

Knowledge, attitudes and practices of healthcare workers about healthcare waste management at a district hospital in KwaZulu-Natal

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Background: Healthcare generates a large amount of healthcare waste (HCW), which is complex to manage because of its variety and potential to create health and safety hazards if improperly handled. It is essential that healthcare workers have appropriate knowledge of and adhere to proper disposal methods for each category of HCW.

Aim: The aim of this study was to assess the knowledge, attitudes and practices of staff working at a district hospital about HCW management, and measure associations between these variables.

Setting: The setting for this study was a district hospital in KwaZulu-Natal province.

Methods: This was an observational descriptive study among 241 professional and non-professional staff. Data were collected using a questionnaire and analysed using the Statistical Package for the Social Sciences.

Results: Knowledge of HCW management was generally inadequate, with 42.7% of the participants scoring 'poor' overall. Just over half of the participants reported a good attitude towards the appropriate disposal of HCW but only 53.9% demonstrated good HCW management practices. There was a significant ($p < 0.05$) relationship between knowledge and practice and between attitudes and practices ($p < 0.05$).

Conclusion: Appropriate training and supervision in HCW management as well as relevant and ongoing in-service training is needed to ensure appropriate knowledge, attitudes and safe practice among all members of staff. As poor practices have been reported on a number of occasions from different hospitals in South Africa, relevant training must also be introduced or improved at undergraduate level.

Keywords: healthcare waste management, knowledge, attitudes and practice

Background

The volume of healthcare waste (HCW) has dramatically increased over the last 30 years, with hospitals and medical centres across the world generating more waste than ever before.¹ The USA is reported to generate approximately 3.6 million tons of HCW per year, while in South Africa (SA) 42 000 tons of HCW were generated in 2010 with the cost of its safe disposal estimated to be in the region of R 71 million/year.² In addition to the direct costs of HCW disposal, there are additional costs such as transporting biohazardous waste material from hospitals to sites where it can be safely disposed of, capital, maintenance, utility and management overhead costs.³

HCW, because of its composition and hazardous nature, needs special attention to be given to its collection, storage and disposal, as it poses risks of transmitting infectious diseases, such as HIV/AIDS, and hepatitis B and C, to people and contamination of the environment.⁴ HCW management policy divides hospital waste into two broad categories, namely general HCW and hazardous HCW, to facilitate its correct and cost-effective disposal. General HCW includes waste generated in the course of administrative and housekeeping functions, as well as through the activities of patients and visitors, and can be treated like municipal waste. Hazardous HCW includes a plethora of potentially dangerous items that are used during patient care, such as sharps (hypodermic needles, saws, pipettes, scalpels, broken glass, blades etc.) as well as other contaminated material (wound dressings, dirty linen, human tissue etc.). The system for

disposal of hazardous HCW is complex,⁴ as each item must be disposed of correctly, according to specific guidelines, to protect patients, staff and the general public. HCW management comprises seven key stages: segregation (ideally at source), collection, storage, handling, transportation, treatment and disposal. The correct identification of HCW at source is important, as it must be deposited into specific containers that are then disposed of through incineration, sterilisation, chemical disinfection or burial in a secured landfill site.⁴

Inappropriate medical waste management can lead to injuries from sharp instruments, contamination of the environment by hazardous chemicals, and diseases transmitted by infectious agents.^{5–8} Several major public health threats have been attributable to poor management of HCW. In October 2008, the by-products of a mass vaccination campaign of 1.6 million children against polio were discarded into the local municipal waste site in Kabul, Afghanistan, causing infectious injury to individuals scavenging landfills for reusable items.⁹ In March 2009, 240 people in the Indian state of Gujarat contracted hepatitis B following the reuse of syringes, which were later discovered to have been acquired through the black market trade in unregulated HCW.¹⁰

Effective and efficient management of HCW remains a major problem throughout the world, and has been identified as a particular problem in developing countries. A study carried out in Ethiopian hospitals in 2011 revealed that there was inadequate

separation of HCW at source and poor treatment practices.¹¹ A study in Kenya in 2012 highlighted a lack of formal training in the management of HCW among hospital staff, and little interest from the hospital administration with regard to the appropriate disposal of HCW.¹² A South African study in 2016 highlighted poor knowledge among healthcare professionals (HCPs), and the need for all staff working in health care to receive regular training to improve their knowledge and practice regarding medical waste disposal to minimise the risks associated with improper waste management.¹³

