with the Millennium Development Goals. Their focus is to deliver comprehensive health services to the rural majority and urban disadvantaged, to address eight major objectives. In this plan they also intend to decentralise the health services to serve each of the provinces, so services can be managed and directed through Provincial Health Authorities (National Health Plan 2011- 2020, 2010; World Health Organization, 2013). The Provincial Health Authority is an act of governorship whereby all the health facilities including human resources, finance, logistics and every aspect of management are amalgamated under one structure in each province (Mon, 2011; Western Highlands Provincial Health Authority, n.d). The WHP and two other provinces in PNG were selected as pilots for this plan. In 2012, WHP was the first province to launch and implement this new structure and it is known as Western Highlands Provincial Health Authority (WHPHA) (Mon, 2011).

1.1.2 About WHP health care facilities and facilities selected for study

Mount Hagen, the capital city of WHP, has a total population of 440,025 (The National Research Institute, 2010). Previously WHP was administratively divided into seven districts (see Figure 2). The districts include Hagen central, Tambu/Nebilyer, Mul Baiyer, Dei, Anglimb South Waghi, North Waghi and Jimi (National Research Institute, 2010). In 2012, Anglimb South Waghi, North Waghi and Jimi districts were politically and administratively separated, to form Jiwaka province (MacPherson, 2009). However, health care services including sharps waste management in this province are still functioning under the WHPHA until they are fully established in terms of infrastructure and human capital in the workforce (Western Highlands Provincial Health Authority, n.d). The remaining four districts are under the structure of WHPHA.

The one main hospital in WHP, located within the city in the heart of the Hagen central district, serves a total of 86,951 people (National Research Institute, 2010). As the main referral facility in the Highlands Region, it accepts referral cases from the neighbouring highlands provinces as well as from health facilities within the province. The health facilities within the province include 11 health centres and 39 health sub-centres, urban clinics and community aid posts which are operated by both church and government health agencies including those in the Jiwaka Province (Garner et al., 1990; Western Highlands Provincial Health Authority, n.d).

The hospital, including two rural health facilities, were selected for this study (Refer Figure 2). Rural facilities are located in Tambul/Neiblyer and Dei districts with a total population of 60,823 and 49,767 people respectively (Western Highlands Province, n.d). Both the hospital and the facility based at Tambul district are fully funded by the government while the facility located in Dei district is run by a church organisation. As described above, the health facility is partly supported by the government through the WHPHA. However, until 2012, the overall management of each facility varied, as the rural settings were under the Western Highlands Provincial Health Services, while the Provincial Hospital was organised under the National Department of Health (Western Highlands Provincial Health Authority, n.d).

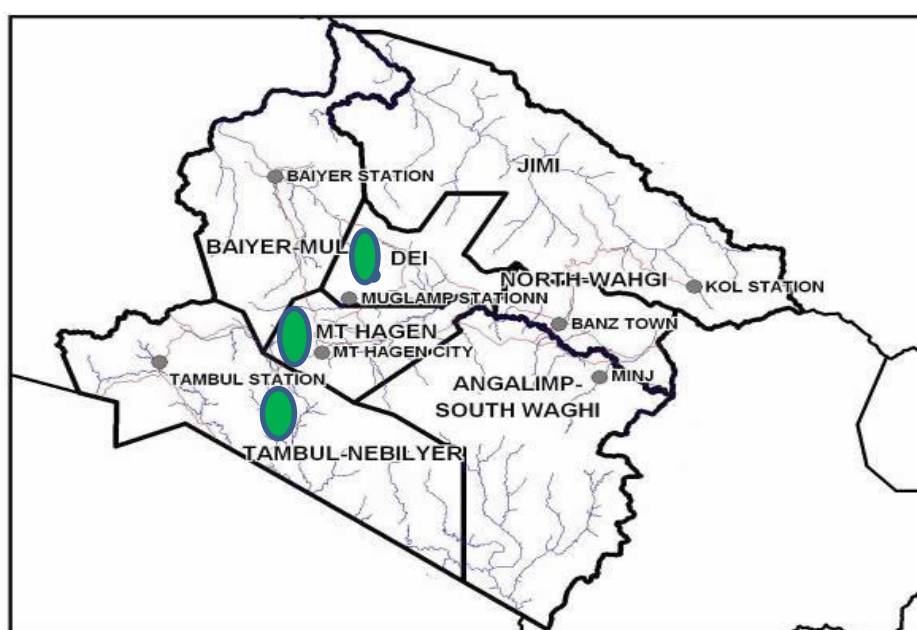


Figure 2. The Western Highlands Provincial map indicating the districts it serves.
Source:http://www.nri.org.pg/research_divisions/cross_divisional_projects/10%20Western%20Highlands%20Province.pdf

1.2 Aims and objectives

The main aim of this study is to investigate those factors which involve the safe practice and management of sharps waste by health care workers in selected health facilities in WHP of PNG. During previous administrations, health facilities had other management and administrators and sharps waste management activities varied between government and church based institutions, as well as those at national and provincial levels. Therefore, waste management protocols were facilitated in accordance with the policies and management protocols available at that time. There could be some barriers that contribute to proper implementation of the policies regarding practice with sharps devices and waste management including sharps disposal activities in both rural and urban settings. Also the

workforce may be affected by some occupational health and safety issues related to sharps injuries. Therefore, this study has been a preliminary effort purposely to identify the knowledge gaps among health care workers associated with other related factors with line managers. Subsequently, it proposes to maintain and develop sustainable strategies in line with the WHPHA approach so that health care workers at all levels of health facilities may have standardised knowledge and skills regarding sharps practices and disposal activities including occupational health and safety issues in the province. If this is successful for the health organisations and staff members in the WHP, then it could be introduced to other health facilities in PNG.

1.3 Researcher's background and standpoint

For over 15 years, the researcher, a registered nurse by profession, has worked in an urban hospital in PNG. During this time, she worked initially for a few years providing clinical care, and later was appointed as an infection control officer. She had this role for 10 years. When she took on this role, she had limited knowledge and skills with regard to the infection control programme as she had not received any formal training. However, by attending workshops and with consistent support from the management team, including the establishment of an infection control subcommittee, she was able to plan, organise, coordinate and evaluate all infection control and prevention practices including sharps waste management activities in the urban setting. Training on all aspects of infection control including waste management and occupational health and safety issues was provided to all categories of health workers including ancillary staff in the urban setting. Despite these attempts, she noticed that the implementation of knowledge acquired seemed to be sub-optimal among health staff.

Until 2009, she was also involved in a multidisciplinary rural outreach programme wherein specialist doctors, nurses and other technical staff both from the hospital and provincial health services visited rural health facilities. Each team member had his or her own obligations based on their specialities. She conducted preliminary assessments regarding infection control and waste management including sharps, as no programme had been introduced in rural settings. In addition, the National Infection Control Policy guidelines for 2008 were distributed to the officer in charge of the facilities and the contents were briefly explained. During her inspections she noted that waste management, including sharps disposal and related practices, were a public health concern. Therefore, she was interested to take up this topic as a research area so that she could re-assess the facilities in the rural settings with regard to sharps handling including

disposal practices and also evaluate the effectiveness and progress of similar activities in the urban areas. It is the researcher's ultimate desire to set up a legacy wherein the organisation and her colleagues may benefit from the outcome of this research. Subsequently, they may support and encourage each other and succeed in their careers using sharps devices appropriately. Once these safe practices are achieved for patients and for the public health benefit, this will enhance the prevention of harm to patients and relatives, staff and colleagues, volunteers, and members of the public, including the health workers themselves.

1.4 Thesis organisation

This first chapter has introduced the background of the research project, explaining why it is an important public health topic, and describing the current health structures in PNG and in the WHP, in particular. It also specifies the aims and objectives of the research project. The researcher also explained her rationale for selecting this topic.

Chapter two explores and reviews the relevant literature with respect to safe handling and disposal of sharps waste in the context of health care settings. Firstly, it explains the definition of sharps including descriptions of how they are used in-patient care activities. Secondly, it explains the sharps waste, items and methods used for disposal purposes. Next, it examines what has been reported in the academic literature regarding the structural and individual factors including consequences for improper handling and disposal from a global context. It also provides information on the prevalence and incidence of HBV, HCV and HIV as well as describing the natural history of these diseases and discusses associated issues necessary to treat and prevent the risk of infections from needle stick injuries. Finally, it discusses the implications that are encountered by injured health staff members, their family, organisation and the patients who seek their care.

Chapter three discusses the research strategy used in this thesis and outlines the analytical approach as well as the tools deployed to collect the information for this research study. A qualitative approach was employed to investigate the safe use of sharps devices and disposal aspects on the part of the health care workers in the WHP of PNG. Firstly, it provides a description and explanation of the differences between the quantitative and qualitative methodologies. Then the different qualitative methods considered are outlined in detail. Next it provides information about the choice of respondents as well as the research questions. The chapter also presents some detailed information about the

procedures involved throughout the entire research process. These include the research proposal, ethical considerations, recruiting procedure, data collection and management, including the analysis approach and time devoted for the entire field trip.

Chapter four provides the information regarding data analysis. Next, it outlines the method and a tool used to analyse the data obtained from the field trip. It then discusses the results identified from interviews.

Chapter five compares the results with other research carried out from both developed and developing countries with regard to knowledge and skills about safe practice and disposal methods related to sharps devices. This comparison is purposely done to substantiate and confirm the findings revealed by this study. It concludes by making recommendations about improvements to the safe practice and management of contaminated sharps devices as well as describing the limitations of the study.

Chapter 2. Literature Review

2.1 Introduction

Health professionals use and generate sharps waste whilst caring for patients in health care settings throughout the world, including those in urban and rural areas within the WHP of PNG. The improper handling and managing of such sharps waste is a public health issue due to the risk involved in transmitting BBVs. There is also the potential to harm and negatively impact the environment in terms of emissions if sharps are burned or incinerated (Soliman & Ahmed, 2007). This is because the emissions contain certain chemicals, such as furan and dioxin that include other poisonous pollutants, which can have direct or indirect effects on human health via inhalation or ingestion through food and water consumption (Angel, 2009; Batterman, 2004). However, whilst acknowledging the serious public health impacts of emissions, this is not the focus of this study. Instead, this study focuses on the safe practices and disposal of sharps in a health care setting in a developing country context.

2.2 Definition of sharps

In order to reorganise their potential use and disposal techniques within the medical context, it is essential to provide a clear definition of various sharps devices. The World Health Organisation (WHO) describes sharps as needles, scalpel blades, broken glass and any other sharp items that are infected with blood and body fluids from patients' use (Prüss-Üstün et al., 2005). Other scholars define sharps as needles of all types, such as winged steel and hypodermic needles, including the ones with safety features and suture needles (Tan, Hawk Iii, & Sterling, 2001). Sharps also include syringes that have needles attached to them, stitch cutters, glass ampoules, vials, broken/clinical glass, intravenous (IV) cannulae and 'giving sets' plus tubing and vacuum tube devices (Angel, 2009; Gillen et al., 2003; Lange, 1978). Vials and glass ampoules may sound unfamiliar to the layman and may not seem to fit the above definition, however as they contain powder and liquid medications, they become health hazards if broken and exposed to contaminated blood (Ernst, 2003). As all sharps have a distinctive and specific purpose in service provision, it is important to gain some understanding and familiarity regarding the sharps most frequently used.

2.3 Use of sharps

Sharps are of various types, however the ones most commonly used in health facilities include needles, syringes with needles attached, scalpel blades, vacuum tubes, lancets, stitch cutters, vial and ampoules. In addition, needles of all types are regularly used, such as hypodermic, hollow bore, wing steel and those with safety features, including self-blunting needles and suture needles. These needles are useful to administer intradermal, subcutaneous, intramuscular and IV injections as well as to withdraw blood from a vein and suturing surgical wounds (Gabriel, 2009; Vaag et al., 1990). In developing countries, the use of sharps, especially injection needles, is considerable because of the high prevalence of many diseases which require the use of injections for treatment. For instance, hospitals in Uganda, Ghana, and Indonesia, treat 60-70% (Uganda), 80-90% (Ghana) and 70- 90% (Indonesia) of patients are treated with one or more injections per visit (Van Staa & Hardon, 1996). The authors contended that most injections are unnecessarily administered as oral treatments could be given. Furthermore, the use of injection needles is also believed to be high because staff and patients perceive that medication via injection heals faster than any other form of treatment (Jagger, Perry, Gomaa, & Phillips, 2008; Perry, Jagger, Parker, Phillips, & Gomaa, 2012; Simonsen et al., 1999; Tan et al., 2001). Many studies identified that hollow bore needles have a greater risk of causing injuries, hence needles with safety features were introduced in the US in 2000 as an attempt to minimise the risk of BBV infections. In developed countries, as they are more able to afford the latest equipment and needles with safety features, these may be used more frequently and staff are more likely to receive regular training so they can use these devices appropriately, although this is not always the case (Glenngård & Persson, 2009; Tan et al., 2001). Conversely health workers in some developing countries may not know how to use new devices which are incorporated into their practice (Wilburn & Eijkemans, 2004).

2.4 Safe practice techniques

Safe practice in the context of this thesis is concerned with taking certain appropriate measures when using sharps devices. A range of recommended practices have been suggested. Firstly, it is recommended that adequate sharps are suitable for the relevant procedures. It is also important to ensure the procedure to be undertaken is explained to the patient or a guardian so that they can cooperate or assist as necessary (Aziz et al., 2009). For example, a mother with a sick child could help to hold the baby in a proper position or a guardian of an unconscious client may assist in positioning the patient for

intramuscular injection therapy. If attending to aggressive or uncooperative patients, then it is suggested that assistance should be sought from colleagues or relatives as patients may move deliberately or unintentionally due to pain from the prick (Aziz et al., 2009). Other researchers have also pointed out the importance of concentration and focus during the administration of treatment using sharps devices (Adams, 2012; Royal College of Nursing, 2013).

Certain guidelines are also suggested for consideration when handling any contaminated sharps devices. In the case of needles, the practice of recapping should be avoided as much as possible, and if it is necessary, the 'one hand' technique should be used, that is, placing the cap on a hard surface and pushing in the needle carefully. The needle, which is attached to the syringe, should be discarded as a single item. Furthermore, if carrying a syringe that contains blood, then it is recommended that the needle is removed by using a removal device (Aziz et al., 2009). The authors point out that sharps devices should not be passed from one person to another, they should not be carried in one's hand, and concentration is required so that they are not left on the patient's bedside or within the work environment. Failure to employ these simple techniques may contribute to sharps injuries (Aziz et al., 2009).

2.5 Definition of sharps waste

Sharps waste generated in health facilities is recognised as health care waste (Mbongwe, Mmereki, & Magashula, 2008; Yadavannavar, Berad, & Jagirdar, 2010). It is important to understand the different types of health care waste as the distinctive categories of waste require different segregation and appropriate disposal items and methods. The two types of health care waste are known as, general and biomedical or clinical waste (Mbongwe et al., 2008; Soliman & Ahmed, 2007; Tsakona, Anagnostopoulou, & Gidarakos, 2007). General waste includes rubbish such as paper, plastics, food remains and others that do not contain any blood and body fluids and therefore are not considered infectious. Biomedical or clinical waste refers to waste that contains blood and body fluids that has the potential to transmit cross infection (Angel, 2009; Yadavannavar et al., 2010). Classic examples of biomedical or infectious waste includes sharps devices; maternal products from labour ward sections, human body tissue, cotton wool, gauze and bandages from wound dressings, mercury and toxic waste from the X-ray department, overdue drugs and chemicals from the health care pharmacy as well as blood samples from pathology laboratories (Angel, 2009; Komilis, Fouki, & Papadopoulos, 2012). Subsequently, several studies have pointed out that the proportion of waste in this category is between

10-25% of the total waste produced in health care settings (Mbongwe et al., 2008; Taghipour & Mosaferi, 2009). Taghipour and Mosaferi (2009) further highlight that sharps waste constitutes 0.45% of total biomedical waste products.

Depending on the size of the health facility and the number of procedures performed, the quantity of sharps waste can vary. Although the amount is small compared to other biomedical waste, it is considered to be very infectious because of the risks it poses on human health (Angel, 2009). Therefore, the WHO recommends that sharps should not be disposed of together with other biomedical waste, even though they are categorised under the same waste group. Rather, to ensure safety and infection prevention, they should be handled and managed using appropriate and reliable universally recognised disposal items or equipment (Diaz & Savage, 2003). Therefore, it is important to understand the best methods involved for safe disposal techniques.

2.6 Safe sharps disposal practice and items

Safe sharps disposal refers to the notion of discarding used devices straight into a designated sharps box until it reaches the final stage of disposal (Sherman, Rusch, & Golub, 2004). In order to implement this, the WHO recommends the use of safety sharps boxes/containers for safe and effective disposal at the point of use (Diaz & Savage, 2003; Perry et al., 2012). Safety boxes should be made of hard card box, be puncture proof and have a required level to be filled. Other ways of disposal include puncture proof containers with lids and labels on (Adams, 2012). These items should be of appropriate size to accommodate the contaminated sharps devices. All disposal items containing contaminated sharps must not allow these to protrude or penetrate (Aziz et al., 2009).

It is important to place sharps disposal items at locations where they can be easily accessed by health workers. Therefore, evidence suggests that an ideal location would be the patient's room instead of a central location (Aziz et al., 2009; Perry et al., 2012; Royal College of Nursing, 2013). This could encourage prompt disposal soon after use and also avoid recapping as this practice has contributed to considerable injuries. If sharps boxes cannot be kept in the patient's room then, to minimise excessive handling, the health workers need to take them to the patients' bedside or place them on trolleys whilst performing procedures (Aziz et al., 2009). According to the WHO policy on best practice, the sharps boxes should be disposed of when three quarters full (WHO, 2010). However, other researchers have recommended that they should be sealed and removed when two thirds full (Adams, 2012; Gabriel, 2012). They should not be filled to the brim as this

may make it difficult to close the lid and there is the potential for them to spill, posing an unnecessary health risk (Aziz et al., 2009; Blenkarn, 2009; Griffiths, 1989; Perry et al., 2012). Filled sharps boxes should be emptied and placed into yellow/purple bags which are placed in similar colour coded bins. The sharps waste in these designated bags and bins must be placed in a safe and usual location for collection (WHO, 2010). Use of international recognised colour codes and using a consistent location for their collection enables the waste collection team to easily locate contaminated sharps contents for efficient transportation for final disposal (Angel, 2009; Griffiths, 1989). Appropriate care should be taken to enclose the waste bags to avoid spillage during collection and transportation (Diaz, Savage, & Eggerth, 2005).

The final disposal of sharps waste occurs when they are completely destroyed by using suitable methods (Sherman et al., 2004). For example, most developing countries may use pit holes, low and medium combustions as they are cheap and easy to maintain, while the developed countries use incinerators with high temperatures where they can easily burn the sharps (Batterman, 2004; Diaz & Savage, 2003). In addition, Griffiths (1989) mentioned, that automatic incinerators are ideal methods where biomedical waste including sharps may be incinerated within the health facilities.

