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Full Length Research Paper

Perceptions of oncologists at two state hospitals in Gauteng regarding the ototoxic effects of cancer chemotherapy: A pilot study

Victor de Andrade*, Katijah Khoza-Shangase* and Fatima Hajat*

Department of Speech Pathology and Audiology, School of Human and Community Development, University of the Witwatersrand, Private Bag 3, Wits 2050, Johannesburg, South Africa.

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This project sought to obtain information regarding the perceptions of oncologists with regards to the ototoxic effects of cancer chemotherapy. Ten oncologists from 2 public hospitals in Gauteng participated in this project. Data were collected from self-administered questionnaires completed by participants. Using a qualitative and quantitative paradigm, data analysis utilized content analysis and descriptive statistics. Only 50% of the participants reported referring patients for audiological management during the chemotherapeutic process. None of the respondents reported having protocols in place for ototoxicity monitoring. Therefore, it appears as though ototoxicity and the role of the audiologist are not fully realized within the sample in the current study. Furthermore, it would seem as though oncologists need to be aware of ototoxicity; the role of the audiologist; and the need to include an audiologist in the oncology team. Results from the current study highlight the need for establishment and implementation of protocols and ototoxicity monitoring programmes in government hospitals in Gauteng.

Key words: South Africa, cancer, chemotherapy, ototoxicity, sensory neural hearing loss.

INTRODUCTION

Although the primary aim of cancer treatment regimens is to cure the disease, some patients are never cured but their disease may be controlled so that they live for many years (Stewart and Kleihues, 2003). Keeping this longer lifespan in mind, patients' quality of life is of utmost importance. In this regard, it is essential for health care workers to be aware of the detrimental effects of cancer chemotherapy on hearing in order to prevent the onset and progression of this type of hearing loss and in doing to improve the quality of life of the patient. Knowledge of the onset and progression of ototoxicity by oncologists may facilitate the development as well as efficacy assessments of otoprotective agents that may eliminate ototoxicity as an adverse effect of cancer chemotherapy. Ototoxicity occurs after ingestion of substances toxic to the hair cells of the cochlea which may result in hearing changes (Desmond, 2004). Frequently, the initial complaint is a continuous high-pitch tinnitus and this may be related to the basal turn hair cells of the cochlea being affected first (Luxon et al., 2003). Generally a permanent and irreversible sensory neural hearing loss, which affects the higher frequencies first and then progresses to the lower frequencies, is present (Fausti et al., 1994). The severity of ototoxicity depends on the drug plasma levels, renal function and general clinical conditions of the patient (Luxon et al., 2003). "Hearing problems may ensue from within a few minutes to several days after drug administration; however, late and slowly progressive hearing loss occurring several years later is possible through synergistic effects between drugs and other noxious agents" (Luxon et al., 2003). Patients do not often complain of vertigo as the adverse effects on the vestibular system are bilateral, symmetrical and gradual (Desmond, 2004).

*Corresponding author. E-mail: victor.deandrade@wits.ac.za. Tel: +27 11 717 4577. Fax: +27 11 717 4572

Most patients with cancer will receive some form of therapy, with the aim of curing the disease (Boyer et al., 1999). Platinum compounds (cisplatin and caboplatin), nitrogen mustard, amino-nicotinamide, dichloromethotrextate (Luxon et al., 2003), bleomycin and 5-flurouracil are known to affect hearing abilities (Roeser et al., 2000). "Among these cisplatin is the most toxic to the cochlea being associated with dose-dependent, extensive and permanent damage" (Luxon et al., 2003: 464). A study by Dutta et al. (2005) concluded that 15% of patients who were subjected to chemotherapy based on cisplatin developed ototoxicity. Functional and structural alterations of the cochlea caused by cisplatin may be related to cellular calcium channel blockage (Saito et al., 1991), alterations in the concentration of glutathione (Rybak et al., 2000) and also to the damage of the stria vascularis, resulting from inhibition of an important enzyme function, that is. adenylate cyclase (Luxon et al., 2003) which results in sensory neural hearing loss. Since it is evident that various chemotherapeutic agents (cisplatin being the most widely used) have known ototoxic adverse effects, it is essential that oncologists are aware of this effect in order to ensure referral to an audiologist for appropriate management.