The South African Government, through the Health Professions Council of South Africa, has developed an extensive waste management guideline for health practitioners to ensure that medical waste 'is handled so as to ensure that it is segregated at source, contained in packaging that holds the contents to the point of disposal, and disposed of in a manner that is practical and efficient yet minimises any hazard'.¹⁵ The guideline further stipulates that HCPs should ensure that they are conversant with the operational approaches for handling and storing HCW safely, and should remain updated with the current trends and knowledge on its safe management through training.

To ensure proper disposal of HCW, South African undergraduate HCP training should ensure adequate knowledge, as well as practical training, in the management and safe disposal of HCW. However, despite the medico-legal hazards associated with poor HCP disposal practices, a South African study published in 2016 highlighted poor knowledge of HCW management among doctors, nurses and medical technologists.¹⁴ The study also demonstrated that non-professional staff (cleaners, porters, ward attendants), some of whom are responsible for HCW collection and disposal, had a much larger knowledge deficit than doctors, nurses and technologists.¹⁴ This finding, however, is not consistent with that of a study in Egypt, which rather surprisingly showed that non-professional hospital staff had greater knowledge of and improved attitudes towards HCW than nurses or doctors.¹⁵

Many of the challenges associated with managing HCW can be attributed to lack of knowledge about its safe disposal.¹⁶ The knowledge, attitude and practices of HCPs has been shown to play an important role in successfully managing HCW, with the lack of adequate knowledge and practices being shown to result in an increase in the spread of infectious diseases, among other consequences.¹⁷

Table 1: Number of relevant staff members working at district hospital and sample selected

| Health worker category | Population | Sample |
|---|------------|--------|
| Doctors | 27 | 26 |
| Medical technologists | 12 | 12 |
| Dentists | 4 | 4 |
| Paramedics (physio, OT, speech therapists and clinical psychologists) | 26 | 25 |
| Nurses | 361 | 187 |
| Porters | 15 | 15 |
| Cleaners | 44 | 40 |
| Ward attendants | 21 | 20 |
| Total | 510 | 329 |

The aim of this study was to establish the knowledge, attitude and practices of healthcare workers (defined as anyone who delivers care and services to the sick and ailing either directly as doctors and nurses or indirectly as aides, helpers, laboratory technicians, or even medical waste handlers¹⁸) about HCW management at a district hospital in KwaZulu-Natal. The data collected in this study moved beyond a focus on healthcare professionals' knowledge and attitudes to include a sample of non-professional healthcare workers (ward attendants, porters and cleaners), as these categories of staff have not previously been included in South African studies and are involved with the collection and disposal of HCW.

Ethical permission for this study was provided by the Biomedical Research Ethics Committee of the University of KwaZulu-Natal (Ref: BE 437/14). Permission was also obtained from the KwaZulu-Natal Provincial Department of Health and the district hospital where the study was conducted. All participants signed informed consent after being informed of the purpose of the study.

Methods

This was an observational descriptive cross-sectional study done at a busy district hospital in KwaZulu-Natal (KZN) province. This site was chosen as the knowledge of, attitude towards and HCW management practices of healthcare workers in a high-throughput district hospital in the province had not previously been studied. The study sample consisted of professional healthcare workers (doctors, nurses, dentists, medical technologists, physiologists, occupational therapists, speech therapists and clinical psychologists), and non-professional healthcare workers (ward attendants, porters and cleaners).

At the initiation of the study a total of 577 people were employed at the hospital according to the human resources department records, of whom 67 were excluded as they had no direct patient contact (admin staff, grounds staff and maintenance staff) or because their normal operation does not generate or handle HCW, leaving a study population of 510 (see Table 1 for details). Due to the large number of nurses working at the hospital and to ensure adequate representation from all categories of staff who are involved with HCW a stratified sample of 329 (calculated at 95% confidence level and error value of ± 5) was chosen.¹⁹

For analysis, participants were grouped into three categories of staff, namely nurses, other professional staff (doctors, dentists, medical technologists and allied healthcare professionals), and non-professional staff so as to better understand the knowledge, attitude and practices of all categories of healthcare workers.