On the other hand, use of incinerators have environmental impacts so land fill methods with treatment of sharps waste with necessary disinfectants could be a possibility if land is available at an appropriate and safe location (Angel, 2009). The extent to which implementation of safe practice techniques and use of appropriate items and methods depends on certain circumstances which management and health care workers would determine in accordance with their background, capabilities and interest. It is therefore necessary to explain the contributing factors that may hinder appropriate and safe practices.

2.7 Barriers to safe practice and disposal techniques

Globally, several reasons have been put forward to explain why sharps devices might not be used and disposed of properly. The reasons may depend on the particular circumstances in different countries and health care settings. Several studies have pointed out that there are two main barriers that hinder safe practices and correct disposal (Diaz & Savage, 2003; Gershon et al., 1995). These obstacles include management factors and individual behaviours.

2.7.1 Management factors

A health care institution is governed by executives and more junior managers who make decisions to ensure the smooth running of the organisation. The organisational responsibility in a health care setting includes policy development, relevant training, human resource management, and financial control including logistics and other necessary supplies and infrastructures (Diaz & Savage, 2003). It is important to understand that effective management can have a positive influence on helping the organisation to achieve the goals they set forth. Therefore, it is suggested that health care administrators and line managers ensure that every important aspect of patient care services including sharps practice and disposal activities, as well as staff health and safety, is considered in their plan (Gershon et al., 1995). However, if these issues are not provided for or supported then it may affect individual health workers' attitudes and behaviours resulting from knowledge gaps, and appropriate and effective sharps handling including disposal practices, may not be achieved (Diaz & Savage, 2003).

Policies

Safe practice guidance with respect to sharps devices and their management initiatives should be integrated into infection control and prevention policies (Tsakona et al., 2007). Policies should stipulate practices with a focus to prevent cross infection during the course of patient care and disposal of sharps waste. Another significant policy is the occupational health and safety policy which should stipulate the procedures to follow including necessary investigations and management, should health staff members encounter occupational sharps injuries (WHO, 2010). This policy also should contain significant information on related matters such as a staff immunisation programme including general safety and welfare within the working environment (Malek, Safty, Safety, & Sorce, 2010; Wilburn, 2004). Therefore, the role of employers in health institutions to provide a safe work place has been put forward (WHO, 2010; Wilburn, 2004). In the UK, for example, a policy regarding safe practice related to sharps devices was initially developed in 1983, and then amalgamated in 1987 and 1988, as part of a universal precaution innovation to preclude infection transmission (Perry et al., 2012). Similar policies related to infection prevention and occupational health and safety measures are available internationally both in developed and some developing countries, including PNG. However, due to a lack of management support, some facilities may fail to develop or adopt and implement the necessary guidelines, and this may result in improper practice and disposal of sharps waste, as well as poor reporting (Mathur, Dwivedi, Hassan, & Misra, 2011).

Training and staffing issues

To provide quality, effective and efficient health care services, the human workforce is an important resource for health institutions. With their level of knowledge and skills, they have the potential to implement strategic plans required by the organisation. For them to be more efficient and competent in what they do in terms of practice and management of sharps devices, including occupational health and safety issues, they require additional updated information and skills with new strategic innovations which the administration should be committed to providing (Gershon et al., 1995). As such, relevant information should be disseminated through appropriate training and orientation sessions. Even so studies have identified that management may fail to provide support, including appropriate training to update and equip the health care workers with additional knowledge and skills (Blenkharn, 2009; Boss, Moli, Roy, & Prasad, 2009; Diaz & Savage, 2003). This may then have some negative impact on the work output so that the desired expectations may not be met.

According to Wilburn (2004) lack of adequate staffing is one significant factor with respect to sharps devices. Another group of authors argued that under staffing contributes to health care workers being over worked or working long hours to cover shifts if a colleague is absent from work (Ilhan, Durukan, Aras, Türkçüoğlu, & Aygün, 2006). As a result, some may rush to perform duties, because they could be the only ones working on specific shifts (Hagstrom, 2006). During these encounters they may not provide quality patient care services and patients may become frustrated. Inappropriate delegation of tasks related to sharps disposal could also contribute to failure in the overall sharps waste management aspects. Overall, these factors may sap the energy and strength of the workforce, and they may lose concentration when dealing with sharps devices (Diaz & Savage, 2003; Hagstrom, 2006).

Financial support

Budgets are necessary in the form of adequate funding in order for an organisation to be able to function and operate every activity consistently. The availability of adequate funding also determines development in terms of infrastructure, procurement and provisions of essential requirements. Each organisation performs under the leadership of stake holders, such as government, church or private entities, and it is their responsibility to sustain and allocate funds for use according to requirements. Therefore, when budgets are allocated to the management of respective health facilities, they prioritise their spending based on their activity plans and interventions to achieve the desired aim of the

organisation. For some reason the management might set priorities to other patient care services and little attention could be given to sharps waste management activities. This may contribute to the unavailability of appropriate sharps disposal items and equipment (Mathur et al., 2011). It has been evident in a study conducted in Botswana, that lack of appropriate sharps waste disposal items and equipment including proper methods for final disposal has resulted from insufficient financial support by the management in their health setting (Mbongwe et al., 2008). Also appropriate safety wear such as gloves and boots may not always be provided for this reason. Consequently, this can result in poor disposal as health care workers may fear the handling of contaminated sharps (Wilburn, 2004). Financial constraints may also contribute to lack of continuous training as well as staffing issues as mentioned above.

2.7.2 Individual factors and consequences

Knowledge about sharps and related issues

The health workers' practice and disposal of sharps devices depends on the individual knowledge they have attained through their initial and additional training and subsequent work experiences. Apart from these learning processes, it is important for health care workers to commit personal time to seek additional information and read research articles to understand safe practice techniques with sharps devices including the risks associated with contaminated devices and disposal issues. In doing so, health workers would be able to create self-awareness and also be able to grasp some valid concepts so that they could practice accordingly. However, some health care workers may have limited knowledge about safe practice techniques and BBVs including risks associated with sharps injuries. Therefore, they would not be able to take appropriate precautionary measures to protect themselves and others around them. This was evident in a study conducted in Pakistan, where it was found that 13.3% of health care workers were not aware of needle stick injuries as the route of transmission for HBV infections. The figure for HCV infections was 10% (Siddique, Mizra, Taugir, Anwar, & Mark, 2008). In addition, only 6% of health workers were familiar with the knowledge that HIV infections were associated with needle stick and sharps injuries. This implies that health workers in other developing countries such as PNG may lack basic knowledge about the risks that result from similar sharps injuries.

Experience

Inexperienced staff members, in particular those new to the health setting or a specific section, may not have the confidence to deal with sharps instruments during and after use (Ilhan et al., 2006). Lack of experience may also contribute to staff not wanting to ask colleagues for assistance because of fear or shame and therefore sharps may be improperly handled and disposed of. In contrast, some health professionals have gained a wealth of experience during their service and feel confident about their practice. However, when change in practice is advocated through training or from colleagues, they may not want to adjust and accept new ideas or knowledge and skills about handling and disposal techniques (Ilhan et al., 2006).

Behaviours and attitudes

Individual behaviours in this context include the attitudes and practices on the part of health staff that influence their choice of action. These could result in an inability to comply with safe practice techniques and disposal protocols, so consequently needle stick and sharps injuries may be experienced at some stage (Gillen et al., 2003). Furthermore, Siddique et al. (2008) point out that 22% of sharps injuries were acquired during the disposal process and 16% of injuries were caused by sharps being left in incorrect places after initial use. A recent study revealed that about 38 % injuries were sustained during a procedure, while 42 % were after use and before disposal (Gabriel, 2012). Another significant exposure was highlighted as being due to recapping where 51% of nurses in the US encountered needle stick injuries (Gillen et al., 2003).

It has been suggested that, most health care workers do not report their injuries for reasons such as not wanting to know the health status of the patient, assuming that the patient may pose a small risk of infection, feeling of self-confidence, worry about the response from management, the unavailability of a reporting protocol or lack of knowledge about the reporting procedures, if these exist (Adams, 2012; Gabriel, 2012; Wilburn, 2004). Furthermore, others could perceive that an injury is a minor issue because they may be unaware of the associated risks and therefore, do not report (Gabriel, 2012). These factors may contribute to some of the following: the injured health staff member could miss out on necessary medical interventions and counselling if available; workers compensation may not be considered (even if it is a possibility); accurate information may not be recorded; estimates of incidence and prevalence of disease may be underestimated (Gabriel, 2012; Wilburn, 2004). Whilst an attitude of unawareness possibly represents one factor, the physical and mental state of a health care worker can also contribute to a

needle stick or sharps injury. For example, health care professionals who do not have adequate rest would result in fatigue and tiredness, where they may lose focus and concentration (Gershon et al., 1995; Ilhan et al., 2006). In addition, some may be psychologically and emotionally burdened with personal problems with family and others, so they may not be able to concentrate at their work place. Ilhan et al. (2006) has suggested that it is important to understand that adequate rest is significant and also the importance of resolving family issues prior to work, particularly when there are risks to the individual and others, but this may be an unrealistic expectation.

2.8 Blood borne virus infections from needle stick and sharps injuries

This review has noted that HBV, HCV and HIV infections are capable of causing significant morbidity and mortality from unreliable practices with sharps devices and disposal of their waste products as discussed above (Gabriel, 2012; Gershon et al., 1995). Generally, there are varied transmission routes where these viral infections can be transmitted. These include blood transfusion, organ transplant, sacrificial body piercing, injection drug use, tattooing, sexual activities, sharps injuries, and mother to child transmission during pregnancy, at birth or early childhood periods (Karim, Karim, & Detels, n.d; Khan et al., 2000; Merican et al., 2000; Mujtaba et al., 2011). In a health care setting, percutaneous needle stick and sharps injuries is one of the obvious routes where these viral infections are transmitted to health care workers, (Blenkharn, 2009; Cardo et al., 1997; Gabriel, 2009). The risk of health care workers in both developed and developing countries acquiring these viral infections depends on the prevalence of infection among the general population and the frequency of patients, who are infected with the pathogens, seeking medical care in addition to the other patients (Glenngård & Persson, 2009; Moses, Pearson, Perry, & Jagger, 2001). Therefore it is important to highlight the significance of the general prevalence and incidence rates in order to create some awareness among the health workforce.

2.8.1 Prevalence and incidence

It is estimated that internationally there are 35 million health care workers which represent 12% of the working population (Wilburn & Eijkemans, 2004). These health care workers include doctors, nurses, community health workers and paramedical staff. It is estimated that potentially three million health workers who are involved in clinical practices could be at risk of exposure to contaminated needle stick and sharps injuries. Projections for the 30 years between 2000 and 2030 estimate that 16,000 HCV, 66 000 HBV and 1000 HIV infections could occur from contaminated percutaneous sharps injuries to health workers

globally per year (Prüss-Üstün et al., 2005). However, the global estimate of infections and deaths could be particularly significant from the developed countries. However, the incidence and prevalence rates may not be accurate due to a lack of surveillance and reporting especially by developing countries (Lee, 2009; Prüss-Üstün et al., 2005). For example, 90% of occupational exposures attributed to sharps injuries were reported to occur in North America and Western Europe compared to 4% in sub Saharan Africa where 70% of HIV infected patients are found among the general population (Lee, 2009). In addition, other developing countries in regions such as Asia and the Western Pacific including PNG also have the highest prevalence of HBV, HCV and HIV among the general population where health care workers in these regions are at high risk. Furthermore several studies have pointed out that PNG has a rapid incidence of HIV infections among the general population and the clinical health care workers may contract HIV infection from improper practices with sharps devices (Abdool Karim, Abdool Karim, Gouws, & Baxter, 2007; Luker & Dinnen, 2010; Madhava, Burgess, & Drucker, 2002; Merican et al., 2000; Moses et al., 2001; UNAIDS., 2007; Wilburn, 2004). It is imperative to note that if a health professional sustains an injury then transmission rates may differ depending on the exposure to blood or body fluid contents. Also these viruses have varied lengths of incubation periods once they enter a human host. Therefore, it is important to highlight all the significant information regarding the natural history including transmission rates, incubation periods as well as treatment and prevention options so that health workers may be aware of and consider the necessary precautions and assistance.

Hepatitis B virus

Wilburn (2004) has pointed out that the probability of transmission of HBV is 2-40% through needle stick and sharps injury. Other studies have estimated it to be 6-30% (Mendelson et al., 2003). In addition, the rate of transmission following a sharps injury from a HBV positive client is 23-62%. It is significant to understand that HBV is 50 to 100 times more contagious than HCV and HIV because HBV may survive for 7 days in an environment that is conducive at room temperature once exposed (WHO, 2010). Even though the incubation period for HBV is about 75 to 90 days, as mentioned, it may vary from 30 to 180 days, depending on the immune system of the infected person (WHO, 2013a). Therefore it is worthwhile to consider precautionary measures, as exposure to contaminated sharps from an infected source is high.

The onset of clinical symptoms indicates that a specific type of infection in the body's system may have occurred, therefore investigations ought to be prioritised for further management. As such, the typical symptoms for HBV include; jaundice or yellowish eyes and skin, dark colour urine, abdominal pain, nausea, vomiting and extreme tiredness (WHO, 2013a). These symptoms remain for several weeks and disappear naturally. If not they persist as a chronic condition (Shepard, Simard, Finelli, Fiore, & Bell, 2006). The persistent condition may then lead to chronic hepatitis, cirrhosis and hepatocellular carcinoma infections and eventually cause premature death (Kao & Chen, 2002; Lavanchy, 2004).

From a medical point of view, vaccination for HBV is available for health care workers as they are regarded as a risk population, because they deal with sharps devices (Cardo et al., 1997; Custer et al., 2004; Mast, Alter, & Margolis, 1999; Merican et al., 2000). The vaccine has to be administered in three doses within six months (Mims, Playfair, Roitt, Wakelin, & Williams, 1998; WHO, 2010). However the level of antibody acquired from the vaccine may reduce so a booster dose is recommended after one or two years to increase the immune level. Studies have indicated that those who receive full vaccination are 90% protected from HBV infection (Gabriel, 2012; Lee, 2009). However, some health workers may only receive the initial dosage and may not complete the full course so they may only have partial immunity. Therefore, it is important that they complete their vaccinations.

Health care workers who receive no immunisation at all are totally susceptible to HBV if they encounter needle stick or sharps injuries because they would not have any passive immunity (Wilburn, 2004). If they sustain a sharps injury then they could be treated with an initial dose of the HBV vaccine together with the hepatitis B immunoglobulin prophylaxis treatment (Cardo et al., 1997; Custer et al., 2004; Mast et al., 1999; Merican et al., 2000). The combination of this treatment is clearly explained whereby "passive-active immunity is induced by giving both immune globulins to provide immediate protection and a vaccine to provide long-term protection" (Levinson, 2006, p. 245). Their level of protection will be similar to a staff member who receives the vaccine as stated above (Gabriel, 2012). With respect to late stage treatment for susceptible health workers, it is recommended they take interferon and lamivudine medications (Shepard, Finelli, & Alter, 2005). The medications only reduce the inflammation of the liver and reduce the level of HBV in patients in the chronic cases (Levinson, 2006).

Hepatitis C virus

A number of studies have identified that risk of contracting HCV following a sharps injury by health care workers is 1.8% (Blenkharn, 2009; Mendelson et al., 2003; Prüss-Üstün et al., 2005; Standard Principles, 2007; Tate Jr, 2007; WHO, 2010; Wilburn, 2004). Furthermore, Wilburn (2004) highlights that the transmission risk could increase between 2.7-10% as it varies depending on an individuals' immunity level. After exposure the HCV has the potential to survive in an open environment for about 16-23 hours. According to WHO (2013b) the incubation period is two to four months. During these time periods the clinical symptoms are often asymptomatic or they develop flu like symptoms, including joint ache and mild skin rash. In addition, clinical symptoms such as "fever, anorexia, nausea, vomiting and jaundice are common" (Levinson, 2006, p. 298). These symptoms appear especially in the acute stage. These symptoms in the acute stage may become chronic and could affect 70-80% of individuals who are infected with the virus (Madhava et al., 2002). It takes about 20-30 years for a susceptible person to develop similar liver infections to that of HBV including liver cirrhosis and this occurs in about 10-20 % of infected individuals (Cacciola et al., 1999; Mast et al., 1999; Shepard et al., 2005; Wilburn, 2004). This infers that infected health care workers who are not aware that they are infected, may become surprised when obvious physical impacts present in the late stages of the disease. It is significant to be aware that as HCV does not have any vaccines or PEP treatment at present, other standard preventative measures should be practised as much as possible (Mast et al., 1999; Mendelson et al., 2003; Wilburn, 2004). Those health care workers who have contracted the HCV infection including chronic carriers can be treated with interferon and ribavirin (Levinson, 2006). Although all these treatments will not provide any cure they may reduce viral replication. Hence, those who are in a chronic state could possibly have a liver transplant (Wilburn, 2004). A liver transplant procedure may be possible for health care workers in developed and in some developing countries who have the necessary resources. However, the infected health care workers in other developing countries such as PNG, may not be able to afford such a costly operation and would lose their lives.

HIV infection

The transmission rate for HIV, as compared to HBV and HCV, is low and is claimed to be 0.3% from similar percutaneous injuries from contaminated sharps devices. However, the exposure risk may increase up to 5% depending on factors such as deep punctures or penetrations, visible volume of blood contaminants on sharps devices especially if they

were used directly on veins or arteries (Lee, 2009; Wilburn, 2004). The authors further contended that, exposure to patients who have high viral loads especially from those who are newly infected or in a terminal condition also increases the transmission risk. The incubation period for HIV is six to 12 months (Karim et al., n.d). Unlike HBV and HCV, the HIV virus may not survive longer once exposed into an open environment. The clinical symptoms include persistent diarrhea, fever, excessive weight loss, oral thrush, repeated fungal infections, other skin lesions and a prolonged cough despite relevant treatments (Karim et al., n.d; Levinson, 2006). These symptoms often progress to acquired immunodeficiency syndrome (AIDS) especially in the late stage when the body's immune system is low. HIV can be like HCV, a short acute illness, but often asymptomatic. That's why many people are surprised when they are infected with AIDS. Opportunistic infections such as tuberculosis, pneumocystis pneumonia, kaposi's sarcoma, herpes simplex, herpes zoster and cytomegalovirus develops during this stage (Levinson, 2006).

There is no vaccination for HIV, however treatment to control the replication is available on a global level both for the public and for health workers (Abdool Karim et al., 2007; Rey, 2011). Health care providers are encouraged to take PEP drugs, which are Zidovudine tablets, for 4 weeks if they have been exposed to needle stick and sharps related injuries (Marfatia, Ghiya, & Sharma, 2007; Wilburn, 2004). Even though the PEP treatment may not cure the infection it may provide some barriers and would reduce the production of new HIV cells (Rey, 2011). In addition, it has been confirmed that 80- 81% of HIV infection risks were reduced through this drug administration (Rey, 2011; Wilburn, 2004; Wilburn & Eijkemans, 2004). Therefore, for effective result it is advisable to follow the necessary procedures and take the drug within two hours or no later than 72 hours following an injury, as it replicates within this time frame (WHO, 2010; Wilburn, 2004).