There is no doubt that chemotherapy is an effective method which is utilized in an attempt to treat life threatening cancer. However, it is essential for all health care workers, including oncologists, to be aware of the possible side effects of ototoxic chemicals administered during the chemotherapeutic process so that patients can be managed accordingly (Klassen, 2006). In South Africa this appears especially important since the incidence rates of cancer are reportedly amongst the highest in Africa (Mqoqi et al., 2004) where 1 in 4 for males and 1 in 6 females (Mqoqi et al., 2004) are reported to have a lifetime risk of developing cancer. In light of the high incidence rates of cancer in South Africa in relation to other countries in Africa (Mqoqi et al., 2004), many people may be at risk of hearing loss due to ototoxicity which highlights the need for health care workers to be aware of the ototoxic adverse effects of this treatment regimen.

Molete (2008) revealed that 80 - 90% of cancer patients in developing countries already suffer incurable cancer at the time of diagnosis which may be attributed to limited financial, human and health resources (Denny, 2005). Therefore, improving the quality of life of these patients is important. In order to improve patient quality of life, all impairments resulting from cancer treatment need to be managed. The oncologist is often the coordinator of patients' treatment and keeps track of the various test results and follow-up examinations of the patient (Shin, 2003) and is, therefore, well positioned to make appropriate referrals to various rehabilitation specialists, including audiologists for the management of ototoxicity during or subsequent to cancer treatment. When life-threatening illness necessitates treatment with ototoxic drugs, preserving the quality of the patients' remaining life is customarily a treatment goal. Early detection of ototoxic hearing loss provides physicians with the critical information and opportunity necessary to minimize further impairment and, in some cases, prevent hearing loss from progressing to the point where permanent damage occurs. Although hearing loss is not a life-threatening condition, it does however become a severe threat to essential quality of life indicators unless intervention occurs early during treatment. The adverse effects of a hearing loss on cognitive-linguistic skills and psychosocial behaviour are well documented, as well as the serious vocational, social, and interpersonal conesquences for the patient. It is therefore imperative that health care workers in hospitals in South Africa ensure that patients receive adequate information on the possible adverse effects of chemotherapy. However, a major dilemma with predicting potential ototoxicity is that it depends on a number of patient-specific factors including the status of renal function, age, length and dose of treatment, and interactions with other medications (Wofford, 1981). According to Schweitzer (1993) it is essential for health care workers to continue to explore methods of altering the dose in order to limit ototoxicity without causing a decrease of the activity of cisplatin (or other second or third generation ototoxic platinum agents). Thus, the only certain method of preventing incapacitating ototoxicity is to identify it as early as possible in the treatment regimen so that medications can be substituted and/or doses changed (Lonsbury-Martin and Martin, 2001). A study by Rybak et al. (1995) revealed that the clinical use of protective agents (specifically diethyldithiocarbamate [DDTC]) could effectively reduce or prevent damage to the inner ear of patients receiving cisplatin chemotherapy. Therefore, there appears to be a number of techniques available in an attempt to reduce possible ototoxicity caused by chemotherapy. In light of the high incidence of cancer in South Africa (Mqoqi et al., 2004), the number of people undergoing cancer chemotherapy, and the increase in HIV/AIDS related cancers, this study was designed to investigate the awareness of oncologists in state hospitals in South Africa of the possible ototoxic adverse effects of the chemotherapeutic treatment regimen.

METHODOLOGY

Research design

Both qualitative and quantitative research designs were employed. The qualitative component of the study can lead to the development of a description and an explanation (May, 1994) while the quantitative component helps to identify trends in the results (Sarantakos, 1998). Oncologists were invited to complete a questionnaire which required approximately 10 min to complete. Be-cause the current research sought to obtain information regarding the perceptions of the ototoxic effects of cancer chemotherapy, both