Data were collected in January and February 2016 using a self-administered questionnaire that was adapted from one used in a study by Al-Emad *et al.* to assess management of HCW in hospitals in Yemen.²⁰ To address issues of attitude towards HCW management, additional questions from a study by Rudraswamy *et al.* were included.²¹ The questionnaire was reviewed after being completed by the first 10 participants as the pilot study, results from which were not included in the final study. Those participants were asked to comment on any challenges they experienced in completing the questionnaire, which led to minor language and presentation changes.

The questionnaire was divided into four sections: demographic details, knowledge, attitude, and practices regarding HCW. Section A considered demographic details such as age, gender, marital status, race, educational status and employment

Table 2: Respondents' information

| Employment designation | Total population | Number selected | Number of questionnaires returned | Percent |
|---|------------------|-----------------|-----------------------------------|---------|
| Medical doctor | 27 | 26 | 26 | 100 |
| Dentist | 4 | 4 | 2 | 50 |
| Nurse | 361 | 187 | 187 | 100 |
| Allied healthcare professionals (physiologists, occupational therapists, speech therapists, and clinical psychologists) | 26 | 25 | 0 | 0 |
| Medical technologist | 12 | 12 | 5 | 42 |
| Non-professional workers (porters/cleaners/ward attendants) | 80 | 75 | 21 | 28 |
| Total | 510 | 329 | 241 | 73 |

designation (doctor, nurse etc.). Section B consisted of 21 questions regarding participants' self-reported knowledge of HCW management. Scores for each question were combined to give an overall knowledge score, which was graded as follows: 17–21 (> 81%) = excellent, 11–16 (52–81%) = good, < 11 (< 52%) = poor. Section C consisted of 22 questions that reviewed participants' self-reported practices regarding HCW management. Questions were specific around sharp and blunt HCW management and the placement of waste in differing coloured containers, with responses for each question combined to give an overall practice score as follows: 17–22 (> 77%) = excellent, 11–16 (52–76%) = good, < 11 (< 52%) = poor. Section D consisted of four questions that assessed participants' attitudes towards HCW as well as practices and protocols with regard to HCW management. A Likert scale-like assessment, which tested the degree of agreement and disagreement of participants with certain propositions, such as: 'Segregating of waste at source increases the risk of injury to waste handlers' was used. Participants were considered to have a good attitude towards HCW management if they strongly agreed or agreed with Q48 and disagreed or strongly disagreed with Q46, Q47 and Q49. The completed questionnaires were analysed using SPSS® Version 23 (IBM Corp, Armonk, NY, USA). A *p*-value of < 0.05 was considered to be significant. The analysis of attitudes was based on frequency of responses and any associations between knowledge, attitude and practices were tested for. The questionnaire is attached as Appendix 1. Participants signed a sheet when they submitted the completed questionnaires to ensure that no participant completed more than one questionnaire. The questionnaires were handed to the participants who were encouraged to fill this in and return on the spot, either by the lead researcher or the research assistants employed for the purpose of questionnaire distribution.

Results

Of the 329 questionnaires that were distributed, 241 (73%) were returned. Most respondents were female (202; 84%) ages ranged between 18 and 56 years, with a mean age of 38 years. Education levels ranged from primary to tertiary education, with 1/241 (0.4%) having only primary education, 47/241 (19.5%) having secondary education, 163/241 (67.6%) tertiary education and 9/241 (3.7%) postgraduate training, while 9% (21/241) did not indicate their educational qualification. Table 2 presents the employment designation of those who participated in the study as well as the percentage of each category who returned the questionnaire.

For the remainder of the results, healthcare workers have been grouped into three designations, i.e. nurses, other professional staff (doctors, dentists, medical technologists and allied

healthcare professionals) and non-professional healthcare workers (porters, cleaners, and ward attendants).