Generally, ultimate prevention for all these BBV infections is better than the medical interventions and PEP treatment. The interventions may consistently be available in resourced and well equipped countries as well as in some developing countries which can afford them. However some health care workers may take these opportunities for granted. The health care workers in most developing countries may not have such opportunities or have only one of the therapies or preventive measures in place. It is essential that those who have such opportunities, make good use of them and those who do not, should be considerate and take appropriate preventative procedures when working with sharps

devices when and where necessary (Gabriel, 2012; WHO, 2010). Note that sharps related injuries that occur to health care workers not only affect the injured staff member, they also contribute to certain problems in their families and organisations, as well as for their patients who they care for, which is important to take into consideration.

2.9 Implications on injured staff and family

Over and above the physical injury, health care workers who are probably aware of the health implications of BBV infections would be psychologically and emotionally traumatised (Gershon et al., 1995). This could then lead to fear, worry, discomfort and embarrassment (Gabriel, 2012). Eventually, the infection may lead to premature deaths as mentioned earlier, if appropriate medical assistance is not sought as early as possible (Gabriel, 2012). In addition, while going through the process of seeking medical assistance, precious money and time will be spent, which could be used for other purposes. In addition, those health care workers who do not have the extra money for necessary medical assistance, might not receive the desired service and might be discouraged. This would further add on to their stress level.

Members of their families could be affected in terms of the social, economic and physiological aspects of the situation as the injured staff may not be able to support and sustain the families' welfare if he or she is the main and only provider (Blenkharn, 2009; Moses et al., 2001). In addition, fear of transmitting similar BBV infections to the spouse may instigate conflicts in relationships and domestic violence may arise. For example, in PNG, family conflict may occur because the innocent person will find ways to accuse or intimidate the suspect or the infected individual (Luker & Dinnen, 2010). They may also be stigmatised, experience low self-esteem. and discrimination from friends, work colleagues and extended family members, as they might not feel accepted in the entire family or society (Aisien & Shobowale, 2005). As health care workers exposed to the above viruses, are impacted in several ways, discussing this in further detail is relevant.

2.10 Impacts on organisation and patients

According to Lee (2009) occupational exposure exhausts human recourse and has an indirect impact. It is also noted that the injured staff members may quit work for fear of transmitting the infection to their patients and also due to a lack of preventative support from the organisation, may prompt their choice to leave or seek a job elsewhere (Blenkharn, 2009; Lee, 2009). Consequently, the health setting may lose valuable staff and it will take some effort, time and money to advertise, recruit and train prospective

replacements (Moses et al., 2001). Whilst in the process, this may have the effect of creating extra work for their existing staff, as they look for strategies to cover the injured colleagues' duty schedules or shifts.

Furthermore, the cost of laboratory investigations and medical treatment for both the injured staff and source client, places an increased financial burden on the organisation (Glenngård & Persson, 2009). Budgets, funds and monies that could be used for other purposes would be diverted to meet such expenses so therefore, it would be more appropriate to avoid additional financial stress on the organisation's management. Furthermore, it would increase the work load for those health professionals who would be required to carry out various investigations, as well as those who would administer treatment to their injured colleagues.

Lee (2009) further identified that health care workers may reject patients' rights to treatment because of fear of exposure. This was evident in a study in Nigeria where 58% of surgical doctors denied surgery to HIV positive patients (Adebamowo, Ezeome, Ajuwon, & Ogundiran, 2002). While the surgeons were concerned over their health and safety, the poor patients may have felt discriminated and would not want to seek further assistance. Another impact is that patients may miss out on professional treatments and care they could receive from those injured health care workers, while they go through the process of seeking medical assistance or they quit their job (Blenkharn, 2009). For example, patients who are admitted with primary conditions may not improve and this could prolong their length of stay in the health facilities. During this extended period they could be prone to contract health care acquired infections which may also increase similar financial and workload issues to management and existing staff members (Raka, 2009). Not only this, it also increases the financial burden and creates other social issues and pressures for the patient and family members. Furthermore, if a working class individual is a patient then this may affect his or her ability to provide support for family obligations. In addition, some patients who are critically ill might possibly die and this could be relevant to patients in some developing countries including PNG where health workers with similar skills may not always be available to substitute, especially if they have special expertise (Garner et al., 1990). In addition, a report from the WHO has highlighted that there are fewer than ten physicians per 100,000 populations in 15 countries in the sub Saharan region, compared to 250 physicians per 100,000 people in the US (Moses et al., 2001). A similar difference also exists between the numbers of nurses in these developing countries compared to the US. These are some of the complex problems that arise from

possibly the largest unrecognised cost of failing to support safe sharps practice techniques and waste management, particularly sharps disposal activities in health facilities in most of the developing countries, including those in PNG.

2.11 Conclusion

In summary, sharps devices are important instruments that are used in health facilities to save the lives of patients seeking medical care. However, unsafe practice of handling and improper disposal technique is risky and it is a global public health problem. Contributing factors to such unsafe practices rest with both management and individual staff members. The adverse effects of unsafe practices result in a serious health hazard for health care workers as they can be exposed to BBV infections through percutaneous needle stick and sharps injuries. Among the three BBVs, possible transmission of HBV is much greater than HCV and HIV as it has the potential to survive longer in an outside conducive environment. If health care workers accidentally encounter sharps related injuries, it affects them physically, psychologically, economically and socially. And it also indirectly affects their family members, the health organisation and the patients who seek medical care. Eventually, in some situations, it results in early deaths.

Therefore, the developed countries have attempted to develop relevant policies about safe practice and sharps waste management and implement them accordingly. Provisions of prophylactic treatment and relevant preventive measures are also consistently available for use. Nevertheless because health workers still lack basic knowledge and skills this impedes the effectiveness of the set regulations. The developing countries may lack sufficient provisions with regard to appropriate methods and practices and whilst attempts are made to educate everyone even so their compliance is often times still lacking. Still in all, the factors affecting these issues are studied in developed and in other developing countries. Relative studies are yet to be done in PNG, especially in WHP, to identify barriers and determine strategies that can be instituted for best practice.

Chapter 3. Research Design/Methodology

According to Amaratunga, Baldry, Sarshar, and Newton (2002) research is an approach where considerable investigations are carried out through using an organised methodology. Furthermore, methodology is defined as “the branch of knowledge that deals with methods and its application in a particular field and also the study of empirical research or the techniques employed in it” (Shorter Oxford English Dictionary, 2002, p. 1762). Scholars have described methodology as any structure that provides guidance to investigate an intended topic of interest to produce quality and relevant evidence that can contribute wealth of knowledge (Amaratunga et al., 2002; Baum, 2008; Gilbert, 2001).

3.1 Types of research methodologies

There are two broad types of research methodology, one is quantitative and the other is qualitative methodology. Some researchers combine both the quantitative and qualitative approach to suit their research objectives and this is referred to as an integrated or mixed methodology. In this approach, one method sets the foundation for the other, providing balance and addressing any weaknesses, to strengthen and support the findings (Amaratunga et al., 2002; Anderson, 2006). The quantitative and qualitative methodologies provide or offer a distinctive methodical approach to data collection.

A quantitative research approach seeks to answer questions such as “how much”, how many, who and when (Babbie, 2008). It aims to resolve cause and affect relationships from an objective scientific perspective. Also it consistently measures and describes the nature of specific phenomena. In social investigation, “Quantitative research is essential for describing the extent and pattern of disease and factors that are related to it within a community” (Baum, 2008, p. 142). Therefore, large samples are random and findings are generalized to the whole population (Baum, 2008; Sarantakos, 1998). Data collection using a quantitative methodology is often carried out using instruments such as, scientific experiments, laboratory investigations, and survey interviews with structured questionnaires (Amaratunga et al., 2002; Gilbert, 2001). Investigations with survey interviews are often used in public health as an approach as they generate information about the general population and are relatively quick and easy to administer (Baum, 2008). However, this method does not provide any opportunity for participants to interpret or justify their answers in detail because the answers or options are already structured based on the researchers’ assumptions. The findings are explained using tools such as frequency tables and tests of statistical significance (Babbie, 2008; Baum, 2008).

Qualitative methodology focuses to answer questions such as why, what and where (Babbie, 2008). With regard to a public health approach, “qualitative research can describe the meaning of disease, poverty or caring and can help us understand how public health strategies can assist in solving the problems” (Baum, 2008, p. 142). Other scholars contend that qualitative methodology in research is a form of enquiry that intends to interact with people to interpret and make sense of their experience about the world in which they live (Anderson, 2006; Babbie, 2008; Gilbert, 2001). Interactions between the researcher and a respondent are viewed as an essential component of the research procedure. It enables researchers to obtain in depth and rich information from the real experiences and perceptions of the participants. This methodology uses purposive or theoretical sampling approaches to select specific participants who represent a certain population of interest. Methods used for data collection are observation, focus group discussion and interviews. Capturing of image is also considered a way of providing evidence (Gray, 2009). Information collated from these methods does not usually involve numbers to analyse the findings, rather it provides textual descriptions in detail (Baum, 2008). However, it is argued that numbers are sometimes used to count or categorise certain aspects (Gray, 2009).

3.1.1 Methodology used for this study

This study has explicitly selected descriptive qualitative methodology as a form of inquiry as it deals with complex settings and provides descriptive and explanatory explorations (Baum, 2008; Gilbert, 2001; Punch, 2005; Sandelowski, 2000). The methodology that offers the best fit for the study design is the descriptive qualitative method as it involves participants who would be able to voice their experience and perceptions regarding sharps related issues.

3.2 Qualitative methods

There are various methods, such as observation, focus group and interviews used in qualitative enquiry to collect information as mentioned above (Harding, 2013). The choice of method depends on the research topic. For example, an observation method may best be selected by a researcher who would study ethnography, where people may be observed in their natural setting over a time period. “The participant observer gains first-hand knowledge of what people say and do in their everyday lives. The interviewer relies extensively on verbal accounts of how people act and what they feel” (Taylor & Bogdan, 1998, p. 88). However, Harding (2013) emphasises that the most popular methods used in qualitative research include two methods which are focus group

discussions and interview sessions. The interview session involves individual conversations with two distinctive approaches. Therefore it is essential to explain each of these methods in detail for clarity.

3.2.1 Focus group discussion

A focus group is one of the primary methods as it involves a number of participants whose discussions are around specific matters of concern (Harding, 2013; Liamputtong & Ezzy, 2005). One advantage of this method is that detailed information is collected within a short period of time using limited resources (Babbie, 2008; Baum, 2008; Gilbert, 2001). Also this method allows participants to have control over the research questions and openly discuss and exchange information within the group. However, the researcher must ensure that no group member dominates the discussions (Gilbert, 2001).

It can be ineffective if some participants are reluctant to disclose vital information in case of discrimination if they perceive others in the group cannot be trusted to keep information confidential (Baum, 2008). Therefore, in some situations some problems might not be fully disclosed, so resolutions for improvement may not be possible all the time.

3.2.2 Unstructured or in depth interview

The unstructured or in depth interview is another primary method utilised in qualitative data collection. This type of interview can be conducted employing open ended questions via face to face interactions with individual participants. This approach allows participants to explicitly express and assert their views, perceptions and understanding based on personal life experience and interpretation of the social setting (Babbie, 2008; Baum, 2008; Ruane, 2005). In order to explore and encourage the participants to share their views “the interviewer may have a single question that they begin with, then ask follow-up questions based on the responses to the first one, or they may have notes of a number of points that they wish to raise in the course of the interview” (Harding, 2013, p. 32).

In this instance, the interviewer may be biased because further questions may be asked based on his or her own interest and therefore may ignore other important explanations the participants may want to express (Harding, 2013).

Conversely, the respondents are given enough time and choice to discuss around the main research questions so they could provide detail and descriptive information regarding the

interview question (Bernard, 2006; Gray, 2009). It is noted that the interviewer has less control over the responses given by the respondents. Therefore if the information is multifaceted then it can be difficult to identify common ideas and also time-consuming to analyse (Amaratunga et al., 2002; Harding, 2013). As this method requires time for detailed discussion or explanation around an issue, those who have busy schedules may not be able to participate thoroughly so they may appreciate the efficiency of a semi-structured interviews.

3.2.3 Semi structured interview

In a semi-structured interview, several topics are developed from the main research question. Scholar has pointed out that, “even though it has much of the freewheeling quality of unstructured interviewing, and requires all the same skills, the semi structured interview is based on the use of an interview guide” (Bernard, 2006, p. 212). In addition, as the interview guide has clear instructions it directs the researcher, and the questions are asked based on related topics and it can be in any order (Harding, 2013). During the conversation, the participant may provide answers for other questions so the interviewer has to take note of this. Furthermore, the semi structured interview allows the interviewer to have control over the overall interview session and keep the participant on track thus avoiding too much or possibly irrelevant information (Baum, 2008; Gilbert, 2009). The researcher can also encourage the participant to explain his or her response in more detail or provide an alternate idea to expand the answer using probing skills (Gilbert, 2001; Gray, 2009; Harding, 2013).

3.2.4 Photo image as a tool

According to Gray (2009, p. 186) “photographs allow the detailed recording of facts, including the presentation of lifestyle and living and working conditions”. Thus data gathered from the interview sessions could be confirmed through the images taken. Even though these may cause some embarrassment if poor practice is revealed, on the other hand it may be useful for justification to gain relevant support for improvement or recognition for commendations of good practice.

3.2.5 Method for this study

The method of choice for data collection in this study consists of semi-structured interviews using open-ended questions (Baum, 2008; Gray, 2009). Photo images are also used to provide additional evidence. This method was considered as a significant

tool in assisting the researcher to explore a health setting in more depth, but enabled a structure to be applied to the interview setting.

3.3 Research questions

The main research question that has guided this study is: what are the safe practices and methods currently used to handle and manage sharps waste in rural and hospital settings in WHP of PNG? In order to answer this question the following topics were discussed in detail:

- Demographic and employment details
- Training and knowledge about sharps
- Handling and disposal of sharps in daily clinical practice
- Types of disposal items or methods and supply sources
- Knowledge of sharps waste management policy and availability of other related protocols
- Previous history of occupational sharps related injuries and reporting protocol
- Any other reasons identified by the participant

3.4 Participants

Participants refer to the persons involved in research projects who provide relevant information. In this study, the purposive method of sample selection criteria was applied to select the participants (Babbie, 2008; Berg & Lune, 2001). This comprised of a small sample of health care workers, with varied qualifications, who work with sharps devices for a range of different purposes in the Western Highland Province of PNG. Some held management roles and the other participants represented other staff groups who hold positions under Nursing, Medical and Rural Health Directorates. The significance of considering participants from different directorates was to obtain views from professionals from different areas who also possess different expertise. Details of the recruiting process are discussed in the following section.

3.5 Research procedures

Before the actual process of data collection at the research sites, it was recognised that certain procedures had to be fulfilled in order for the study to run efficiently. This section describes some significant procedures that were followed prior to conducting the field research.

3.5.1 Proposal

A research proposal is an essential tool as a form of preparation prior to any study (Babbie, 2008). As such, a proposal was submitted to Auckland University of Technology, Faculty of Health and Environmental Sciences Postgraduate and Research Committee stating the rationale for the research, proposed methodology and methods, and overall research process including time schedule and budget (Liamputtong & Ezzy, 2005).

3.5.2 Ethical issues

Ethical consideration is an important issue in any research that involves human participants (Babbie, 2008). This is to consider the welfare and safety of the participants and their rights during the research process. The main ethical principles surrounding these aspects include: do no harm, do good, respect autonomy and ensure confidentiality and anonymity (Weed & McKeown, 2001).

Ethics approval in New Zealand

An ethics application was submitted to the Auckland University of Technology Ethics Committee (AUTEC) and approved on the 9th May 2013 (Appendix A). One particular ethical issue which arose was the safety of the researcher in carrying out the research. To address this concern, a communication network was established with the Chairman and Chief Executive Officer (CEO) of the WHPHA ethics committee, whereby the researcher kept in contact with these individuals throughout the course of the research. As she is a native of PNG, it was understood that she is familiar with the local language and the culture and as such, it was not anticipated that any other security issues would arise.

Ethics approval in PNG

In order to carry out the study, it was also necessary to obtain ethical approval from the Chairman of the Ethics Committee of the WHPHA. Before this could be approved, permission to carry out the study needed to be obtained from the head of the management team (Liamputtong & Ezzy, 2005; Taylor & Bogdan, 1998). Therefore, a formal letter was written and sent to this person requesting this permission (Appendix B). An approval was granted with an assurance to support her where necessary (Appendix C). Upon arrival in WHP, a copy of the ethical approval letter from AUTEC and the letter giving permission to carry out the study was delivered to the Chairman of the Ethics Committee. This was granted. Also permission was given to utilise an office space, library and internet services in the hospital setting.

3.5.3 Recruitment process

An advertisement for voluntary participation including contact details was circulated to the selected health facilities (Appendix E). Those who were interested in participating were encouraged to contact the primary researcher directly via phone or by text message. The interested health care workers then contacted the researcher. Participant information sheets were given to potential participants, with clear explanations for the prospective participants to read and decide within a week if they would like to participate (Appendix F). Based on their responses, schedules for interview sessions were organised accordingly at convenient times for them.

3.5.4 Data collection

The research involved carrying out semi-structured interviews with each of the participants. The research was initially planned to include 16 participants including health extension officers based at health centres in rural settings as officers in charge. However, during consultation with potential interviewees, it was discovered that two health extension officers were not allocated so that role has been filled by senior nursing officers. Also because a technical lab position was not established in one of the rural centres and another potential candidate in the urban area was not interested in participating, it was not possible to conduct four of the 16 interviews.

Where an invitation was accepted, face to face interviews were conducted, using questions from the thematic section on the interview guide, and discussions spread out to other sometimes unexpected themes. This approach was effective in gauging the comprehensive views, perceptions and practices of the participants. Use of prompts and probing skills were useful during the conversation (Gilbert, 2009).

From time to time the researcher asked extra questions to keep the participants on track and also to give them an opportunity to provide more detailed explanations to the original questions and to encourage them with respect to options or alternate ideas to expand their answers (Babbie, 2008; Gilbert, 2009). Consequently, each interview lasted about 60 minutes. Even though the questions were asked in English, detailed explanations were in Tok Pisin, one of the common languages; this was so that the participants could fully understand, and so they responded in both Tok Pisin and English.

Photo images

Photo images of relevant items and equipment used for sharps waste disposal at the waste generation sources and final management methods were captured towards the end of the meeting. The staff on duty at each health facility received a brief explanation regarding the purpose of taking the photos, and once they understood the purpose they agreed to assist. However, to maintain everyone's privacy, careful consideration was taken to ensure that the images of those who assisted as well as those who were on duty were omitted.

3.5.5 Management of data

To maintain their privacy, each health facility was assigned a code number. Code numbers were also applied to the participants in sequence. To avoid any possible loss of data from technical problems, the interviews were recorded on two digital tape recorders (McNiff & Whithead, 2011). Clear and accurate recording is significant because it is helpful to facilitate appropriate translations (Gilbert, 2009). To ensure that each conversation was appropriately recorded and no information was omitted the recorded information was replayed after each interview session. The interviews were translated to English by the researcher herself.