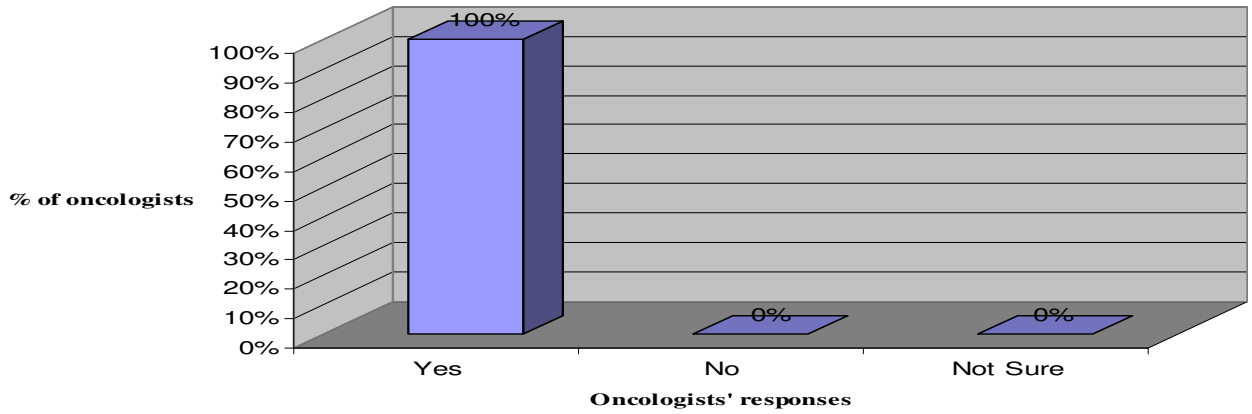

Figure 1. Representation of the Oncologists' responses to the impact of chemotherapeutic drugs on hearing abilities (n = 10).

open and close ended questions were used within a questionnaire.

Participants

A convenient, non-probability sampling strategy (Burns and Grove, 2001) was utilized to recruit participants from two tertiary academic South African state hospitals based in Gauteng Province in which adults with cancer are treated using cancer chemotherapy. 10 oncologists volunteered to participate in the current study, and this small sample size is acknowledged as a limitation to the generalizability of current findings; hence this study is presented as a pilot study. For the purpose of this study, all participants had to meet the following criteria: familiarity and involvement of the participants with the cancer chemotherapy procedure; the participants were working at the site for at least three months at the time of the study in order to ensure familiarity with the chemotherapeutic process at the particular site; participants were fluent in English since the questionnaires were formulated in English. There were 3 respondents from Hospital 1 and 7 respondents from Hospital 2. The experience of oncologists involved in the chemotherapeutic treatment of cancer patients ranged from less than a year (3 months) to greater than 10 years. The majority of participants (40%) had been working within this field between 2 - 4 years followed by 30% of participants working within the field for 3 months - 1 year and a minority of the participants (10%) had been working in this field for longer than 8 years. The mean length of the oncologists' work experience was 2.4 years with a standard deviation of 1.3 years.

Research instrumentation

After a literature review, the questionnaire (Appendix 1) designed for this study was adapted and modified from a questionnaire designed by Mélange (2007) to best provide information on oncologists' perceptions with regards to cancer chemotherapy and ototoxicity. The questionnaire was pre-tested on 4 honours year students within the department of Speech Pathology and Audiology to ensure its validity. From this pre-test, two minor grammatical adjustments had to be made to improve expression. The results from the pretested questionnaire were excluded from the study. The questionnaire included sections on clinical experience; chemotherapy and hearing; ototoxicity; audiology; and protocols and recommendations

Procedure

Before the study was conducted, ethical clearance was secured from the University of Witwatersrand, Human Resource Ethics Committee. The questionnaires and participant information letters, which included a description of the study, were then distributed to oncologists at the hospital oncology departments whose heads of department had agreed to be included in the study. Participants were requested to read the participant information leaflet and complete the questionnaire. For this study, no direct consent was obtained as completion of the questionnaire served as tacit consent.

Data analysis

Descriptive statistics and content analysis were utilized to analyze the information obtained from the participants study. The goal of descriptive statistics was to provide a summary measure of some characteristic of the sample data (Durrheim, 2006). Data were subjected to thematic analysis which was used to obtain reappearing themes (Holstein and Grubrium, 1998). Common themes were highlighted and grouped to establish major themes.

RESULTS

The results of this study are reported according to the layout of the questionnaire and will include the following sections: chemotherapy and hearing; ototoxicity; audiology; and protocols and recommendations.