Knowledge scores for each category are presented in Table 3. The major gap in knowledge was around the safe disposal of blood and blood products, followed by a lack of knowledge about managing human tissue remains. Nurses' knowledge of HCW management was better than that of the other healthcare professionals, with an aggregate of 63% of nurses scoring 'good' (47.7%) or 'excellent' (15.3%) on the knowledge score. The other professional participants scored worst, and had poor knowledge of the purpose of the different coloured bags used for sorting medical waste. Just under half of the participants (48.3%) reported that they have never received any formal training in HCW management. However, among the 50.7% (122/241) who reported in-service training in HCW management, 38.7% (86 participants) were nurses.

While 53.5% of the other professional participants correctly disagreed or strongly disagreed that 'Segregation of waste at source increases the risk of injury to waste handlers' only 33.7% of nurses and 21.4% of non-professionals disagreed or strongly disagreed with this statement. The majority of the other professional participants (89.6%), 68.8% of the nurses and just 33% of non-professional participants recognised that containing sharp objects helps to safely manage hospital waste; however, 33.3% of the non-professionals did not answer this question. In addition, only 26% of the non-professional participants seem to understand the importance of reporting needle-stick injury (Q49) (28.6% did not answer the question). The detailed responses to each question are given in Table 4.

Only one participant scored 'excellent' for HCW management practice with 53.9% scoring good and 45.5% scoring poor, suggesting that unsafe HCW disposal practices are placing staff, patients and the hospital environment at risk (see Table 5). Only 51.2% of other professionals and 52.8% of nurses reported sorting HCW when depositing it into collection bins, and over 80% of the non-professionals reported that they sort HCW on collection. Important areas where HCW disposal practices were suboptimal included: collecting liquid with other waste material, and not separating sharp from blunt objects. Furthermore, 33% (80 participants) reported the temporary piling of medical waste in open spaces within the hospital, and 47.6% (115) indicated the non-availability of all the required categories of colour-coded containers. An appreciable number of the participants (48.1% or 116 participants) had no idea whether or not the hospital had an incinerator to managed on-site waste disposal. Only 53.9% (130) reported receiving supervision while handling HCW, of whom 114 were nurses.

Table 3: Overall knowledge of healthcare workers about healthcare waste

| Designation | Knowledge | | |
|--|----------------------|------------------|-----------------|
| | Excellent (> 81%) | Good (52–81%) | Poor (> 52%) |
| Other professional healthcare workers (n = 33) | 0 (0%) | 11 (32.3%) | 22 (67.7%) |
| Nurses (n = 187) | 29 (15.3%) | 89 (47.7%) | 69 (36.9%) |
| Non-professionals (n = 21) | 1 (5.9%) | 8 (35.3%) | 12 (58.8%) |
| Total | 30/241 (12.4%) | 108/241 (44.8%) | 103/241 (42.7%) |