3.5.6 Analysis plan

Tables were drawn up for each major theme. To understand the data and the significance of the answers to the questions that emerged from the transcriptions of the interviews it was necessary to sub categorise themes. The extent and detail of the data analysis approach are discussed in the next chapter.

3.6 Time frame

The trip for the initial data collection started on the 24th of May 2013 and ended on the 24th of July 2013. Overall the data collection procedure took six weeks, incorporating a scheduled two weeks for each health facility. The last two weeks was used on final organisation of the data as well as preparation for my return trip to Auckland, New Zealand.

3.7 Conclusion

In summary, research projects are often carried out either by using quantitative or qualitative methodology or a combination of the two. Although the questions involved in seeking answers to the research problem differ, as well as the methods for collecting the

data, they both seek to generate and contribute knowledge to clarify, make sense of and understand our world. For this study, the qualitative descriptive methodology has best answered the questions involved in identifying issues affecting appropriate practices and methods in sharps waste management in complex health settings in one of the provinces in PNG. Semi-structured interviews enabled targeted questioning, whilst allowing participants to voice their own opinions and offer new perspectives. Therefore this was considered in this research. After gaining the necessary approval required for the research process from both AUT and WHPHA in PNG, it took two months for data collection in the field.

Even though the participants' involvement in the data collection process was on a voluntary basis, consent was obtained for ethical purposes. In order to obtain a wide range of information, health workers with different qualifications who are involved in handling and disposing of sharps devices were selected to participate. Photo images were included to provide collaborating information. A thematic analysis was undertaken.

Chapter 4. Data Analysis and Findings

Data analysis is defined differently among researchers who use the qualitative approach as a methodology (Punch, 2005). Data analysis refers to methods used to identify in depth meaning contained within a raw data (Bazeley, 2013). In order to discover deeper meanings, many approaches such as hermeneutic, critical, discourse, semiotic, content and thematic analysis have been developed (Bazeley, 2013; Liamputtong & Ezzy, 2005). The methods researchers use to critically analyse the raw data depend upon their interpretation of the qualitative research based on the research topic (Patton, 2002). This is because there are not any absolute rules or prescribed formulas addressing the qualitative data analysis to determine the meanings. Therefore the researcher must find suitable ways to clearly explain the information that best suits the purpose of the research (Patton, 2002). Different techniques can be applied to synthesise the information with the qualitative research approach. According to Gray (2009), data analysis entails the procedure of breaking data into smaller units to disclose their distinctive components and structures.

4.1 Data analysis approach

With respect to qualitative data analysis, researchers critically examine the data to ascertain patterns, themes and categories in order to identify the significance and the meaning of the data in accordance with the participant's personal views and experiences (Gray, 2009). According to Bazeley (2013) qualitative analysis obviously changes data into findings which then translates into information. So in order to establish an approach that would provide the necessary results which could then be known as translated information from this descriptive research, a thematic approach was selected to analyse the data collected from the field trip. A group of scholars have acknowledged that the thematic approach allows the findings to emerge from the frequent, main or important themes found integrated in the raw data (Bradely, Curry, & Devers, 2007; Ryan & Bernard, 2010). In this study the major themes were developed based on the literature review prior to the data collection (Pope & Mays, 2006; Ryan & Bernard, 2010). As such, sub themes were then developed during the actual analysis process. In order to identify the sub themes, the recordings were repeatedly listened to. Recordings were then transcribed and all data was put into a recognised thematic framework. They were then thoroughly examined, read several times and referenced in textual form by marking the transcripts with appropriate codes per facility.

According to Harding (2013) coding is a key process of simply selecting, sorting, separating, categorising and synthesising data. Coding also provides links between ideas and identification, pin pointing where to locate and retrieve information if and when necessary. As such, qualitative coding involves data recollection rather than data reduction (Bazeley, 2013). Therefore, data in this study was then rearranged according to the appropriate part of the thematic framework to which they related. This was done to find connections between common themes with a notion of providing clear descriptions for the findings, including similarities and differences (Green & Thorogood, 2009; Pope, Ziebland, & Mays, 2000). In this analysis, the group of meanings were developed from the respondent's views and expressions based on their clinical experiences and knowledge, with regard to the use of sharps devices and disposal methods in their respective health facilities in WHP.

4.2 Results /findings

The results from this research are specified in a textual description of what was experienced and a structural description of why it was experienced (Baum, 2008). Some information is presented with a flow chart, a tables and related quotes to reflect and portray respondents' personal voices, experiences and suggestions whilst performing their duties related to sharps usage and disposal aspects. Thus detailed information about each of the transcripts is in Appendix G for reference. The images captured on sharps disposal methods are included between relevant themes as proof of available practices and methods currently in use. These images will provide a clear view of the reality to confirm the information collated in the interview sessions (Gray, 2009).

4.3 Theme one: Demographic and employment details

4.3.1 Demographic information

Six females and six males comprised of health workers from urban (n=5) and rural (n=7) health settings took part in the research project. Their ages ranged from 24 to 45 years, with the average age 38.3 years and the median age 41 years.

4.3.2 Current job titles

The majority were nursing officers (n=7). Three community health workers also participated, one medical officer, and a laboratory technician. Four nursing officers performed administrative and clinical duties, and three performed general clinical nursing duties only. The community health workers also carried out general clinical nursing

duties. The medical officer performed specialist procedures including operations and the laboratory technician performed technical duties.

4.3.3 Previous experience

Seven had worked in the same organisations since finishing their training. The others (n= 5) had previously worked in health care facilities managed by church or private organisations. Two respondents from urban settings had spent seven and ten years working in other health care organisations before joining their current place of employment, whilst three respondents in the rural locations had worked in other health care organisations for nine months, one and 22 years respectively.

4.3.4 Total length of employment

Nine had been in employment for at least 11 years. The remaining three had relatively less experience, having been employed for between one and five years.

4.3.5 Length of current employment

Six participants had worked between zero and five years in their current position. The other six had worked for at least 16 years in their current job.

4.3.6 Type of services

The type of health care services respondents provided was based on their qualifications and job descriptions. Clinical care carried out by both nursing officers and community health workers included deliveries of babies, injections, oral and IV treatments, inserting IV therapies and catheters, suturing minor lacerations and dressing of wounds. In rural settings, some of the senior nursing officers performed general administrative duties as well as clinical practice, and were called upon to provide on-call services between their shifts. Others would be asked to cover on-call shifts for their speciality only, as well as working their usual shifts. The laboratory technician provided diagnostic tests for only a few infections, as major tests were referred to the urban setting. In urban areas, nursing staff tended to adhere more to carrying out clinical duties, although some senior staff carried out administrative duties at the ward level. Some of the staff mentioned they had also been asked to provide occupational health and safety services. The medical officer provided specialist operations and other clinical procedures.

Some staff employed in urban settings mentioned they rotated between different wards and/or moved between in-patient sections and out-patient departments.

4.4 Theme two: training and knowledge about sharps

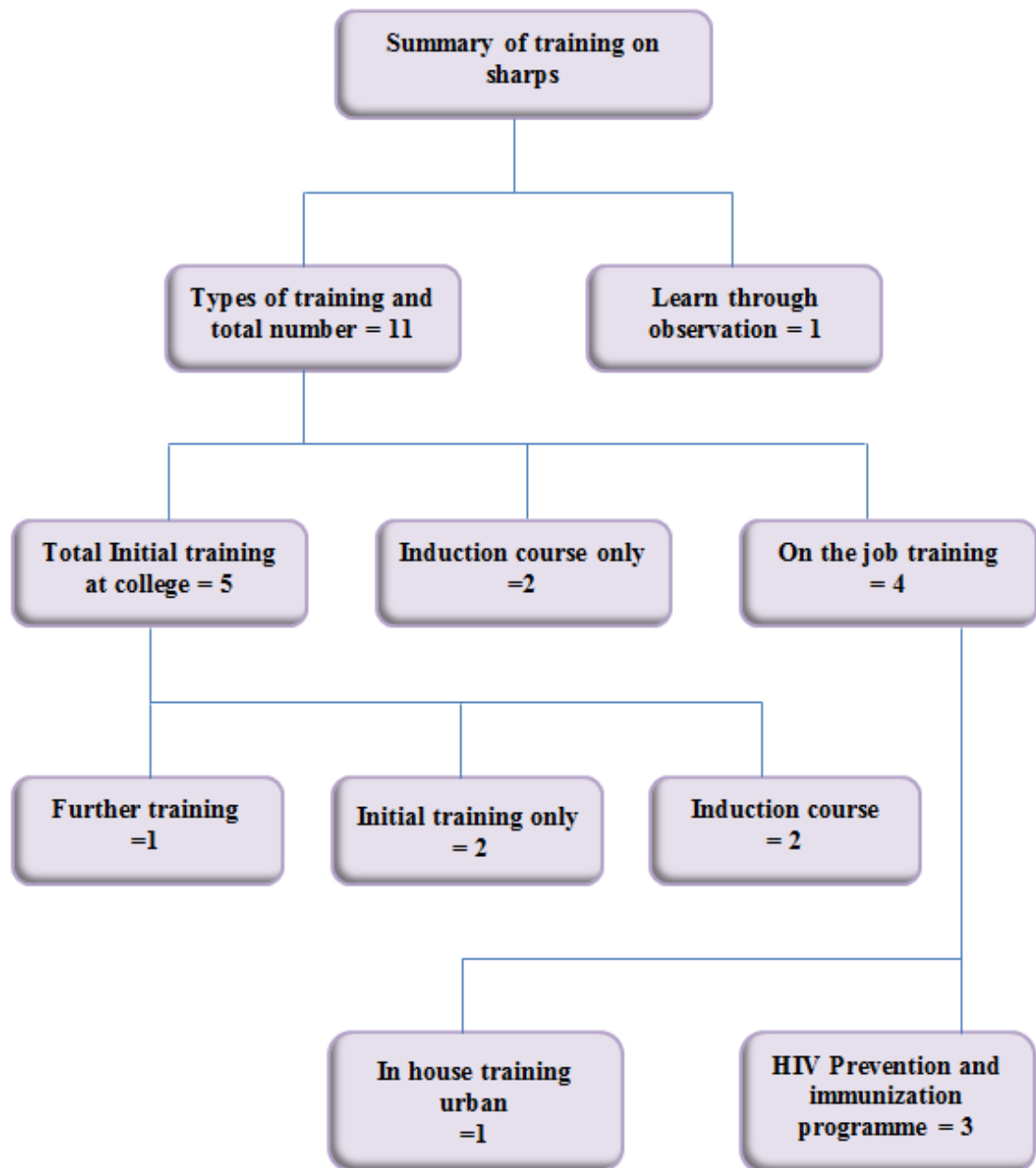


Figure 3. A flow chart depicting types of training gained by the participants

All respondents except for one had received some sharps related training. Training had been undertaken in different ways. Five had received initial training during their study to become qualified professionals. Of these, three had additional training through further education and induction programmes, and although induction periods were not routinely offered to staff from rural areas, they had recently attended the induction course through the initiative of WHPHA. Two staff members from the urban settings attended induction sessions while one respondent had learned only through observation. Four had received on the job training, that is, one through in-house training in the urban setting and the others in rural settings, through HIV prevention and immunisation programmes only.

4.4.1 Length of training and specifications

The length of initial professional training was four years for the medical officer, three years six months for nursing officers, three years for the laboratory technician and two years for community health workers. Further training for nurses was for a year. Induction to new employment programmes had lasted for one week. On the job refresher training courses had lasted from a day to a week.

4.4.2 Training received during HIV prevention and immunisation programmes

Respondents from the rural settings with on the job training, had received it through HIV and AIDS prevention at the workplace and immunisation programmes. Initially as training to combat HIV and AIDS became popular, basic information about sharps was incorporated in those programmes. One of them had specific training about sharps related to HIV prevention at his previous employment. Generally the majority did not impart what they learned to their colleagues and subordinates. The respondent who had had no training learned about sharps through observation and illustration from immediate bosses and colleagues.

4.4.3 Definition of sharps and their dangers

All respondents described how sharps are used in health settings. For example, they were all able to identify needles such as injection and suture needles as sharps, whilst one also defined lumbar puncture needles as sharps. The majority defined scalpel blades, and some also identified IV cannulas and lancets as sharps. A few also mentioned vials, scissors and forceps while one person referred to razor blades and one to broken glass as sharps. Only one respondent from a rural area described syringes as a type of sharp.

The majority defined sharps as dangerous devices which could harm them, and realised the risks sharps pose, to themselves, their colleagues, patients and the general public. One participant explicitly defined sharps in the following way;

I understand that sharps are objects that can penetrate into human tissue and may cause injury. Sharps may also cause blood borne infections if they are contaminated with the blood borne viruses.

4.4.4 Perceptions about the adequacy of information provided

Not everyone who attended training believed they had been provided with sufficient information. For example, the majority from rural areas explained that only basic information about sharps handling and disposal was taught. As a result of this lack of

adequate knowledge, some respondents explained that they disposed of sharps into other waste bins.

The infection control and prevention programme, which comprised the “orientation and on the job training” was considered to be particularly useful. During the interviews, one of the respondents pointed out the impact of this programme as follows:

I was not aware of the importance of sharps until the introduction of the infection control programme where training was initiated about eight years ago.

Another respondent indicated that she had become more aware of the dangers associated with sharps. For example, previously she thought that cross infection could only occur from sources other than sharps. As a result of her participation in the interview, she said she understood the significance of taking precautions and would include these safeguarding practices in the future.

4.4.5 Orientation at the work place

Few participants were orientated on the importance of sharps practices and methods during their initial day of work in a new work section, except one in the urban setting. The respondent in the urban setting was orientated, as she would work specifically in sharps waste management. Those with many years of experience commented that sharps waste disposal was never an issue of concern before the introduction of infection control training and was not covered in their induction process when joining a new ward. They considered that even with the greater emphasis on infection control in recent years, workers were not necessarily trained about sharps handling and disposal because the immediate ward managers and officer in charge may consider this to be a minor issue, and they took it for granted that staff would know how to do this. They mentioned that their bosses assumed that they knew what to do. More senior staff who were interviewed also commented that they had not received orientation at the workplace, again, because it was assumed that they knew the correct procedures. They all mentioned that they learned about sharps handling and disposal by observing the practice of others in the same sections.

4.5 Theme three: Handling and disposal of sharps in daily clinical practice

4.5.1 Handling of contaminated sharps

In the ward sections, contaminated sharps were discarded directly after each procedure because the trash boxes were within their reach, except when engaging with individual patients. Then they carried them with their hands as they did not want to push the treatment trolley to and from patients' bedside. However, a few responded that they either placed them on a kidney dish or paper bags but not always. One respondent from a rural area stated that he carried the sharps in his hands to and from the patients' bedside because the treatment trolley which has the sharps box attached, malfunctioned, so he never used the trolley.

4.5.2 Recapping practices

Besides other sharps, injection needles were mostly used every day so the majority of the respondents recapped them. They also observed that their colleagues had performed the same practice of recapping. Some avoid recapping at times but if they were busy, they forgot, so they recapped at these times. A few recapped in their previous job as it was normal practice during their employment with another health organisation, prior to their employment with their current organisation.

During the process of recapping, the majority reported they held the needles with both hands and pushed the cap in, except for a few who took precautions by placing the cap on the hard surface and gently pushed the needles in. Besides the needles, one of the respondents who mostly used lancets commented that he bent the pointed edges prior to disposal and also even if he was busy, he ensured the needles were recapped as well.

4.5.3 Rationales for recapping

The majority responded that recapping was purposely done to avoid blood spillage on the floor as well as to prevent accidental injuries to self, colleagues, waste handlers, patients and the general public. Other respondents deliberately recapped for safety reasons as they commented that their final waste disposal method was not safe. Also a few commented that needles might penetrate through the disposal item and become a risk to others so therefore recapping was practised. One mentioned that she only recapped when she dealt with individual patients. This was because she carried the devices in her hands and she feared that it might prick her or others in between the walking distance towards the location of the disposal item. Otherwise she avoided recapping during normal treatment

schedules as disposal items were attached on the trolley. One respondent from a rural setting commented that he could not change his habit despite being told because it had been a routine for him in all his years of service.

4.5.4 Disposal technique

Prior to disposal, the majority of the participants in the urban areas separated needles from the syringes in an attempt to control fast filling of the disposal items. The other respondents discarded them as a single item. The majority of respondents from rural areas disposed of both needles and syringes as a single use item, including other sharps, such as scalpel blades into one trash bin, however some were not sure whether this was a correct practice. A few sometimes removed the needles and disposed of them separately. However, on conditions when they had ran short of sharps boxes, they were advised by their officer in charge to separate them, whilst waiting for new stocks.

4.5.5 Location of sharps disposal boxes

The majority of the respondents from the ward sections both in urban and rural locations hung the disposal items on either the trollies used on ward rounds or on the trollies used for the treatment of individual patients, as appropriate. Others placed them on bench or table tops and office floors. A few of those who placed disposal items on the table or bench top stated that it was for safety reasons as they might accidentally drop the box open if it were placed on the floor. However, some mentioned that putting the sharps box on the bench or table top was not safe because it may spill over, particularly as the working environment was always busy.



Figure 4. Placement of a sharps box on a treatment trolley in a ward section
Source: Researcher

4.5.6 Access to sharps boxes

All participants would put the contaminated needles into sharps boxes. They explained that most other colleagues would do the same, but had noticed that some new employees forgot to do this at times, especially when they were busy. Also some commented that they misplaced sharps into other nearby bins when they were busy as well. A respondent that kept the disposal item in the office brought it to and from the procedure sites to minimise risk of excessive handling.

4.5.7 Acknowledgement of receiving injuries

All participants except one, (who did not think he was at risk as he had never received a sharps injury) identified reasons why they thought they might be at risk of receiving sharps injuries. From the urban perspective, the majority stated that due to staff shortage and a high staff to patient ratio they were always busy, rushed to carry out procedures and were tired due to the pressure of work. A few added the difficulty of maintaining concentration when working night shifts, especially in the early hours of the morning. This was also mentioned as being a problem for their colleagues, and one mentioned that he had received a sharps injury from a colleague when they had been working early in the morning together at the end of a night shift. One respondent commented about the stress of workplace demands placed upon her by her superiors, which she felt made it difficult to concentrate and more likely to be injured. Others commented that their own laziness and careless behaviour could also put them at risk of receiving a sharps injury.

Similar concerns were raised by those working in rural areas. Additional factors thought to contribute to the risk of receiving a needle stick injury included recapping, lack of orientation and light issues, especially during night shifts because they worked alone. Half of the participants explained that only a generator is used to supply power and usually it is turned off after 10pm. Therefore, they used other light sources, such as a phone light, a torch or a lantern to provide light to treat patients. Although other rural areas did have a main power supply, one of the respondents raised the issue that light fittings were not always provided and that power failures occurred.

4.6 Theme four: Types of disposal items and methods

4.6.1 Supplier of sharps boxes

One of the respondents with knowledge of the process explained that sharps boxes are procured from and supplied by the National Government through the Department of Health and transported by ship to Lae City (the nearest port). The items are then

transported by road and stored at the Area Medical Stores in the Western Highland Province. Hospital pharmacists and officers in charge in urban and rural areas are responsible for obtaining sharps boxes. Some rural respondents explained that additional disposal items were supplied by AUSAID and Family Health Services Division in the province to ensure they have consistent supplies. As the administration office of the health facility in the urban area also have funds available, they can place additional orders for sharps boxes with private companies.