Chemotherapy and hearing

Figure 1 shows that all oncologists participating in this study were aware of the impact chemotherapeutic drugs have on hearing function. Although all participating oncologists were aware that chemotherapeutic drugs have an impact on hearing function, 20% of oncologists (Figure 2) were not sure as to what the hearing related symptoms were while the remaining 80% reported some awareness of the symptoms of hearing impairment which included a

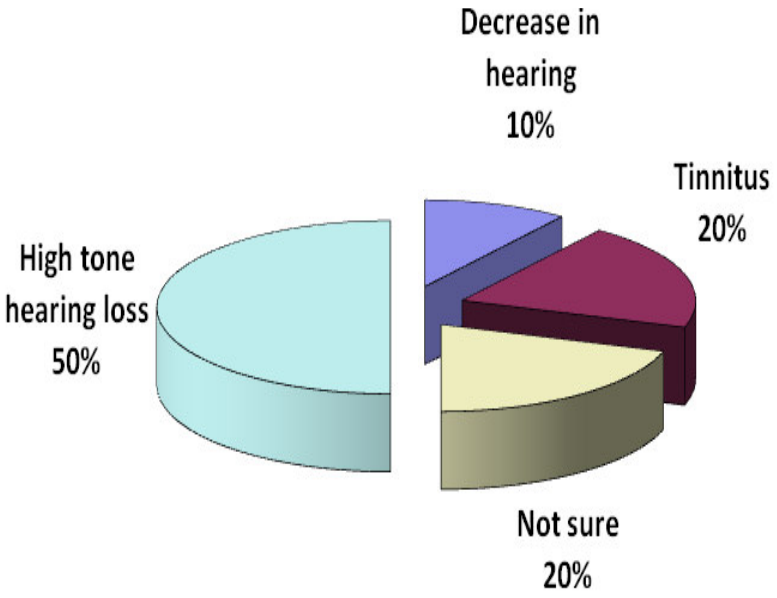

Figure 2. Summary of the common themes articulated by Oncologists regarding the audiological symptoms of chemotherapy.

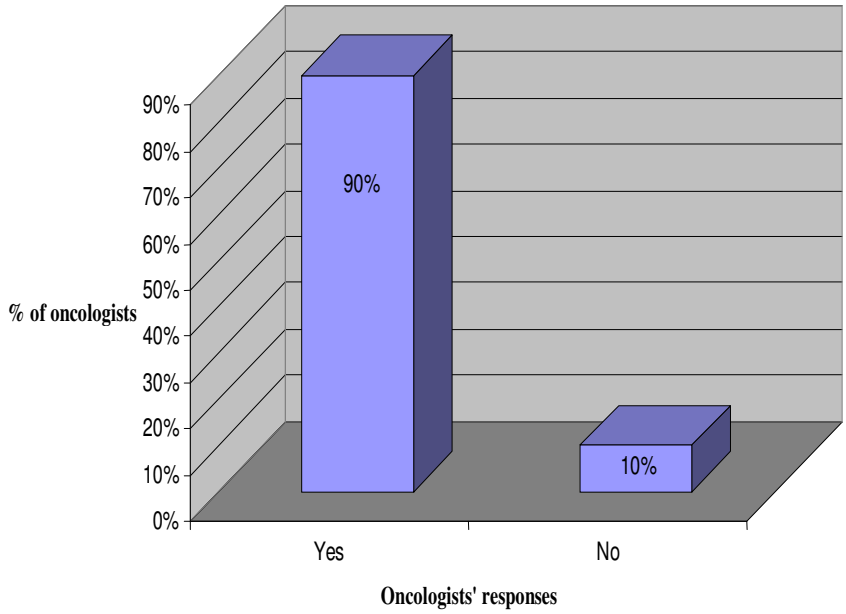

Figure 3. Representation of oncologists' responses as to whether chemotherapeutic drugs physically change the auditory system (n = 10

decrease in hearing, tinnitus and high frequency hearing loss (Figure 2). From Figure 3 it is evident that 90% of oncologists knew that chemotherapeutic drugs can physically change the auditory system. It is concerning to note that 10% said that chemotherapeutic drugs do not cause physical change in the auditory system. Figure 4 represents the common themes regarding the reported biological changes to the ear following the administration of cancer chemotherapy. The results shown in Figure 4 reveal that an alarming 56% of oncologists reported that they were "not sure" of the physical damage to the auditory system that may be caused by chemotherapeutic drugs. It, therefore, appears incongruous that although 90% (Figure 3) were aware that the drugs physically