Table 4: Overall attitude of healthcare workers about healthcare waste

| Designation | Possible responses | Q46: Segregating waste at source increases the risk of injury to waste handlers | | Q47: Containing sharp objects does not help the safe management of hospital waste | | Q48: Hepatitis-B immunisation prevents its transmission within the hospital | | Q49: Reporting needle-stick injury is an extra burden on work | |
|------------------------------|--------------------|---|------|---|------|---|------|---|------|
| | | No. | % | No. | % | No. | % | No. | % |
| Other professionals (n = 33) | Strongly agree | 4 | 12.1 | 1 | 3.0 | 6 | 8.2 | 2 | 6.1 |
| | Agree | 8 | 24.2 | 1 | 3.0 | 13 | 39.4 | 2 | 6.1 |
| | Disagree | 6 | 18.2 | 5 | 15.2 | 3 | 9.1 | 10 | 30.3 |
| | Strongly disagree | 9 | 27.3 | 21 | 63.7 | 6 | 18.2 | 14 | 42.4 |
| | Don't know | 1 | 3.0 | 1 | 3.0 | 1 | 3.0 | 1 | 3 |
| | Unanswered | 5 | 15.2 | 4 | 12.1 | 4 | 12.1 | 4 | 12.1 |
| Nurses (n = 187) | Strongly agree | 34 | 18.2 | 16 | 8.6 | 25 | 13.4 | 13 | 7 |
| | Agree | 63 | 33.7 | 28 | 15 | 22 | 11.8 | 21 | 11.2 |
| | Disagree | 24 | 12.8 | 69 | 36.9 | 83 | 44.4 | 66 | 35.3 |
| | Strongly disagree | 29 | 15.5 | 41 | 21.9 | 26 | 13.9 | 58 | 31.0 |
| | Don't know | 7 | 3.7 | 6 | 3.2 | 3 | 1.6 | 3 | 1.6 |
| | Unanswered | 30 | 16.1 | 27 | 14.4 | 28 | 15 | 26 | 13.9 |
| Non-professionals (n = 21) | Strongly agree | 1 | 4.8 | 0 | 0 | 3 | 14.3 | 2 | 9.5 |
| | Agree | 6 | 28.6 | 5 | 23.8 | 7 | 33.3 | 7 | 33.3 |
| | Disagree | 4 | 19.0 | 4 | 19.0 | 1 | 4.8 | 2 | 9.5 |
| | Strongly disagree | 0 | 0 | 1 | 4.8 | 0 | 0 | 2 | 9.5 |
| | Don't know | 3 | 14.3 | 5 | 23.8 | 4 | 19.0 | 2 | 9.5 |
| | Unanswered | 7 | 33.3 | 6 | 28.6 | 6 | 28.6 | 6 | 28.6 |

Table 5: Healthcare workers' practices in dealing with healthcare waste

| Designation | Practice | | |
|------------------------------|----------------------|------------------|-----------------|
| | Excellent (> 77%) | Good (52–76%) | Poor (< 52%) |
| Other professionals (n = 33) | 0 (0%) | 13 (38.7%) | 20 (61.3%) |
| Nurses (n = 187) | 1 (0.6%) | 102 (54.5%) | 84 (44.9%) |
| Non-professionals (n = 21) | 0 (0%) | 15 (70.6%) | 6 (29.4%) |
| Total | 1/241 (0.6%) | 130/241 (53.9%) | 110/241 (45.5%) |

Associations between participants' categories and knowledge, practice and knowledge, as well as attitude and practice indicate a significant ($p < 0.05$; chi-square = 14.312) but weak association (Cramer's $V = 0.179$) between the designation and knowledge

with nurses ranking best in terms of knowledge. There was a significant ($p < 0.05$; chi-square = 30.928) but moderate (Cramer's $V = 0.253$) relationship between knowledge and practice with a statistically significant ($p < 0.05$; chi-square = 11.465) but weak (Cramer's $V = 0.154$) relationship between their attitudes and practices.

Discussion

This is the first study to be done at a district hospital in KwaZulu-Natal that explores the knowledge, attitude and practices of healthcare workers (including non-professional staff) towards HCW management. There was excellent participation by doctors and nurses but poor participation by the allied health professionals (physiotherapists, occupational therapists and clinical psychologists), possibly due to their limited contact with hazardous medical waste and not feeling that the study was

relevant to them. The low participation from the non-professional healthcare workers (i.e. porters, cleaners and ward attendants) is a cause for concern, as many have contact with HCW and it is important that they are appropriately equipped to deal safely with HCW.

Knowledge of HCW management was generally inadequate, with 42.7% of the participants scoring 'poor' overall. In general, nurses demonstrated a better level of knowledge compared with the other designations, with other professional healthcare workers having the lowest knowledge score. The poor level of knowledge of other professional healthcare workers is surprising considering that doctors, medical technologists and dentists have regular contact with hazardous healthcare material and would be expected to be knowledgeable about HCW management. This finding, however, is consistent with previous South African studies done in Johannesburg, Mpumalanga province,^{13,22} and elsewhere¹⁴ and needs further investigation to

determine the reasons for this gap in knowledge. Just under half (48%) of the respondents reported that they had never received any formal training in HCW management and just over 50% reported receiving any in-service training. These results reflect the lack of exposure to HCW management during undergraduate training as well as a lack of exposure to in-service, ongoing training at the hospital regarding HCW management. The higher knowledge level amongst nursing staff may be due to their undergraduate and more structured in-service training. Of concern is the lack of knowledge among the non-professional healthcare workers who collect and dispose of the waste.