4.6.2 Barriers to suppliers

In the urban and in one of the rural settings the supply of sharps boxes was described as inconsistent at times. Some of the respondents commented that the delay could be due to the geographical location of the province, in the Highlands Region, as road blocks were often experienced due to landslides in the area.

4.6.3 Knowledge on the use of disposal box and disposal of its contents

Use of sharps boxes varied according to the number of patients. In busy areas in urban settings, such as out-patients and emergency sections, one to two boxes per day were used because most patients required injections. In ward sections, it could take between three or four days to fill a box. However, in Rural One, a senior staff member stated that two to five boxes were filled each week and 10-20 boxes in a month. The participants in rural two reported that one to two boxes were filled each week. In one section in Rural Two, it could take between five and six months to fill a box as few patients were seen.

Although the majority in the Urban and Rural Two understood that they should replace a sharps box at the time it was three-quarters full, if they were busy they forgot and sometimes filled it to the brim. A few from urban areas were confused as to whether the box should be replaced once it was one-third or three quarters full, whilst a few from rural settings were not sure when the box should be emptied.

4.6.4 Alternatives choices for disposal of sharps

As mentioned above, some areas did not always have supplies of sharps boxes. In this case, alternative items such as empty IV flasks and detergent containers were used in urban areas to dispose of contaminated sharps whereas in the rural areas dishes, buckets, cardboard boxes, drums and paddle bins were used.

More specifically, one participant from an urban setting made the point that IV flasks were visible to see through once they were full, whereas sharps boxes were not visible.

The sharps boxes could be inadvertently filled to the brim and spill over. Therefore, he preferred to use an IV flask. Using empty detergent containers to dispose of sharps was said to be a normal practice in urban areas as they were puncture proof and had lids. Therefore, at the time they were full they could easily be closed for collection and final disposal.

4.6.5 Final disposal methods

In urban settings a double chamber incinerator which has a burning temperature of 800-900 degree Celsius was used. However, technical problems were sometimes experienced, including intermittent fuel shortage. When no incinerator was available, open pit holes were used as an alternative. However these open pits holes did not have proper fences to contain the sharps waste. In this alternative scenario, contaminated sharps devices were burnt using kerosene and open fire methods, and then the remains were pushed into the open pits. The pits were often dug close to the incinerator, so the remains of the incinerated sharps could be easily buried in the same pit.



Figure 5. Incinerator with a double chamber used in the urban setting only
Source: Researcher

In rural settings, pit holes had been regularly used to dispose of sharps and this was the method used at the time of this study. Sometimes sharps boxes were burnt outside the pit and the remains were put into the hole. As it was not always possible to burn the sharps in the rainy season, they were disposed of, along with other health care waste material, into one single pit.



Figure 6. Sharps boxes together with other waste, none of which was burnt because of the wet season

Source: Researcher

4.6.6 Environmental health and public health safety

The participants in urban areas recognised the environmental impact associated with the limitations of the incinerator. In particular, they noted that it was located within the hospital and city vicinity and produced thick fumes and a bad odour. Also there was no fence around the pit holes that were used as the alternative. Sometimes children and animals scavenged through the pit. This was described as being a threat to the health of staff, patients and the public.

Similar practices within both rural settings were described, wherein open pit holes without proper fences were used, and children and animals scavenged. In one rural setting, the pit hole was inside the health facility and was easily accessible. After the interview, one respondent reported that her school age child had sustained a needle stick injury. This was sustained while the child was searching through the pit for syringes to withdraw water to use as a water gun to have fun. In the other rural area, the pit was outside the health facility on the road side. As few respondents explained that a pit inside the health facility could not be dug inside the health facility, because there was water under the ground.

4.7 Theme five: Knowledge of sharps waste management policy and availability of other related protocols

4.7.1 Availability and knowledge about sharps waste policy

Most of the participants from the urban areas were aware of the availability of the National Infection Control and Prevention Policy which integrated the guidelines of safe

handling of sharps and waste management including sharps disposal. They also had some knowledge about the local revised infection control manual and one of them mentioned the waste management flow chart which included sharps disposal protocols as an additional guideline. Of those who were aware of the policy, only a few respondents had had time to read and understand the guidelines. Even though one of the participants had heard that an infection control policy in the hospital existed, he had never seen it at his work section. One respondent pointed out that there were no separate guidelines for sharps management and disposal alone and suggested that a specific policy could be developed.

In both rural settings only one respondent knew that an infection control and prevention policy was available. Although she was also aware of policies surrounding HIV prevention and immunisation, which she believed contained some information about sharps handling and disposal, she was not aware of the contents. Some respondents mentioned that they had heard about the existence of a general policy, but did not know if it contained information about sharps management, nor what other information it included. The three attendances at sharps related training sessions did not result in respondents being aware of a sharps policy.

4.7.2 Rationales for not reading the policies

Those who heard of the availability of the infection control and other related policies mentioned that due to their own personal attitudes such as being lazy, ignorant and/or busy, they had never made an attempt to search for and read these documents. A few from urban areas reported specifically that they had developed a 'don't care' attitude because they believed their superiors did not have time to resolve their queries and were only interested in their work output. They reported that they had developed anger and resentment and would not cooperate with the hospital management.

The participant who had heard of the infection control policy mentioned that if he had been made aware of the policy during initial orientation on his first day at work in the ward section, then he would have been more likely to read it.

One commented that he could not understand the concept of a policy, as he had been trained over 20 years ago when, he reported, no policies were available. One acknowledged that although they may blame the Government and top managers for not providing the guidelines, they had not attempted to read what was available and were jointly responsible for their own ignorance. Otherwise all of them strongly emphasised

the need for training so they could understand the importance of policy and implementation.

4.8 Theme six: Previous history of occupational sharps related injuries and reporting protocol

4.8.1 Causes of sharps injuries

There were numerous factors that had contributed towards injuries that were sustained both by the participants and their colleagues. The factors include recapping, careless practice by colleagues when performing procedures, holding contaminated needles in their hands, administering injections to uncooperative and aggressive patients alone, especially HIV positive clients, excessive movement by patients when receiving injections, working night shifts particularly in the early hours of the morning as at times no light was available, and while doing general cleaning. This latter factor was especially a factor for hygiene staff.

Over half of the respondents had encountered sharps injuries (three from urban and four from the rural facilities). One respondent from a rural area had been injured twice. All the participants from the urban and half from one rural area had witnessed their colleagues receiving sharps injuries. Other colleagues such as nurses and hygiene staff from urban settings reported their injuries to a responsible officer where records were kept as evidence.

The injuries sustained by the health care workers were mostly from contaminated injection needles. These were the most common sharps used. Others experienced deep punctures from contaminated IV and suture needles while a few respondents had been injured by clean broken vials and needles. One respondent reported that hygiene staff under her management had sustained needle stick injuries from needles that had not been disposed of properly.

4.8.2 Experiences from injuries

Respondents described both their own, and their colleagues' responses upon receiving a sharps injury. The respondents who had sustained injuries from contaminated devices reported that they experienced psychological impacts such as worry, fear, upset, and being scared. Some were confused about what to do next. Some were angry, and walked away from their duties when they injured themselves. Some of them applied immediate first aid measures such as pressing the injured area, washing the affected area under running water,

rubbing with alcohol swab and applying small dressings. This helped them to feel better emotionally. Five colleagues and some hygiene staff from the urban areas who were aware of the reporting protocol for sharps injuries took advantage of these (ref theme six from Appendix G). The two respondents (from urban and one rural) who had been injured by a sharp device that was not contaminated with blood or other body fluid, said they were not worried about the potential impact of accidental incidents.

4.8.3 Availability and awareness on reporting protocol

The majority of respondents from urban areas were aware of a standard reporting protocol for action to be taken upon receipt of a needle stick or sharps injury. Although not all respondents had received an injury personally, many had witnessed injuries to colleagues. In these situations, they or their injured colleagues had reported the injury to their immediate bosses. However, not all respondents or their colleagues reported these directly to their immediate supervisor. Instead, some reported to an infection control officer, whilst others went immediately to a location where they could receive PEP treatment. Some respondents felt, that as a variety of individuals were reported to, there was a danger that follow up procedures, including counselling and treatment were not followed up consistently.

The few who were not aware of such protocols expressed concern that they had never been informed about the availability of these forms at the ward level, even though the forms were available at these locations. They had also noticed that as some of their colleagues (mostly community health workers and housekeeping staff) were not aware of the reporting protocols, they would take the opportunity to inform an infection control officer about their injury, even if this meant speaking to this person outside the hospital vicinity.

No rural respondents had been introduced to a reporting protocol for needle stick or sharps injuries. Therefore, those who sustained injuries had never reported to anyone for further assistance. They only applied first aid measures, and/or walked away from their duties to find comfort. One of them further commented that the research interview had reminded him of the worry, fear and anxiety he had experienced from two injuries that he sustained. Conversely, a colleague from the other rural area who had received a needle stick injury had been referred, with an informal referral letter, to the urban hospital for further investigation and management. The majority expressed concern about their health which they felt to be a neglected issue as nothing significant had been done over the years for

those who were injured. They further expressed fear should they or their colleagues encounter similar injuries in the future.

4.8.4 Post exposure prophylaxis process and treatment

The majority of the respondents from the urban areas including colleagues who had been injured were aware that PEP treatment was available for such injuries. They were also aware of certain procedures that should be followed, such as collecting patients and the injured person's blood for serology tests and assessment of the severity of injuries prior to administration of the PEP therapy. However, one respondent had not commenced PEP as he was not aware of the reporting procedure as mentioned above. He stated that the patients' initial blood test had been negative so he did not bother to check his blood following this incident. He also regularly checked his own blood status every three months as a precaution. He had not reported to the clinic for further assessment as to whether he should take PEP.

Regarding the colleague who was referred from the rural area, the patients' initial blood had not been tested. The respondent stated that:

The patient was only a baby and the injury was only through an injection procedure. Therefore patients' initial blood was not tested.

The colleague was advised to check her blood three times, and as each result was negative, no prophylaxis treatment was administered.

A respondent who had previously worked at another hospital had witnessed his colleagues who were injured being assessed and treated with PEP within 72 hours. However, he had no idea if any PEP were available at the current facility.

4.8.5 Knowledge about blood borne infections

Table 1. Knowledge of staff with reference to blood borne infections that could be acquired from needle stick injuries

Respondent	HIV and AIDS	Hepatitis A	HBV	HCV	Not sure of specific Hepatitis	Others
001-01	✓				✓	
002-02	✓	✓	✓	✓		
001-03	✓		✓		✓	Typhoid
001-04	✓		✓			
001-05	✓	✓	✓			
002-01	✓		✓			
002-02	✓				✓	Tetanus
002-03	✓	✓	✓	✓		
003-01	✓		✓			
003-02	✓				✓	
003-03	✓		✓			
003-04	✓		✓	✓		Gastroenteritis
Grand total	12	3	9	3	4	3

All respondents were aware that HIV could be transmitted through infected sharps devices. One respondent felt that knowledge about HIV/AIDS was well known because there were many patients who had been admitted to hospitals within PNG who had contracted this disease, and there had been extensive health promotion campaigns for this disease in the past that were still on-going. Even though the majority of respondents were aware that HBV could be transmitted in this way, few were aware of the possibility of contracting HCV infection. Some also believed that hepatitis A, typhoid, tetanus and gastroenteritis could be transmitted by sharps devices.

4.9 Theme seven: Recommendations made by participants

This theme explains some significant problems and recommendations highlighted by the participants. For detailed information refer to Appendix G.

4.9.1 Training and awareness

Although on-going in house training including an induction programme is available in the urban area, the majority of the participants expressed concern that it was irregular and knowledge gained was insufficient. They suggested other training options such as regular teaching sessions at the ward sections to serve as refresher courses to update the knowledge and practices of the existing staff members. For new employees, it was recommended that management organise induction sessions on the first day of work regarding the importance of safe sharps practices and proper waste management

activities. It was also suggested that the ward managers and supervisors could take responsibility to create awareness by providing additional orientation at the ward level in addition to the general induction training. The orientation could also apply to health workers who are on rotation as this was considered to have been overlooked by ward managers and supervisors.

The respondents in both rural settings raised concern that training regarding sharps and waste management was a long standing issue of serious concern. Therefore it was suggested that similar training concepts accorded to urban staff be introduced to the rural settings in order for all health care workers throughout the entire province be made aware of safe practices.

4.9.2 Reporting protocols and support after receiving needle stick injuries

Although a reporting protocol is available in the urban setting, most participants stated they and their colleagues never accessed it. Therefore, the respondents suggested ways such as regular training and ward orientations to create awareness for all staff to access the services such as PEP and other related care, should they encounter sharps injuries. They would also like to be made aware of a worker's compensation scheme if one is in place. They further stressed that in the event of an injury, line managers and other management employees should offer the necessary support. This will enable proper documentation for follow up and further support if and when necessary. Also, as the health care workers in the rural areas have had no access to such a protocol, the participants suggested a similar protocol applicable to their settings, be made available.

4.9.3 Waste management issues

The waste management including sharps disposal strategies are implemented in the urban setting and the participants pointed out some strategies that could be implemented to improve on the weak areas. These include advance ordering of sharps waste items to have consistent stock, placing biomedical waste bins in suitable locations in the ward settings, and having separate trash bins to dispose of filled sharps boxes for easier collection and final disposal. They also noted the importance of constructing an appropriate disposal method such as a concrete pit with proper lids and fence as an alternative method for final disposal. Some of the respondents had noticed the unsustainable environmental impact from the fumes produced by the incinerator and suggested the incinerator be relocated to a remote area if at all possible as breathing those fumes is dangerous and a health hazard. Also the management could procure and install a backup incinerator for standby purposes.

Both rural settings had similar needs, such as improving the entire health care waste management system including sharps disposal strategies for final disposal. They also recommended interim measures including proper concrete pits and a secure fence. The appropriate disposal method for a sustainable waste management system would be the use of incinerators that are suitable for rural settings. Rural settings also require a plentiful supply and availability of sharps boxes at all times.

4.9.4 Waste management policies

The participants in the urban setting noted the importance of developing a specific policy with regard to the handling and disposing of sharps devices. This may enable them to search for specific information. The participants in both rural settings explained that they were not aware of the Infection Control Policy that contained information regarding safe sharps handling and safe disposal guidelines. Therefore, the majority suggested that Infection Control Policy be introduced for implementation.

4.9.5 Other issues with administration

A respondent in the urban setting expressed concern that patient care services are increasing due to the influx of patients, and current health care staff persons are overworked. Therefore, management should seriously look at increasing staff persons that patient care services including other relevant responsibilities related to sharps waste management can be shared. In doing so, health care workers will not be tired so that accidents with needle stick and sharps injuries could be avoided.

Staff shortage is also a serious concern raised by the participants from both rural settings, which urgently requires attention from overall management and administrators. Another of the important issues raised by a respondent in Rural Two was the importance of teamwork whereby the administration team of the health facility could understand and support the health workers requirement for on-going training. Strategies to improve the overall waste management system in general should also be instituted. Other significant aspects include health and safety for health care staff at the workplace in terms of the handling and disposing of sharps instruments. The management may consider procuring appropriate personal protective equipment, safe portable lanterns for night use, as well as trolleys in good working order, training cleaning staff regarding safe waste management practices as well as creating an overall clean and safe system and environment at the workplace for health workers in all rural settings in the WHP.

4.10 Conclusion

Data gathered in this study was analysed by employing, applying or utilising a thematic approach. The information was then transcribed and grouped into significant sub themes. The main overarching themes that were identified from each of the sub themes included irregular inductions and irregular in house training as well as a lack of proper orientation at the workplace. Also sharps injuries were mostly caused by the unsafe practice of recapping as well as other associated factors, followed by various physical and psychological experiences post injuries, including the level of knowledge about BBV infections and PEP therapy. It was noted that most injuries were caused by needles during administration of injection therapy. Furthermore, knowledge of a sharps policy by the respondents in the rural areas in particular was not adequate, as the training they received was not up to date regarding the integration of the National Infection Control Policy. In addition, effective handling and management of sharps waste appears to be a major public health issue and, accordingly, necessary improvement was identified as being required to include a collaborative approach for both the management and the clinical health workers. Therefore, detailed information to equip health care workers with the necessary knowledge, attitude and safe practices with sharps devices and related issues in terms of occupational health and safety is significant to consider. In addition, aspects of an overall sharps waste management programme are relevant to discuss and implement appropriate everyday practices and interventions.

Chapter 5. Discussion and Recommendations

Safe practice of sharps devices and proper disposal after their use is an important international public health issue because of the risks associated with BBV infections to the individuals and onward transmission potential to the general population. This study has explored these issues within a health care environment in a developing country's context.

Due to the fact that the population is growing in PNG there is more opportunity for the number of people infected with BBVs to increase (Papua New Guinea population, n.d). The increase in the population is due to a range of factors. These include a lack of awareness of family planning including lack of education on reproductive health and birth control issues, especially among married couples, youths, and other vulnerable populations such as prostitutes. Social influence and economic issues are also possible factors (Marie Stopes International Countries, n.d; Midire, 1996). Unless the government of PNG intervenes, supports and sustains the population with appropriate control measures, it may not be stable in the future.

The rise in the population may also have an impact on greater numbers of people requiring medical treatment, possibly contributing to an increase in the use of sharps and sharps waste. In addition, these issues may have the effect of increasing the workload for health workers as shortage of staff is already a pressing issue in PNG (Dawson, Howes, Gray, & Kennedy, 2011). Furthermore, the potential for occupational health and safety risks such as needle stick and sharps injuries might increase amongst health care workers.

It may also add economic pressure on the government and health care organisations to support and provide necessary items and equipment as well as addressing the issues related to needle stick and sharps injuries.

In this chapter the researcher outlines the important points identified in this study for possible consideration to improve and institute safe practices and disposal activities related to sharps devices in urban and rural settings in the WHP of PNG.

5.1 Knowledge and practice related to sharps

With regard to the knowledge about safe handling and disposal of contaminated sharps devices, all except one of the health care workers who participated in this study had received some training. They all reported that knowledge gained through various training

was used in their respective health facilities. Whilst they were all aware of the rule prohibiting recapping, in several instances they recapped because it had become a habit. Other respondents recapped because in a pressured working environment, they put the care of their patients before their own health and safety. With respect to the potential risk of BBVs, not many understood that HBV and HCV could be spread from sharps injuries. The majority were aware of the danger of contracting HIV but this did not result in them always taking the necessary steps to protect themselves. In addition, awareness of reporting protocols and other issues related to PEP treatment was also limited. Studies in other countries have also demonstrated similar challenges and have resulted in an improvement in knowledge and practice (Wilburn, 2004).