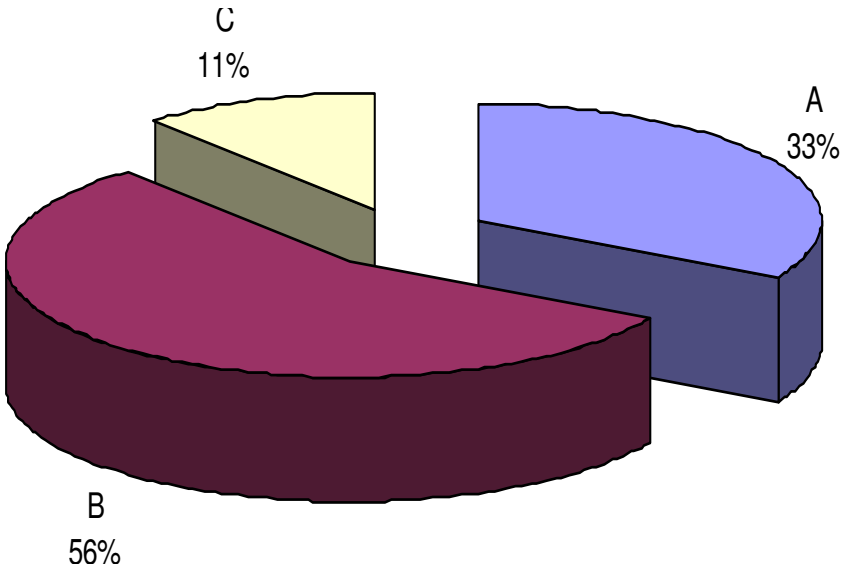

Figure 4. Representation of the Oncologists' responses to the biological changes in the ear after the administration of chemotherapy (n =10). A= Damage to the cilia in the cochlea. B= Not sure. C= Otosclerosis.

change the system, many (56%) were unaware of the nature of those changes. Figure 4 also reveals that 11% of oncologists reported that otosclerosis is caused by the administration of cancer chemotherapy.

Ototoxicity

From Table 1 it is evident that 70% of oncologists reported that no ototoxicity-monitoring programs were offered to patients in their oncology departments. Table 1 also reveals that 80% of oncologists reported that they do provide patients with information regarding the ototoxic effects of medication, stating that they advise patients to "be aware of and report any changes in hearing to the doctors" and (those) patients may "experience high tone hearing loss". It appears evident that the majority of oncologists do not provide patients with specific information regarding the ototoxic effects of medication which may result in a lack of early identification or even neglect of early signs of ototoxicity by patients. Regarding family history of ototoxicity, Table 1 reveals that an alarming 90% of oncologists do not enquire about family history of ototoxicity from patients. With regards to obtaining information about previous use of ototoxic drugs such as drugs used to treat malaria, tuberculosis (TB), pain and fever, it is evident from Table 1 that 80% of oncologists enquired about previous drug exposure for the treatment of malaria, 100% asked about drugs to treat TB and only 60% enquired about drugs used to treat pain and fever.

Audiology

Figure 5 reveals the common themes extracted for Question 8 of the questionnaire where 50% of oncologists responded that an audiologist is a "person who assesses speech and hearing" while the remaining 50% of oncologists responded that an audiologist is a "person who assesses and manages hearing problems". Therefore, 50% of oncologists appeared to present with limited evidence of the awareness of the role of an audiologist in that they reported that audiologists are only involved in the assessment of hearing dysfunction and not in the management of hearing disorders. Figure 6 reveals that 50% of oncologists reported that there are no audiologists on their teams. The remaining 50% reported that they were not sure whether an audiologist formed part of their teams. With regards to referring patients to an audiologist, Figure 7 reveals that 50% of oncologists reported that they do refer, while the remaining 50% responded that they do not refer. It can, therefore, be surmised that cancer patients may not be receiving the most beneficial intervention involving services from all disciplines within the health field since they are not being referred for manageable sequelae of cancer chemotherapy.

Protocols

With regards to the availability of protocols, all oncologists reported that there were no protocols in place that state how often a patient's hearing should be monitored during cancer chemotherapy.