Just over half (54%) of the staff were considered to have a good attitude towards the appropriate disposal of HCW based on their response to the questions. This is somewhat of a surprise and may have been influenced by the wording of the questions and needs further investigation. Most participants, however, expressed a good attitude towards the proper handling of HCW but were unaware of the hazards associated with its improper disposal. A good attitude towards safe HCW handling in the hospital is an important finding with the World Health Organization stating that with regard to safe HCW management the human element is more important than the technology. Almost any system of treatment and disposal that is operated by well-trained, and well-motivated staff can provide more protection for staff, patients and the community than an expensive or sophisticated system that is managed by staff who do not understand the risks, and the importance of their contribution.²¹ In general the responses of non-professional healthcare workers suggest a poorer attitude towards HCW management. However, a significant proportion of the non-professional staff did not answer the attitude questions, which may suggest that they did not understand the questions or a knowledge gap rather than a poor attitude towards HCW management. Other studies have shown that training and ongoing monitoring is essential if policy is to be implemented.²⁴⁻²⁶

Considering the important safety and medico-legal implications for staff and patients, the HCW management practices in the hospital were disappointing, with only one participant having excellent practice and only just over 50% of participants demonstrating good practice. The large number of staff with poor HCW management practice reported in this study is consistent with reports in both private and public hospitals in Limpopo province, suggesting that HCW management practices need improvements in both the public and private sectors.²³ The poor practices demonstrated in this study could be partly attributable to inadequate knowledge, as there was a significant but moderate association between the two. In addition, this study has shown that there was inadequate effort made to ensure adequate knowledge of and compliance with hospital policy, with just under half of the respondents reporting a lack of in-service training on HCW management as well as inadequate supervision and monitoring of their HCW management practices. These results point to a lack of mechanisms and systems within the hospital to ensure that good practices are known and consistently followed. Other studies have shown that training and ongoing monitoring is essential if policy is to be implemented.²⁴⁻²⁶

Limitations

Busy schedules and staff rotations posed a major challenge to data collection, with only 241 out of 329 questionnaires (73%) being returned. In addition, the low number of non-professional

healthcare workers who participated in the study means that the results for that category must be treated with caution. In addition, the questionnaire was only available in English and contained words and concepts with which the non-professional healthcare workers might not have been familiar, which might have been a barrier to their participation. Furthermore, practices were reported and not observed and actual HCW practices may differ substantially from reported practices.

Conclusion

This study demonstrated a good attitude towards HCW management among the majority of staff members but inadequate knowledge, and disappointing practices in respect of HCW management at this district hospital. There is a need for the hospital management to put systems in place to ensure compliance among all members of staff with national legislation by providing appropriate training on and resources for HCW management (appropriately coloured bags, sharps bins etc.). Ongoing monitoring of HCW practices at the hospital is also essential to ensure best management practices, and to create safe working conditions for staff, visitors and the environment. In addition, given that poor practice and lack of adequate knowledge have been reported in studies in other parts of the country, there is a need to review the training curriculum of healthcare workers, to ensure that HCW policies and practices are appropriately covered in the undergraduate curriculum.

Authors' contributions – AO developed and wrote the protocol, collected and analysed the data and wrote the article. RG and AR made inputs during the protocol development and critically reviewed and revised article drafts.

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Appendix 1: Research questionnaire