While inadequate knowledge was one of the factors affecting poor practice and reporting issues, disposal and management of contaminated sharps waste was also a problem in both urban and rural settings in WHP. Of particular concern were the health facilities in rural settings where health care workers have coped with using open pit holes as disposal sites were without proper fencing. This has been a continuous practice. Previous studies have also noted that it is an international problem, especially in developing countries, where relevant skills including appropriate disposal methods are limited for a number of reasons. Also health care providers are not always trained in the most up to date methods. These issues impose significant challenges in terms of practice with sharps devices (Blenkharn, 2009; Diaz & Savage, 2003; Diaz et al., 2005; Wilburn, 2004; Wilburn & Eijkemans, 2004). Other issues regarding a lack of light and equipment such as a malfunctioning trolley that was used for placing sharps boxes in rural areas and inadequate staffing, were identified as having the potential to lead to needle stick and sharps injuries.

Although some training related to the importance of safe practice and sharps waste management has been provided, which has helped alert the health care workers to the possible impact, problems still exist due to lack of support and provisions of necessary items and equipment by management.

The following recommendations are proposed to institute innovations to create and maintain a safe and supportive working environment for the health care workforce, the patients who seek their care and the general public.

5.2 Recommendations

The initiation and introduction of the Provincial Health Authority Act in the health system in PNG is an important and fortunate strategy wherein health issues including safe practice and sharps waste management can be comprehensively addressed by the National, Provincial, and Local level government as well as church health organisations, through a collaborative approach. Although some previous discrepancies were evident in health management, including financial allocations and inequity in health service provisions, the new collaborative approach could have some positive impact on public health issues and programmes in PNG (National Health Plan 2011- 2020, 2010). It is acknowledged that “collaborative strategies allow organisations to perform tasks that are too costly and complicated for single organisations to perform”. “These tasks include the full range of organisational activities, including purchasing raw materials, hiring and compensating organisation members, manufacturing and service delivery, obtaining investment capital, marketing and distribution, and strategic planning” (Waddell, Cummings, & Worley, 2011, p. 404). Therefore in the WHP through the implementation of this approach by the WHPHA, respective administrations including church health organisations may uphold and resolve issues identified in this study for the sake of the rural majority and urban disadvantaged population (Western Highlands Provincial Health Authority, n.d). As such, it is relevant to consider the models for advocating change and developing related policy in line with health promotion concepts (Nutbeam & Harris, 2004). With respect to the model involved in changing an organisation, four stages are clearly defined. These are awareness raising, adoption, implementation and institutionalisation. It is vital to discuss the significance of the stages in line with the context of this study.

5.2.1 Awareness and adoption

It is important that awareness of the challenges related to contaminated sharps devices is established, for the management of WHPHA and their team of line managers. This can be done through management meetings and other clinical presentations. The WHPHA management may seek collaborative support from the national government and further extensive support from other donor agencies and organisations to address the issues related to infection prevention and waste management, including a sharps disposal programme. The main focus, according to Nutbeam and Harris (2004) is to maintain and improve the service to achieve effective, efficient and sustainable results from a programme.

Discussions with health care providers related to safe practices and sharps waste management activities could lead to mutually agreed aims in service improvement. Therefore, it would be appropriate to create awareness among the health care workers, identify potential senior staff members in both rural and urban settings who are more involved in clinical practice. This may also include a few of those who participated in the research project and request their involvement in helping to re-write the manual. They would be able to articulate and identify their own strengths and weaknesses regarding safe practice and management of sharps waste. This approach is to encourage them to make their own comprehensive recommendations. The manual would also include relevant issues such as to completely avoid recapping, as well as information related to infection prevention and other standard precautionary measures. The idea of refraining from recapping the needle is in contrast to previous studies which stated that they could be recapped, if necessary (Aziz et al., 2009). The manual could also include protocols to follow for needle stick or sharps injuries in accordance with those suggested by previous studies (Wilburn, 2004; Wilburn & Eijkemans, 2004).

This could lead to the development of a policy for both urban and rural settings to present to the management team and administrators. The aim is for the health care staff to be able to present their needs and determinations to management and also specify the obligations and responsibilities of management and administrators. Involving various health care workers to help instigate change is promising because of the collaborative approach (Waddell et al., 2011). As they shift from passive learning to active learning strategies, awareness will be raised, interest will be stimulated and participation will empower them to make informed decisions (Nutbeam & Harris, 2004). This approach may also increase their abilities in creating a team oriented culture, where adoption of new infection control and prevention practices, will be widespread, and safety oriented sharps waste management guidelines will be widely implemented.

5.2.2 Implementation and institutionalisation

The implementation stage involves the practical phase of delivering the actual programme through training and advocacy decisions (Nutbeam & Harris, 2004). Relevant training components form a significant method for disseminating existing policy information and establishing newly-created protocols written by health care workers. Training and induction programmes are acknowledged as vital activities to spread relevant information to health care workers to equip them with necessary information to implement safe practices (Griffiths, 1989). Therefore, it is wise to re-emphasise sharps related aspects of

clinical work through existing on-going training and the induction programme for health workers in the urban areas. For the rural health settings, relevant training and an induction course with similar concepts should be conducted at a district level where every health worker could participate.

In addition to the above implementation strategies, there are other significant issues for consideration by the management of WHPHA, including:

- Appoint staff representatives from the rural health service to be members of the infection control and occupational health and safety committees based in the urban area.
- Further sub committees may be formed at district levels where they may report to their representative as an overall person in the above committees.
- Increase the budget and allocate adequate finance to procure necessary items and equipment for sharps waste management including protective wear and hepatitis B vaccines for health workers in both urban and rural settings. The budget may also include the necessary chemicals for conducting pre serology blood tests for hepatitis B prior to vaccination and relevant tests for other BBV infections.
- In order to have a consistent supply of sharps boxes, create a network comprised of reliable companies in order to procure supplies if stocks supplied by the normal government and/or other support service suppliers are inconsistent.
- Discourage and completely stop health workers from using alternative items for disposing contaminated sharps devices because of the dangers involved.
- For a final disposal method, consider low or medium combustion suitable for the health facilities in rural settings (Batterman, 2004; Diaz & Savage, 2003). Staff responsible for operating these processes may be trained to maintain them for proper use.
- With respect to the hospital, consider a backup incinerator for consistency of service and also relocate the old incinerator for public health and eco-friendly sustainability purposes, especially to clear and clean up noxious emissions (Angel, 2009; Batterman, 2004; Soliman & Ahmed, 2007).
- Construct appropriate fences completely surrounding final disposal sites in both rural and urban areas to keep the public and animals from scavenging.
- Advertise for and recruit more health care workers.

- More cleaning staff could be employed so health care workers do not feel that blood spills on the floor are a hygiene problem. As the rural health facilities do not currently have cleaning staff it would be beneficial to recruit and allocate these to the various health facilities where they may oversee the overall environmental cleaning including sharps disposal activities.

These important innovations could be continuously monitored and supported to sustain the long term safety health outcome for health workers and the public through on-going assessments and evaluations.

5.2.3 Assessment and evaluation

Prior to implementing certain changes regarding the aspects of prevention of BBV infections and occupational health and safety, including sharps disposal, it is important to retrospectively assess and review the existing mandatory programmes including staff immunisation, records of needle stick and sharps injuries and waste disposal audits in the urban setting. The audit in the urban areas is to ascertain how many health care workers have been immunised and have completed their vaccinations over the past several years. Also it will be relevant to identify how many were referred for further treatment and follow up and the reasons why others may not have been vaccinated.

With regard to the waste management especially related to sharps waste, it is important to determine how well the sharps were segregated from the point of use by the respective clinical sections. Another important point will be to take note of the available waste audit forms to ascertain if specific instructions related to the topic of safe sharps disposal have been included. Thus based on the findings or evidence, it will be imperative to set new targets as well as guidelines and work towards improvement.

Staff immunisation will be an initial intervention for the rural health staff, so it will be important to obtain a list of health care workers, make the necessary arrangements, procure the essential vaccines and carry out the pre serology blood tests. Based on the results, the new policy will set a base line target, then administer the vaccines as appropriate and encourage completion. This should become mandatory. Another important item will be a baseline for the number of needle stick and sharps injuries so that the auditor, including management and the supervisory team, can ascertain if the number decreases or increases after the interventions. It will also be necessary to use the waste audit forms that are suitable for the rural settings and set baseline findings,

especially about safe handling and segregation at point of use and final disposal related to contaminated sharps devices.

More importantly, there should be an agreement with management and sanctions on employees if best practice guidelines are not followed. As such, relevant changes to sharps practices and disposal may be incorporated into current staff appraisal forms, especially for clinical health workers so their performance in this regard can be assessed. The health care workers may then feel compelled to act on their duty of care related to sharps devices and thus could improve their performance. General knowledge about the importance of infection control and prevention including occupational health and safety as well as sharps waste disposal may be measured through regular assessment by using appropriate checklists, and more support from management will be beneficial.

5.3 Thoughts for the health workforce

Whilst the management has responsibility to provide necessary requirements and guidelines, it is important for health staff to adhere and follow all sharps practices and waste management guidelines. This may also take into account the personal and professional conduct of the health care workers and their attitudes to the set policies (Lakbala, Azar, & Kamali, 2012; Lee, 2009). Of particular concern is the reporting of injuries where it will assist in improving disadvantages identified in previous studies (Bryan, 2006; Gabriel, 2012; Wilburn, 2004). Accurate records will also provide evidence to support any medical problems that may arise in the future. However, if there is any doubt or matter that requires further clarification, then it is wise to seek professional assistance either from colleagues or from the administration team. If the necessary items and equipment are not available or provided for by management, they may also raise their concerns through the appropriate authorities for consideration. Hence utilising good communication skills and creating clear lines of communication to exchange information is significant in health care service delivery (Nutbeam & Harris, 2004). This is to establish honest, caring and understanding relationships with colleagues and management. The health professionals should not have to work in isolation and suffer silently as failure to comply with relevant guidelines might result in negative health and other associated implications and it will be too late to follow through properly.

5.4 Future studies

A more detailed study of sharps waste disposal is required and this should include the non-clinical workers such as housekeeping staff especially those in urban areas as they

are involved in sharps waste collection and disposal activities. Some housekeeping staff have reported that they have sustained sharps injuries and others are likely to sustain occupational injuries because of the actions of others. It would be relevant to obtain their views which could be instituted for safe and proper disposal methods and activities. In addition, further research studies could include the health facilities in other provinces. These studies could be supported by the National Department of Health. It could be wise to consider recommending a country wide project that will assist in the development of safe sharps practices and waste management policies for all of PNG. Subsequently these policies can be introduced and implemented nationwide for safe, effective and sustainable practices for all concerned.

5.5 Limitations of the study

This was a small study and one of the few to be carried out in WHP or PNG. There was a good range of respondents from urban and rural settings with different levels of designations and experience, including age variations. Consequently, this has provided an opportunity to explore this topic in detail. However, in the rural area, it was found that there were vacancies for the post of health extension officers and lab technician, and it would have been useful to have obtained the viewpoints of these individuals. In the urban area, one member of staff approached was not able to participate in the study. Therefore, this has some limitations where extrapolations cannot be applied to other categories of health workers. In addition, a potential for response bias existed as the participants knew that the researcher was a co-worker and also the person who facilitated training especially to health workers in urban areas. Another limitation is that due to lack of time and financial constraints this study was only able to be conducted in WHP, therefore the results are limited to this province. Health care workers located in other provinces in the country may employ safe practice techniques and have better strategies regarding sharps waste disposal in their health facilities. On the other hand, they may have similar or possibly worse practices compared to health care workers located in WHP. Therefore a future nationwide study will be appropriate in order to examine and compare their views and practices.

5.6 Conclusion

This research has described in detail the main challenges encountered by health care workers from a variety of designations in terms of safe practice with sharps and disposal of the contaminated devices in both urban and rural health facilities in WHP. The urban

settings compared to the rural areas have implemented the guidelines related to the concept of infection control and prevention. This has had some positive impact in terms of activities such as on-going training with respect to safe practice and waste management including safe sharps disposal and protocols to follow during sharps and needle stick injuries, which involves PEP treatment. However, it is clear that some of these activities were not followed in an appropriate manner by the health care workers and even their knowledge related to the significance of these activities is lacking. Also, no records have been kept to determine whether health workers have had an impact on BBVs. Provision of items and equipment necessary for safe sharps waste disposal has been reported as inconsistent and therefore it is still a challenging issue.

Over the years, rural staff members have struggled with practical knowledge and use of available methods for sharps disposal. They also missed out on other important services compared to those working in the urban setting. It is therefore important to introduce these important activities through the WHPHA approach.

The recommendations have been set for distinct responsibilities for all concerned. A collaborative approach by leaders from the national, provincial and local level of governorship in the health sector, including church based organisations in PNG and staff members with similar visions, is required to address the recommendations above. The management team of WHPHA and the government organisations must also support future studies to extend and update knowledge and practices related to sharps and other important public health issues. This is for the good of the health workforce and the entire population of the country both for now and in the future and for the world at large. With continued research and action on this topic, perhaps PNG could institute programmes and practices related to this challenge, to set a standard for improvement that could be emulated in other places around the world where this problem also exists.

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Glossary

AIDS	Acquired Immunodeficiency Syndrome
AUTEC	Auckland University of Technology Ethics Committee
BBV	Blood borne virus
CEO	Chief Executive Officer
HBV	Hepatitis B virus
HCV	Hepatitis C virus
HIV	Acquired immune deficiency virus
IV	Intravenous
PEP	Post exposure prophylaxis
PNG	Papua New Guinea
UK	United Kingdom
US	United States
WHP	Western Highlands Province
WHPHA	Western Highlands Provincial Health Authority
WHO	World Health Organisation

Appendix A: Approval letter from AUTECH



A U T E C
S E C R E T A R I A T

26 April 2013
Penny Neave
Faculty of Health and Environmental Sciences

Dear Penny

Ethics Application: 13/69 Safe methods and practices of disposing sharps waste in health facilities in the Western Highlands Province of Papua New Guinea.

Thank you for submitting your application for ethical review. I am pleased to advise that the Auckland University of Technology Ethics Committee (AUTECH) approved your ethics application at their meeting on 22 April 2013, subject to the following conditions:

1. Provision of the access permission letters mentioned in the response to section C.3.5 of the application;
2. Clarification of how voluntary consent will be assured and how the recruitment and consent processes will be kept independent of the employers. AUTECH advises that it is important that employers do not know who will be participating and that they are seen not to be exerting any coercive influence that may compromise the voluntariness of consent. It is recommended that interested potential participants contact the researcher directly as a result of an advertisement or similar invitation;
3. Reconsideration of the response to section I.1.7 of the application and inclusion of advice about this in the Information Sheet. AUTECH notes that there may be significant discomforts for the participants if something inappropriate is happening in their workplace procedures, or if they have had an undisclosed needle stick injury;
4. Clarification of how long the participants have in which to decide whether or not to participate. AUTECH prefers the one week stated in the Information Sheet rather than the 15 minutes stated elsewhere in the application;
5. Reconsideration of how the significant conflicts of interest around the researchers roles are being managed and inclusion of clear advice about this in the Information Sheet;
6. Amendment of the Information Sheet as follows:
 - a. Provision of the translations;
 - b. Definition of the term 'sharps' as it is being used in this study

Please ensure that your Participant Information Sheet contains the current Executive Secretary's contact details as given in the exemplar on the website.

Please provide me with a response to the points raised in these conditions, indicating either how you have satisfied these points or proposing an alternative approach. AUTEK also requires copies of any altered documents, such as Information Sheets, surveys etc. Once your response is received and confirmed as satisfying the Committee's points, you will be notified of the full approval of your ethics application. Full approval is not effective until all the conditions have been met. Data collection may not commence until full approval has been confirmed. If these conditions are not met within six months, your application may be closed and a new application will be required if you wish to continue with this research.

To enable us to provide you with efficient service, we ask that you use the application number and study title in all correspondence with us. If you have any enquiries about this application, or anything else, please do contact us at ethics@aut.ac.nz.

I look forward to hearing from you,

Yours sincerely



Madeline Banda
Acting Executive Secretary
Auckland University of Technology Ethics Committee

Cc: Sabina Kerepa

Appendix B: Letter to CEO of WHPHA seeking approval

Dr James Kintwa
Chief Executive Officer
Western Highland Provincial Health Authority
P.O. Box, 36
MT Hagen,
Western Highlands Province
Papua New Guinea

Date: 30 April 2013

Sabina Benesa Kerepa
Faculty of Environmental Health Science
Auckland University of Technology
90 Akoronga Drive
North Shore
Auckland, New Zealand
Email: sabinakerepa@yahoo.com

Dear Dr Kintwa

RE: Seeking approval for use of health facility and health staff in conducting research

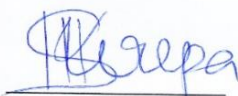
I am writing to seek official written approval to conduct research with health workers in these three health facilities (Kotna, Tambul and Mt Hagen Provincial Hospital) in Western Highlands provinces. The research topic is on safe methods and practice of disposing sharps waste in the health facilities in Western Highlands Province from May to July 2013.

The reason is that I have received pre-approval notice on my ethics application from Auckland University of Technology Ethics Committee but require an official document from your office as proof to provide to the committees.

Enclosed is the copy of the AUTECH pre-approval letter.

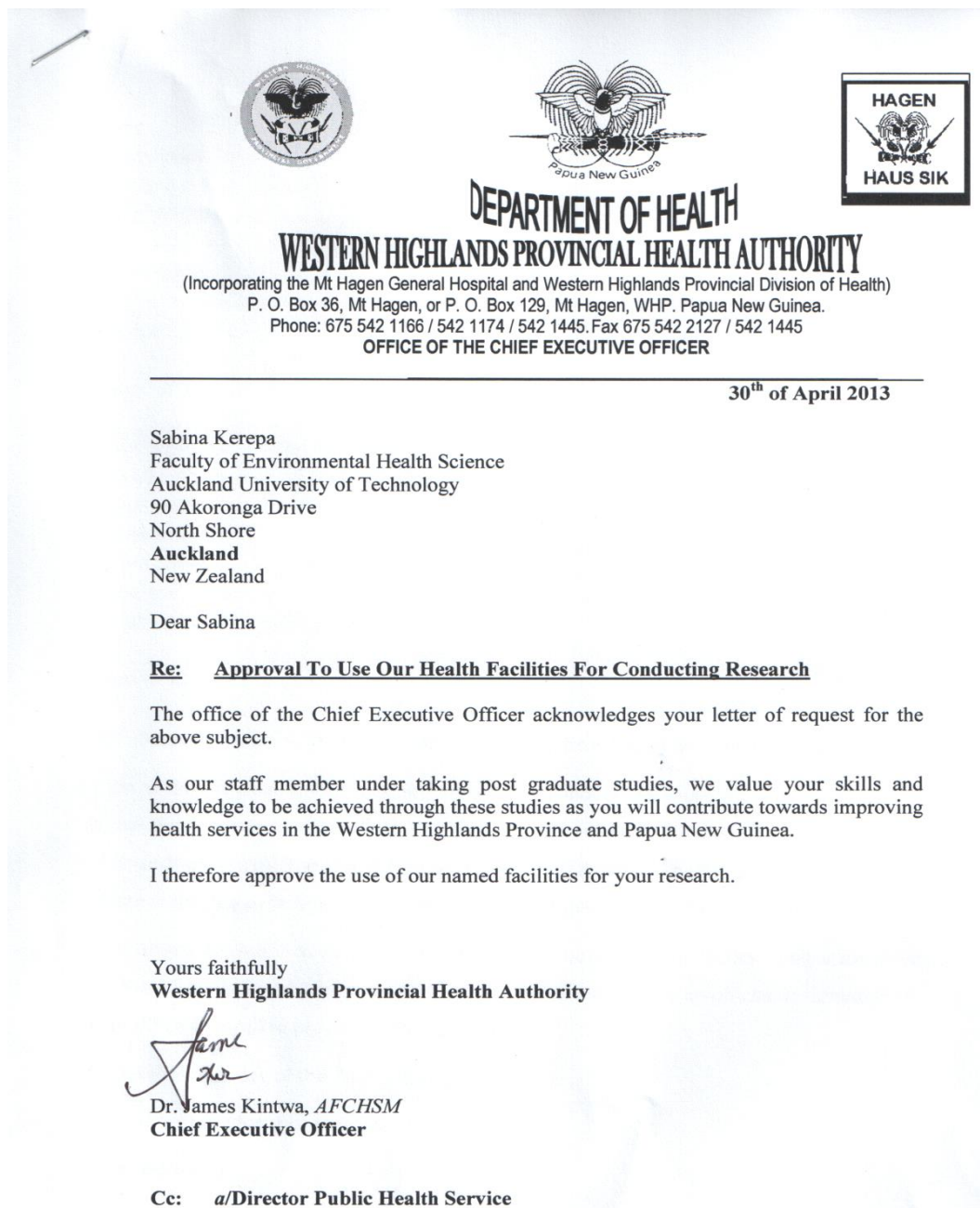
I will be grateful for your prompt response.