Recommendation

Figure 8 show that 60% of oncologists did not provide pa-

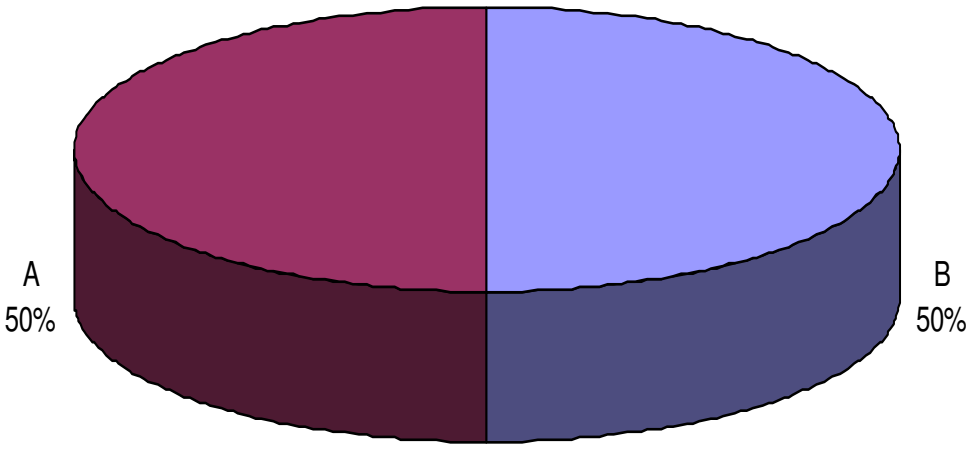

Figure 5. Representation of the Oncologists' responses to the role of an Audiologist (n = 10). A = person who assesses speech and hearing. B = person who assesses and manages hearing problems.

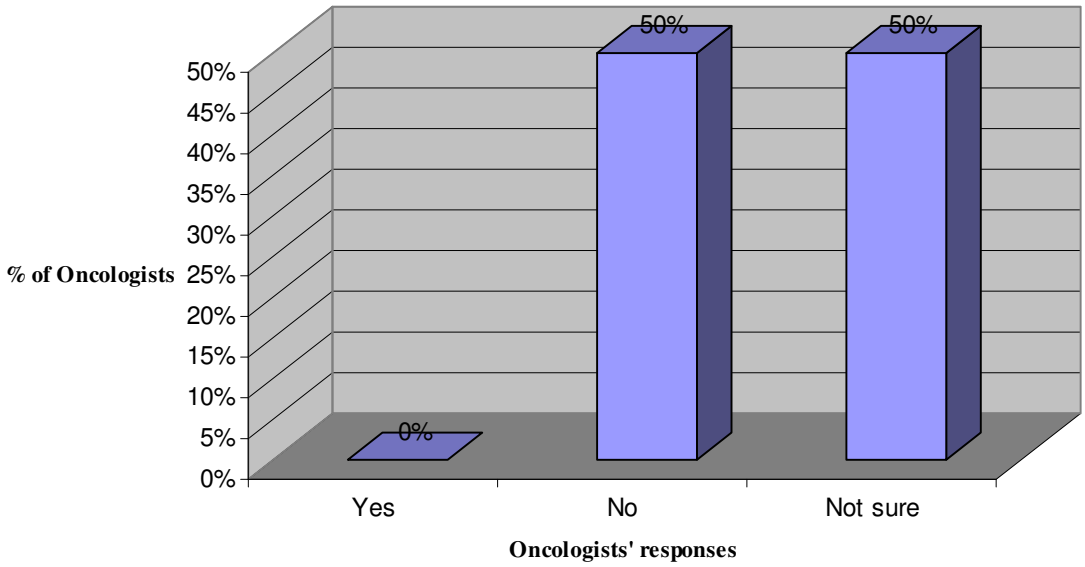

Figure 6. Representation of oncologists' responses to an audiologist being part of the cancer team (n = 10).

tients with any recommendations regarding hearing conservation.