Section A: Demographic

1. Age (years)

2. Sex: Male Female

3. Educational Level:

(a.) Primary (b.) Secondary (c.) Tertiary (d.) Others _____

4. Designation:

(a.) Medical Doctor (b.) Dentist (c.) Nurse

(d.) Laboratory Worker (e.) Ward Attendant (f.) Porters

(g.) Cleaners (h.) Paramedics

Section B. Knowledge of health workers about medical waste

| | Yes | No | I don't know |
|---|-----|----|--------------|
| 5. Are you able to identify the nature of medical waste? | | | |
| 6. If yes what criteria do you use to identify medical waste? <i>Please state them below:</i> | | | |
| 7. Do you identify the need to sort medical waste during collection? | | | |
| 8. Do you know the reason behind sorting (separation of) medical waste? i. ii. iii. | | | |
| 9. If yes give 3 reasons why waste should be sorted at site: | | | |
| 10. Are you aware of risks in dealing with medical waste? | | | |
| 11. If yes – name 3 risks associated with medical waste: i. ii. iii. | | | |
| 12. Do you know adequate disposal procedures for liquid waste? | | | |
| 13. If yes, give a brief explanation of the procedure you use or know of below: | | | |
| 14. Have you ever received any formal training on medical waste handling? | | | |
| 15. If yes, kindly tick the form(s) of training you received below: A. Formal lecture B. seminar C. workshop D Case scenario E. Others (please state below) | | | |
| 16. Do you know adequate disposal procedures for expired blood units and by-product waste? | | | |
| 17. If yes briefly describe what you will do with it below: | | | |
| 18. Do you know adequate disposal procedures for human tissue remains? | | | |
| 19. If yes, briefly state the disposal approach you use: | | | |
| 20. Do you have appropriate knowledge of the colour coding of medical waste disposal bags/containers? | | | |
| 21. If yes, state the categories of waste that goes into each of these colours: i. RED----- ii. ORANGE----- iii. YELLOW----- iv. BLACK OR DARK GREEN----- v. BLUE----- | | | |
| 22 Do you know adequate disposal procedures for expired medicines? | | | |

| | Yes | No | I don't know |
|---|-----|----|--------------|
| 23 Do you believe that throwing blood waste into domestic waste is an adequate disposal procedure? | | | |
| 24 Do you receive any form of supervision on the way you handle wastes? | | | |
| 25 Do you believe that throwing expired medicine into domestic waste is an adequate disposal procedure? | | | |

Section C. Health workers' practices in dealing with medical waste

| | Yes | No | I don't know |
|--|-----|----|--------------|
| 26 Do you sort medical waste during collection? | | | |
| 27 Do you separate sharp waste from blunt waste? | | | |
| 28 Do you move medical waste using trolleys? | | | |
| 29 Do you clean the waste trolley directly after each collection? | | | |
| 30 Do you use personal protection tools (e.g. gloves, safety goggles, face mask) ever or when handling medical waste? | | | |
| 31 Do you think the number of people employed to handle waste in the hospital is adequate? | | | |
| 32 Do you collect liquid waste in bags that prevent leakage? | | | |
| 33 Do you collect blood waste in bags that prevent leakage? | | | |
| 34 Do you collect human tissue remains in separate bags to prevent leakage? | | | |
| 35 Do you collect liquid waste together with other waste? | | | |
| 36 Do you collect blood waste together with other waste in ordinary bags? | | | |
| 37 Do you collect human tissue remains together with other wastes in ordinary bags? | | | |
| 38 Do you collect expired medicines together with other wastes? | | | |
| 39 Do you dispose of liquid waste into the sewage system after processing? | | | |
| Does the hospital have furnaces for internal destruction of medical waste? | | | |
| 40 Are hospital visitors exposed to medical waste? | | | |
| 41 Do you gather medical wastes in open areas within the hospital for temporary storage before being transferred outside the hospital? | | | |
| 42 Does the hospital have standard stores for temporary storage of medical wastes? | | | |
| 43 Does the hospital depend on the city cleaning authority (e.g. DSW) in moving and disposing of medical waste outside hospital? | | | |
| 44 Does the hospital dispose of medical waste outside using its own vehicles? | | | |

Section D. Attitude to waste-management practices and knowledge of the consequences of inappropriate practices

| | Agree | Strongly agree | Disagree | Strongly disagree | Don't know |
|---|-------|----------------|----------|-------------------|------------|
| 45 Segregation of waste at source increases the risk of injury to waste handlers | | | | | |
| 46 Containment of sharps does not help in safe management of hospital waste | | | | | |
| 47 Hepatitis B immunisation prevents transmission of hospital-acquired infections | | | | | |
| 48 Reporting of needle-stick injury is an extra burden on work | | | | | |

Thank you for participating.