Yours faithfully



Sabina Kerepa

Appendix C: Approval letter from CEO of WHPHA



Appendix D: Invitation notice for voluntary participation



INVITATION TO PARTICIPATE IN A RESEARCH PROJECT

To: All Health Workers
Kotna, Tambul and Mt Hagen Provincial Hospital

From: Sabina Benesa Kerepa

Date: 28 May 2013

Sub: Volunteers to participate in a research project

This is a general notice to inform the health workers in the above health facilities about a research project which I will be conducting in your respective health facilities. The research is on safe methods and practices of disposing sharps waste in health facilities in the Western Highlands Province.

A total of 16 health workers including doctors, health extension officers, paramedical staff, registered nurses and community health workers who work with sharps devices are required to participate in this study. Five from each health centres and six from the hospital.

Your participation is voluntary and confidentiality will be maintained throughout the research process. If you are interested to participate then feel free to call or text me any time on this number 71868961.

Your participation will be highly appreciated.

Thank you all.

A handwritten signature in blue ink, appearing to read 'Sabina Kerepa', written over a dotted line.

Sabina Kerepa
Researcher

Appendix E: Participant information sheet

Participant Information Sheet



(Individual interview)

Date Information Sheet Produced: 22 of February 2013

Project Title: **Safe methods and practices of disposing sharps waste in health facilities in the Western Highlands Province of Papua New Guinea.**

1. An Invitation

My name is Sabina Kerepa; I am a Master's student of Public Health in the Faculty of Health and Environmental Science at Auckland University of Technology (AUT), Auckland, New Zealand. I am undertaking research on safe methods and practices of disposing sharps in health facilities in the Western Highlands Province of Papua New Guinea. I would like to invite you to take part in this research. Your participation is entirely voluntary and you can choose to withdraw at any time during the interview or up until the time when the data will be analysed.

2. What is the purpose of this research?

This research is designed to determine what factors might lead to the poor management of sharps within the rural and urban health facilities in the Western Highlands Province of Papua New Guinea. Poor handling and disposal of sharps can lead to an occupational risk of acquiring blood borne infections such as Hepatitis B Virus, Hepatitis C Virus and Human Immunodeficiency Viruses. There is also a risk to patients and members of the public who might become infected.

This research will also help prepare me for my Master's thesis. The findings of this study will be presented in professional forums, conferences and written as a journal article.

3. How was I identified and why am I being invited to participate in this research?

You have been invited as a potential participant because you work at one of the health facilities included in the study and may be involved in the use of sharps devices such as needles, syringes, blades, lancets, vacuum tubing and blood collection bottles in your day to day practice of providing health care services to the patients in your health setting.

4. What will happen in this research?

If you choose to participate you are invited to take part in an interview which will take about 60 minutes. The interview will be conducted in your health facility. You could select a place which is comfortable and convenient for you to do this interview. I prefer to do this interview during a week day and in the morning. However, you can inform me of the best time you would be available for me to conduct the interview. In the interview we will be exploring your knowledge and skills about the experience, understanding and practice of sharps handling and disposal from the start to the finish and discussing reasons why poor handling and disposal of sharps might happen. The information you supply will be audio recorded and will be translated into English by the person who carry out the interview. Once the information has been collected it will be analysed by looking in detail at the topics that are discussed by participants.

5. What are the discomforts and risks?

Some participants may be worried that they didn't comply with the current waste management and sharps disposal policy, or weren't aware of these. Others may be concerned that the researcher is the member of the staff in the organisation who has been the officer in charge of the infection control and waste management programme. Alternatively participants might be concerned that they didn't report all needle stick injuries, or that they had an injury and they are afraid they might be infected.

How will these discomforts and risks be alleviated?

Assurance is guaranteed that I'm conducting this research from a student's point of view. Everything that will be discussed in the interview session will be kept confidential and will be used for the purpose of the research only. Even if I come back to work with you in the same organisation no details of the interview will ever be disclosed and your identity will not be given to anyone else. The study is conducted purposely to improve the service and for the good of the organisation and the community.

If you are concerned that you may have become infected in the past, but did not report it, you can do so following this interview. If you are not sure of where to seek help then the infection control office that coordinate this programme is located in the hospital. However, to maintain your confidentiality, you are advised not to report that participation in this study encouraged you to do so.

You will be given an infection control and waste management policy guide which includes sharps handling and management procedures at the end of the interview for you to use it in your setting.

6. What are the benefits?

The results of the study will be used to suggest strategies to improve safe sharps handling and appropriate methods to use in both urban and rural health facilities in Western Highland Province. If these strategies are successful, then they could be used in other health facilities in the country.

7. How will my privacy be protected?

Your identity will be kept confidential as your name and address will not be recorded in the study documentation. An audio tape will be used to record your conversation throughout the interview process and will be translated by the researcher herself. The information will only be accessed by the researcher and will remain confidential. I also would like you to know that the supervisor at the AUT will have access to the information; besides this no other person in the organisation will know about what you say in the interview.

8. What are the costs of participating in this research?

You will be expected to spend about 60 minutes of your time.

9. What opportunity do I have to consider this invitation?

A week is given to you to decide whether you would like to participate or not. I can be informed through phone call or text message when you are available to be interviewed.

10. How do I agree to participate in this research?

If you wish to participate after reading this information sheet then we can arrange a time for you to do so after you have had a week to consider it. Prior to the interview, I will also give you a consent form to sign to confirm you agree to participate.

11. Will I receive feedback on the results of this research?

A final result of this study will be presented back to your health care facility, but you will not be identified.

12. What do I do if I have concerns about this research?

Should you have any concern regarding the nature of this study then do not hesitate to notify the Project Supervisor based at AUT namely, Penny Neave. Email address: penny.neave@aut.ac.nz

Concerns regarding the conduct of the research should be notified to the Acting Executive Secretary of AUTECH, Madeline Banda, ethics@aut.ac.nz , 921 9999 ext 8316.

13. Whom do I contact for further information about this research?

13.1. Contact the primary researcher on this contact details:

Sabina Kerepa: sabinakerepa@yahoo.com

13.2. Project Supervisor Contact Details:

Penny Neave: penny.neave@aut.ac.nz, 9219999, ext 7407

Approved by the Auckland University of Technology Ethics Committee on the 22nd of April 2013 Application number 13/69.

Project Supervisor Contact Details:

Community Health Development Department, School of Public Health and Psychosocial Studies.

AUT University, Private Bag 1142, New Zealand.

Tel: 09921 9999 X7407

Approved by the Auckland University of Technology Ethics Committee on *type the date final ethics approval was granted*, AUTECH Reference number *type the reference number*.

Appendix F: Consent form

Consent Form

For use when interviews are involved.



Project title: Safe methods and practices of disposing sharps waste in health facilities in the Western Highlands Province of Papua New Guinea.

Project Supervisor: Penny Neave

Researcher: Sabina Benesa Kerepa

- ☐ I have read and understood the information provided about this research project in the Information Sheet dated 22nd of March 2013.
- ☐ I have had an opportunity to ask questions and to have them answered.
- ☐ I understand that interviews will be audio-taped and transcribed.
- ☐ I understand that I may withdraw myself or any information that I have provided for this project at any time prior to completion of data collection, without being disadvantaged in any way.
- ☐ If I withdraw, I understand that all relevant information including tapes and transcripts, or parts thereof, will be destroyed.
- ☐ I agree to take part in this research.
- ☐ I wish to receive a copy of the report from the research (please tick one):
Yes ☐ No ☐

Participant's signature:

.....

Participant's name:

.....

Participant's Contact Details (if appropriate):

.....

.....

.....

.....

Date:

Approved by the Auckland University of Technology Ethics Committee on **type the date on which the final approval was granted** AUTEK Reference number **type the AUTEK reference number**

Note: The Participant should retain a copy of this form.

Appendix: G: Data analysis transcripts

Take note that age, sex, current designations and total length of employment details are not included in the subsequent tables to avoid repetition. Only the codes for the health facilities and the participants are included in distinctive tables.

4.3. Theme one: Demographic and employment details

Facility/ code & participant	Sex/ Age	Current designation	Previous length of employment	Current length of employment	Total length of employment	Current place of work and services	Comment
Urban 001-01	F/37	Community Health Worker (CHW)	No	17	17 years	Children's out-patient, gives injection and medication	Same organisation
001-02	F/44	Registered Nursing Officer (RNO) Ward manager	No	24	24	Medical ward, Officer in charge, administrative and clinical nursing care	Same organisation
001-03	F/39	RNO, Acting Officer in charge (OIC)- Infection Control Officer	Yes, 7 years private health services	4 years	11 years	Infection control unit, technical administration, bleed staff for pre serology test for HIV and hepatitis B	
001-04	M/30	Medical Officer	Nil	5 years	5 years	Obstetrics and gynaecology, ward round, collect blood, put up IV, give injections	Same organisation
001-05	F/36	Registered Nursing Officer	Yes, church organisation 10 years	5 years	15year	Surgical ward, patient care services including IV and injections	Years of previous services not mentioned but used to be in the WHP. However recently separated
Rural 1							
002-01	F/43	Registered Nursing Officer, Officer in Charge	Nil	21 years	Same	Rural health services (RHS), administration and clinical sections	Same organisation
002-02	F/45	CHW		20	Same	RHS, in and out patients	Same organisation

002-03	M/24	RNO,	Yes, 9 months with church health services	6 months	1 year 3 months	RHS, outpatient, inpatient labour ward, minor theatre and family health services (clinical patient care services)	Different experience with previous employment in the same province (WHP)
Rural 2							
003 -01	M/43	RNO, OIC	Nil	22 years	Same	RHS, administration and clinical sections	
003-02	M/30	CHW	1 year in own Province	6 months	1year & 6 months	In-patients (wards x3), accident and emergency receive admissions, give injections insert IV and suture minor lacerations	1 year with church health services in another province
003-03	F/45	RNO,	Nil	22 year	Same after graduation	RHS, family health services and labour ward after hours	
003 - 04	M/44	Assistant laboratory technician	22 years with the church health services	4 months	22 years & 4 months	Rural laboratory, collect blood for all laboratory tests	Previously worked with the same church health services in another province

4.4. Theme two: Training and knowledge about sharps

Facility code & Participant	Sharps related training Yes/ no	If yes, Where and length of training?	If no, why?	Sharps definition	Are sharps wastes important?	Remarks
001 - 01	No		Never attended refresher course within the organisation	Scalpel blade, broken vials and glasses	Yes, although not considered important because we are always busy with patient care services	<ul style="list-style-type: none"> Learn from demonstrations and illustrations in ward sections by supervisors, ward managers and colleagues
001 - 02	Yes	Refresher training for 1 week		Injection needle, IV cannula, vials and forceps	Yes, it is risky because of injury to self, colleagues and others such as waste handlers	<ul style="list-style-type: none"> I was not aware of the importance of sharps until introduction of infection control programme where training was initiated about 8 years ago
001 - 03	Yes	14 years ago at college and orientation programme for 1 week 4 years ago		Needles, bush knife, broken glass, razor blade, pencil, pen, edge of table that is not properly laminated or anything that have sharp edge and could penetrate	Yes, sharps are risky because they can cause injury to human health	<ul style="list-style-type: none"> I fully understood the importance of sharps after the refresher course and able to take necessary precautions and segregate from point of generation
001 - 04	Yes	Orientation programme for 1 week		Surgical blade, IV cannula and needles as I mostly use these sharps	Yes, I know the importance of safe practice and sharps disposal practices	<ul style="list-style-type: none"> I am able to use what was taught.

001 - 05	Yes	1 week orientation with current employment and ward teachings		Needles, blades, vials, IV cannula and lancets	Sharps are dangerous to harm patients and staff. Often took sharps for granted and came to realise the importance after going through the interview process.	<ul style="list-style-type: none"> • I thought cross infection would only come from other sources and not sharps. • The knowledge on sharps was never taught in previous employment. I am now implementing what was taught during the orientation programme in this organisation
Rural 1						
002 -01	Yes	HIV prevention and immunisation programme, only once a long time ago		Syringes, injections, suture needles, IV cannula, lancets, scissors and razor blades	Yes, to prevent from sustaining injury to self and colleagues	<ul style="list-style-type: none"> • Information was not sufficient as only basics were taught but tried all best to manage sharps within our capacity
002 - 02	Yes	20 years back during initial community health workers training		Needles, syringes, and empty box	I do not know but I still use the same old techniques maybe because I never attended any additional training since I passed out	<ul style="list-style-type: none"> • No refresher training while in the field. Says the knowledge was not sufficient so throws sharps in to other waste bin.
002 – 03	Yes	Back at the nursing college 2 years ago and 1 week orientation at Mt Hagen provincial Hospital under the initiative of WHPHA about 2 weeks ago		Injection needles of all sizes, lumbar puncture needles, surgical needles, lancets, IV cannula, scalpel blades, toothed forceps	Sharps are items that come in contact with blood and body fluids and may cause cross infection. They may cause injury to self and patients if not careful.	<ul style="list-style-type: none"> • Learn not to recap during the orientation programme

Rural 2						
003- 01	Yes	Had training during initial nursing college and medical faculty from community health administration training		Injection and suture needles, scalpel blade and scissors	Understand the definition of sharps especially the main ones that they mostly used	<ul style="list-style-type: none"> • No refresher training whilst in the field. But assumes that he is implementing what was gained in his other training
003 - 02	Yes	Initial community health workers training about 2 years back		Injection and suture needles, lancets, vials and IV giving sets	Yes, it is important so the government and the management can seriously consider the safety and welfare of the health workers	<ul style="list-style-type: none"> • Said the knowledge he gained from initial training is insufficient as it was too general. • No refresher training
003 – 03	Yes	HIV prevention at the work place training for one week, at 3 different times where they discussed issues about sharps handling and disposal		Scalpel blade, injection and suture needles, scissors and forceps	She thinks it is very important so everyone should be trained on how to handle and dispose sharps properly	<ul style="list-style-type: none"> • Only the basics about disposal methods were taught during those training. • No refresher training within the facility • Observed that those who had not attended training do not take precaution when handling sharps
003 – 04	Yes	5 – 6 years ago with previous employment. It was a 3 days training		Needles and lancets	Yes, understands that sharps are objects that can penetrate in to human tissue and may cause injury. They may also cause BBIs if they are contaminated with BBV. Therefore, we are to take precautions to prevent	<ul style="list-style-type: none"> • Only the basics were taught during that training when HIV was initially popular so the information was not sufficient. • No recent training • Not fully implementing what was taught because of poor waste management system.

					ourselves and others from contracting infections.	
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4.5. Theme three: Handling and disposal of sharps in daily clinical

Facility/ code	Handling of contaminated sharps	Recapping Yes/ No Rationales	Separate needle from syringe	Location and accessibility of sharps box	Possibility of injuries	Orientation at work place	Comments
Urban 001 -01	Dispose direct to sharps trash bin	Yes: to avoid blood spillage & to prevent injuries to self, colleagues and others	Yes, to have control over fast filling of sharps box	Bench top and not safe but access by all staff	Busy, tired personal problems	No	Always a long queue for injections as there is increased number of children for injections so always busy
001 -02	- Direct disposal during treatment time as box attach to trolley- Carry sharps with hands during individual patient treatment	Yes: to prevent injury to self, colleagues, patients and others but sometimes does not recap	No, all in to the trash bin	All procedure and treatment sites. When busy new employees do not access it.	During busy times as staff patient ratio is less. Tired, careless and ignorant	No	Sometimes when busy they dispose sharps to other waste bins
001-03	Carry sharps box to and from point of use	Currently not recapping but yes with the previous employment as recapping was a normal practice	No	In the office and it is placed on the floor and is access by self	Tired, early hours of mornings with previous experience	Yes	Dispose to nearby biomedical wheel bin when it is full.
001 -04	Carry with Hands	Yes, I do recap	Yes, to have control over fast filling of sharps box	In all treatment and procedure sites. It is access by every health worker	During busy times as staff to patient ratio is low, so we are not mindful of sharps. Tired during early hours of work, careless practice by	I was not orientated, but those in charge orientate others now	Rush most times to finish work load. He carries sharps on hands because he only attends to certain patients

					other colleagues		
001- 05	Direct disposal during treatment time, carry with hands to and from individual patients use	Yes, with the previous employment. Now at times when busy. Place the cap on a hard surface and push needle in. But not always, as taught not to recap. I see that colleagues are recapping	Yes, I separate to have control over fast filling of sharps box. Colleagues do the same	Procedure trolley and is access by every staff member	When busy due to lack of man power, In all 3 shifts as we handle sharps, boss does not attend to my queries so I was physiologically affected so could not concentrate	No, managers think it is a minor thing to orientate on sharps. Assumes that we know how to manage sharps	Work alone with community health worker in afternoon or night shifts to attend to about 48 patients and more
Rural 1							
002 -01		Yes I did recap previously, Not now due to HIV awareness about 7 – 10 years ago. but others recap in an attempt to protect others from injuries because of no proper disposal methods		Procedure trolley and other treatment section, it is access by all staff	Busy, rush with procedures, recapping even told not to, Lack of man power so staff work alone in afternoon and night shifts	No because waste management was not considered as an important issue	They dispose them into other waste bins when they are busy with excessive workload
002-02	Carry with hands	Yes, I do recap despite being told because it is normal for me as I cannot change. I hold the needle and syringe on both hands and recap. This is to	No	On the floor and access by every staff member	I don't think that I would sustain any sharps injuries	No, I could not remember as it was some time ago	Unable to change this habit of recapping very easily. Sharps are also discarded together with other wastes by using items such as buckets, dish and empty card box.

		protect others from injury					
002- 03		Yes, I recap during previous practice as taught in nursing college. Does not recap after orientation programme	No	At all clinical sections but it is not properly accessed by the colleagues	Busy with work load, rush, tired from over work, no orientation, laziness, no proper lights		Colleagues have no passion to use the sharps box. Throws them in to any waste bin that is available
Rural 2							
003- 01	Tray, carry in hands at times	Previously I did recap. I learn not to recap about 7 – 10 years ago.	No, direct disposal as one item	All clinical sections	During recapping	No, as there was no significant consideration on sharps disposal. Orientated only on clinical matters	Lacks importance of sharps handling and management by middle managers so orientation in this regard is not significant.
003- 02	Carry with hands	Yes, to prevent self and others from injury. Place the cap on a surface and push the needle into recap.	No I don't, but have seen colleagues separating the needle and syringe	On the treatment trolley which is located in the treatment room Yes, as everyone carry the sharps back to the sharps box which is stationed on the trolley as the wheels are damaged	At night as there is no light after hours. Use mobile torch and other means to generate light, When busy with emergency due to lack staff shortage	No orientation so practiced through observation	No separate box for each ward section as the box is placed in the common treatment room

003- 03		I recapped previously. I was taught not recap about 5-6 years ago. Sharps boxes were introduced 10 years ago. Others are still recapping as it is a normal practice (could not adapt to changes easily)	No	On the table top. If I leave it on the floor then I might accidentally drop it open. It is accessed by my colleague	During busy times when attending to too many patients. At nights due to light problem as we use lanterns and other means to generate light	No. observed and followed others	Others who have not attended any sharps related training do not handle and dispose sharps properly therefore has recommended proper training for them.
003-04	Dispose them direct as the distances between the place of work and the sharps box is close	Bend lancets prior to disposal to avoid injury to self, colleagues or others. Recap needles even when busy for same reason	Yes, separate needle from the syringe prior to disposal to avoid fast filling of the box.	Place on top of the table for safety reasons and he access it himself as he is the only staff	Busy especially in the mornings when there is plenty of patients, sometimes family problems as I may not concentrate	No orientation was done on sharps waste besides other activities in the facility	Assumes it is safe to place it on the table top.

4.6. Theme four: Types of disposal items and methods

Facility/ code	Sharp box	when to change sharps box	Stock/ Supply source	Number of boxes/ day/ week /month	Other alternatives	Final disposal method	Comments
Urban 001 -01	Yes	1/3 full or I am not sure	At times supply fall short, supply from hospital but not sure of external suppliers	2 boxes daily when busy	Empty IV flask and detergent containers	Incinerator, Burn, pit hole	When there is a technical fault with incinerator, sharps are burn and buried so I think it is not a safe practice
001 -02	Yes	¾ full as advised during training	Not always in stock. Supply obtain from hospital stores & pharmacy	A box is used for 3-4 days	Empty IV flask & disinfectant containers	Incinerator and sometimes burning method and remains are buried	It does not take long for the hospital to take new stock. Barriers could be finance but not sure. I think use of alternatives are not safe
001- 03	Yes	¾ full	Not always in stock. Supply from area medical store	1 daily in busy areas such as outpatient, sometimes depend on number of patients	Empty detergent container as it is a normal practice when there is no supply	Incinerator but when there is technical problem, sharps are burnt and remains are buried or sometimes thrown into the open pit	It is not safe because dogs pull out sharps box and public scavenge because they are disposed together with other biomedical waste. Hospital has an approved budget for infection control. Place order through companies when delay in transport
001 -04	Yes	1/3 or ¾ full. Sometimes it fills to the brim and spills over	Sometimes not in stock. Obtain from hospital stores	Depends on number of patients we serve	IV flasks	Incinerator	Assumes that empty IV flasks are safe because I can see through once it is full. Because of the consistency in the collection, I think final disposal methods are in good condition.
001-05	Yes	¾ full	Not always, especially weekends. Obtain supplies from area medical store and hospital pharmacy	About 3 days to fill a box in busy areas.1 week in ward sections	Empty IV flasks and detergent containers	Incinerator and Bury using open deep pit holes	Not safe because of public accessibility due to lack of proper fence around the pit

Rural 1							
002 -01	Yes	Have no idea	Not available at times. Order bio monthly through area medical store	5 box /week 10-20 month	Dish, buckets, empty cardboard boxes	Open pit hole about 6 – 8 feet deep, Burn sharps and dispose remains into the pit	Not a safe practice because there is no fence around the pit. Generally no training so all the staff are not aware of safe and proper sharps disposal techniques
002-02	Yes, but not sure of the name	Have no idea	Not available sometimes. No idea where the boss obtains them	2 boxes in a week as it is not always busy	Dish, buckets, empty card boxes	Open pit	Children access for syringe and dogs as well because it is not fenced. I dispose sharps into other wastes bins as well and it is not safe
002- 03	Yes but not properly used. Sharps are disposed into other waste bins	I have no idea	Always available because we do not use often	Depend on patient use	Dish, buckets, empty card boxes, drums and paddle bins	Open pit	Sharps are often disposed of together with other waste instead of the box provided. Whole waste management is very poor and it is not safe. Appoint a specific officer to be responsible for waste management
Rural 2							
003- 01	Yes	¾ full. However, fills up to the brim by those who are not aware	Always available. Obtain from Area Medical store, AUS AID support kit and family health services.	1 or 2 in a week. Depend on patients use	-	Open pit outside on the road side. Could not have it within the facility because of water under the ground	No suitable location so that is the only option. Otherwise it is not safe as there is no fence
003 -02	Yes, but throws into other waste trash	No idea	Always available. OIC places orders so don't know where he obtains them	-	-	Open pit on the road side	Sharps box is available but he is lazy and ignorant to use it properly so throws everything in to one bin which is not safe
003- 03	Yes	¾ full	Available	-		Open pit	Needs improvement. Understands importance of sharps waste. Current practice is not safe

003- 04	Yes	¾ full	Available at the health centre pharmacy but no idea of external order	Depend on patients. Maybe a box 5 – 6 months	No substitute at his work area	Open pit	Dogs harbour through the whole waste pit. School children access to search for syringes. Whole waste management is poor and it is not safe for staff and public
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4.7. Theme five: Knowledge of sharps waste management policy and availability of other related protocols

Facility/ code	Aware of policy Yes/ No Specify	Other related protocols	Understand the Policy? Yes/No	Barriers	General remarks
Urban 001 -01	No	No	No	Never attended training so not aware of the policy, Lack of cooperation among staff and middle managers, Always busy so no time to search around	<ul style="list-style-type: none"> • She only heard about an infection control policy but has never made attempt to find and read it. • Middle managers interested in work output and not interested in solving staff queries
001 -02	Yes, National and local revised infection control policies	Yes, Waste management Flow chart	Yes	-	Aware of the policy and related guidelines. Attempts are made to implement them.
001 - 03	Yes, National and local revised infection control policies	Local manual was approved by the management to use in 2010	Yes	-	Need to develop specific sharps policy for staffs' convenience
001 -04	No	No	No	I could not think of some barriers	I heard of a policy but never read it, knowledge on safe handling and disposal practices was gained through orientation training
001-05	Yes, National infection control policy	No	Yes	If others are not following then it is due to individual behaviours such as laziness and ignorance	Not aware of the revised policy

Rural 1					
002 -01	Yes, National Infection Control and prevention policy	HIV prevention and immunisation policies	No	Personal attitudes, lazy and ignorant so I never read the available policies. Specific training on sharps waste was never rendered by previous management	<ul style="list-style-type: none"> States no specific policy for sharps We could also blame ourselves for not reading and following the instructions on available policies Suggest training to all staff to understand policies and implement accordingly
002 - 02	Yes, but I am not sure of type the type	No	No	Tired and ignorant. I would not be able to understand concepts if policy is available	No one reminds me about a policy. I heard the name of the policy but not sure of the specification
002 – 03	No	No	No	-	Emphasis strongly on training and improvement on overall waste management including sharps disposal as we are and I am afraid of HIV and other blood borne infections
Rural 2					
003- 01	No	No	No	-	Heard about a general policy but I have never sighted it.
003 - 02	No	No	No	-	If a policy is available then the boss needs to inform me so that I may read and know the content and follow.
003 – 03	No	No	No	-	I understand the importance of sharps waste management so urge to have a policy in place
003 – 04	No	No	No	Lack of cooperation and understanding between the OIC and the administration team	<ul style="list-style-type: none"> I practice through knowledge from previous training. Strongly suggest for a policy, No vision for improvement by management so receive negative responses when suggest for improvement

4.8. Theme six: Previous history of occupational sharps related injuries and reporting protocol

Facility/ code	Had sharps injury? Yes/ no	Injury of a colleague yes/ details, No	Injury type	Reported Yes/where No/ why	Treated With PEP Yes/ No	Psychological Impacts Yes/ describe, No	Aware of reporting protocol Yes / No/ why?	Aware of blood borne Infections Yes/ types; No/ why	Remarks
Urban 001-01	No	Yes, a nursing officer, worked 18 years of service.	Needle stick injury from a HIV positive patient	Yes, she reported to a medical officer in the ward.	Yes, commence d on treatment	Scared, worry and left shift work	No, I am not aware because never attended training and also no one told me about a protocol	Yes, HIV & AIDS Hepatitis in general.	<ul style="list-style-type: none"> • Never attended training, • Lack knowledge on specific hepatitis.
001 -02	No	Yes, three colleagues: Two nursing officers and one medical officer	Needles stick injuries from HIV positive pts.	Yes, all reported	Yes, all of them got PEP	Scared, worry, fear of HIV infection	Yes, from available policies At the work place	Yes, HIV& AIDS, Hepatise A, B & C	<ul style="list-style-type: none"> • Injured colleagues had sustained injuries while attending to patients alone • Not quite sure of hepatitis type A. HIV is a more common admission than hepatitis
001- 03	Yes, with previous employe nt when recapping. I never reported	Yes evidence of staffs reports available in file	Needle stick injuries from old and fresh needles	Yes, some especially hygiene staff report. Others do not report officially. Verbal reports outside of work area	Not sure as they report direct to Tininga clinic where they keep the PEP medicatio ns		Yes, it is available in the office and distributed to all the sections within the setting	HIV and AIDS but not sure of Hepatitis C and Hepatitis A. I think typhoid is one of them	<ul style="list-style-type: none"> • Protocol in place but staff does not seem to report. • Young workforce in late 20s and 40 mostly encounter sharps injury and some they report. Most verbal notices. • May be the curriculum is not taught in nursing schools

001- 04	Yes	yes	Needle stick injuries	No, I did not report to anyone but I checked the patients' initial blood and it was negative	I did not receive any PEP		No idea of a protocol due to no awareness at the ward level	I know of HIV and Hepatitis B as they are commonly emphasised by Government especially HIV & AIDS	<ul style="list-style-type: none"> • I was injured by a colleague during early hours of work. • Checked initial blood for patient and was negative so no PEP. • Assumes that if it was positive then I would receive PEP. • I do not check my initial blood because I know my status as I have regular checks.
001-05	Yes	Yes	I got injured with a clean vial. My colleague had needles stick injury	Yes, the colleague checked her blood	No, because patient's initial test was negative	I was not worried because of the clean device but my friend was worried, scared and left duty	Yes, protocol is available in the ward section	HIV, Hepatitis A and B	<ul style="list-style-type: none"> • Protocol is available, due to ignorance; staffs do not follow the instructions. • I am aware of the protocol. • Assumes that if the patient's initial blood test was positive then the colleague could receive PEP. • NB: wrong perception as incubation period is 3/12 after contact so client might be positive thereafter.

Rural 1									
002 -01	No	No	-	-	-	-	No protocol available	HIV and Hepatitis B only	<ul style="list-style-type: none"> • If sustains injury then would take it lightly because of no reporting protocol. • Aware of the implications and first aid care through HIV Prevention training. • Would affect family and job if encounters the BBIs
002- 02	Yes	No	Needle sticks	Did not report because no protocol in place	No PEP because not aware of information	-	Nothing in place	HIV, Hepatitis and tetanus	<ul style="list-style-type: none"> • Never even reported to the boss because it was considered as a minor issue. • Scared now of HIV and hepatitis B because he is aware of the implications.
002 -03	Yes , twice	No but even if they had, they would not tell me because there is no one to report	Surgical and injection needles when recapping	Not reported because no protocol in place	No	Scared, fear and worry	Nothing in place	HIV and Hepatitis A, B and C	<p>Never reported the injuries because of no reporting protocol</p> <p>You are reminding me of the terrible experience I felt during that time</p>

Rural 2									
003- 01	No	Yes, a female officer	Needle stick injury	Yes, she was referred to the provincial hospital and had her blood checked	She was not started on PEP as her result was negative	She was scared and worried	No proper reporting protocol in place	HIV and AIDS and Hepatitis B	<ul style="list-style-type: none"> Assumes that injury was sustained from a child who is not positive HIV so did not bother to collect patients' blood for initial tests No appropriate reporting protocol in place
003- 02	Yes	No	IV needle	No	No	Worried, confused and upset	No reporting protocol available	High chances of contracting HIV & AIDS and hepatitis due to the current practice	<ul style="list-style-type: none"> Understand a bit of first aid care and applied. Aware of likely implications but no choice to report even if I encounter injuries again
003- 03	Yes but it was a minor injury as it was from a clean device	No	Clean needle	-	-	-	No protocol in place	HIV & AIDS and hepatitis B	<ul style="list-style-type: none"> Reporting of sharps injuries and knowledge of likely implications was not of significance until recently. I feel that through a reliable training every health worker will know and understand the whole issue about sharps
003- 04	No	Yes, 3 colleagues from prev. employment	All were needle sticks. two by recapping and one during injection to an uncooperative client	Yes	Yes, they reported within 72 hours	Yes	Yes with previous employment but none with current institution	HIV and AIDS, hepatitis B, C and gastroenteritis	<ul style="list-style-type: none"> Aware of the implications and a reporting protocol with previous employment but not with the current setting.

4.9. Theme Seven: Recommendations made by participants

Facility / code	Problems identified	Recommendations
Urban 001-01	<ul style="list-style-type: none"> • Use of alternatives not consistent, but depend on the availability of sharps boxes 	<ul style="list-style-type: none"> • Bosses need to address staff complaints and assist where necessary. • Management to make known a workers compensation protocols if any • Have a committee in place with fair representatives of staff members. If there is one then apologised as I never read the policy so not aware of an existing committee • General basic waste management is practiced within their means through management support. However, I am not aware of other facilities within the province and the country
001-02	<ul style="list-style-type: none"> • Inconsistent supply of sharps box • Technical faults with incinerator and sharps are buried closer to the hospital vicinity • Incinerator produces thick fumes and pollutes air and surrounding environment • Lack additional orientation for newcomers at ward level 	<ul style="list-style-type: none"> • Ensure constant supply • Procure a backup incinerator • Re-location of existing incinerator • Regular orientation for new employees and those who are on rotation to new work sections at the ward level by ward managers and supervisors. And also conduct regular in-house training by responsible officers and training coordinators.
001-03	<ul style="list-style-type: none"> • Placement of filled sharps boxes at the nurses' station • Placement of biomedical waste bin which contains sharps in wrong location in ward sections • Lack of regular training for both new employees and existing staff • Lack of adequate staffing, so work load too great • Poor reporting of sharps injuries 	<ul style="list-style-type: none"> • Locate biomedical waste bin in a place where only health workers can place biomedical waste including filled sharps boxes. • Improve on providing on-going training to both new and existing staff • Increase workforce to share responsibilities as services are increasing from new approach with the WHPHA. • Staff need to be aware of the importance of reporting procedures so as to provide evidence to seek assistance from management to improve related service
001-04	-	<ul style="list-style-type: none"> • Orientation on first day for every new staff person joining workforce • Weekly or monthly briefings about sharps waste in ward sections

001-05	<ul style="list-style-type: none"> Filled sharps boxes are not picked up on time by responsible staff. Maybe lack of manpower could be the delay Improper location of the biomedical trash bins where patients access and dispose general waste 	<ul style="list-style-type: none"> Regular awareness refresher training at management level Regular ward teachings by bosses and supervisors Relocate bio-medical waste bin to suitable location in ward sections Have separate waste bin for sharps alone Maintain current practice <p>Comment: Respondent is motivated to read more and would like to re-educate others at her place of work</p>
Rural 1		
002-01	<ul style="list-style-type: none"> Animals, children and publics have free access to the final disposal site/pit Inconsistent supply of sharps box Improper final disposal method Lack of knowledge by health staff Lack of adequate staff 	<ul style="list-style-type: none"> Improve on waste management system and provide suitable incinerators to all rural health facilities Train all rural health staff on the importance of safe sharps waste management Provide constant supply of sharps boxes Allocate adequate staff as it is a district health facility where we are over worked <p>Comment: after the interview the respondent understood the significance of staff health and safety at the workplace and strongly recommend the above</p>
002- 02	<ul style="list-style-type: none"> Poor waste management system Pit is about to fill to the brim 	<ul style="list-style-type: none"> A similar machine to burn waste that is used in the hospital setting (incinerator) Training for all health workforce Meanwhile dig a new pit
002-03	<ul style="list-style-type: none"> Poor and improper waste management system Not enough staff on duty especially afternoon and night shifts 	<ul style="list-style-type: none"> Introduce waste management standard in the hospital to the rural health facilities Install suitable incinerators for final disposal Training for all rural health workforce More staff especially nursing officers are needed <p>Comment: Has learned the importance of sharps waste through this interview and appreciated</p>

Rural 2		
003-01	<ul style="list-style-type: none"> • Poor waste management: • No proper fence • Dogs, children, and public access to waste site • Could not burn them during wet seasons • Digging pit after pit holes for these many years • House are few metres away from dump site • Lack of knowledge by health workers 	<ul style="list-style-type: none"> • Upgrade and improve entire waste management system in all rural health facilities • Proper training for all the staff members about the importance of sharps waste management
003-02	<ul style="list-style-type: none"> • Poor waste management system • Lack of knowledge by all health workers • Most times I work alone especially in the night because of staff shortage • Bad odours produced by wastes from the open pit • Secondary and primary school children including the general public as well as health workers are at risk because of the location of the dump pit 	<ul style="list-style-type: none"> • Improve on entire waste management system including installation of incinerator or a concrete pit • General staff training on sharps issue • Consider staff safety • More health workers are required
003-03	<ul style="list-style-type: none"> • Poor sharps waste management activities: • Location of dump site on the road • No proper fence • School children access in search of syringes • Pigs and dogs have free access • Lack of awareness to the public about the dangers of sharps waste 	<ul style="list-style-type: none"> • Introduce infection control and standard waste management programmes to the rural settings • Train all health workers regarding the importance of sharps waste management
003 -04	<ul style="list-style-type: none"> • No policy guidelines in place • Lack of knowledge by health workers • Poor waste management at current 	<ul style="list-style-type: none"> • General staff training and awareness regarding the importance of sharps waste management • Management awareness regarding the importance of sharps waste management and willing to support training program and so forth • Improve on entire waste management system