DISCUSSION

Results from this study indicate that all oncologists surveyed had awareness of the negative impact that cancer chemotherapeutic drugs may have on hearing function. However, the fact that initial ototoxicity complaint tends to be a continuous high-pitch tinnitus (Luxon et al., 2003), generally followed by a permanent and irreversible sensory neural hearing loss which affects the higher frequencies first and then progresses to the lower frequencies (Fausti et al., 1994) was not as clearly known by all oncologists, as can be seen in Figure 2. Therefore, even though a majority (80%) of oncologists presented with some awareness of the hearing related symptoms of someone receiving cancer chemotherapy, 20% of the sample did not appear to be fully aware of the symptoms. Lack of knowledge on symptomatology may hamper identification and, consequently, negatively impact on appropriate referral and management of the hearing loss. This statement is particularly true for the one oncologist (Figure 3) who did not believe that chemotherapeutic

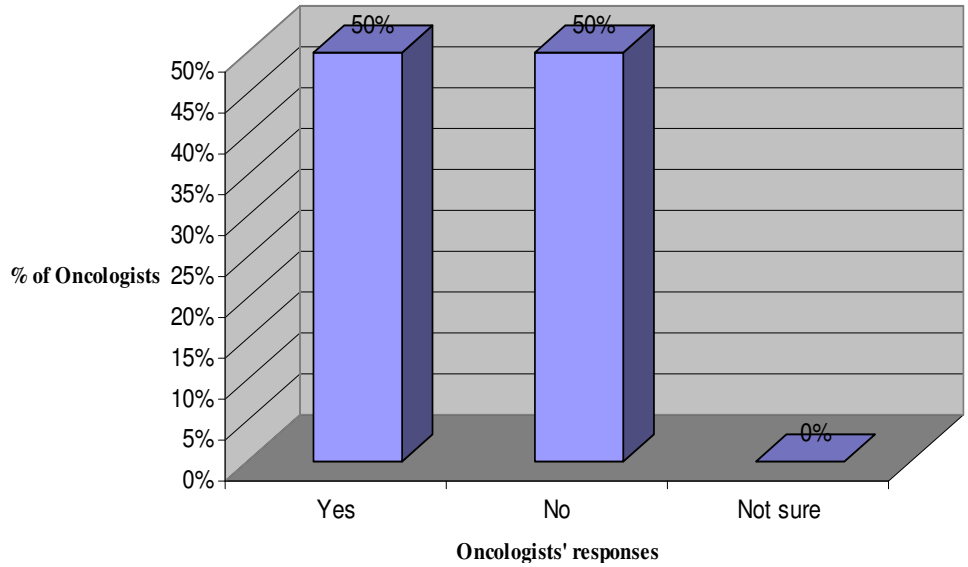

Figure 7. Representation of Oncologists' responses to as to whether patients are referred to an audiologist during the chemotherapeutic process (n =10).

drugs do cause physical change in the auditory system. This result suggests that many people may be getting doses of cancer chemotherapy which are insidiously affecting their hearing and are not prepared for that eventuality because of possible lack of awareness by some oncologists.

The fact that 90% of the sample (Figure 3) were aware that the drugs physically change the auditory system did not translate to as high a percentage of oncologists who knew what the physical damage to the auditory system are because an alarming 56% (Figure 4) reported that they were "not sure" of the physical damage that may be caused by chemotherapeutic drugs. Furthermore, 11% of the respondents (Figure 4) reported that otosclerosis is caused by chemotherapy. These inconsistencies in current findings may suggest limited and superficial knowledge of the adverse effects of cancer chemotherapy on the hearing system by oncologists. Knowledge of the ototoxic effects of cancer chemotherapy is necessary to ensure that patients are informed regarding the adverse effects of cancer chemotherapy on hearing abilities and in so doing ensure early identification of ototoxicity so that it can be managed immediately to improve patients' quality of life.

The findings indicating that more than half (70%) of the respondents (Table 1) stated lack of ototoxicity monitor-ing programs in their oncology departments may infer that patients receiving cancer chemotherapy are not being monitored for any changes in hearing function while on treatment. According to Lonsbury-Martin and Martin (2001), the most effective protocol for the early identification of ototoxicity is the monitoring of hearing sensitivity in patients receiving ototoxic medication. The fact that the remaining 30% of the sample reported that they were not sure of the availability of an ototoxicity monitoring program may highlight that there appears to be confusion about who refers a patient for rehabilitation and whether such a referral is required.

Although Table 1 also shows that a large majority (80%) of the respondents reported that they do indicate to patients that the medication they are taking has ototoxic effects, it also appears evident that they do not provide patients with specific information regarding the ototoxic effects which may result in a lack of early identification or even neglect of early signs of ototoxicity by patients. According to Klassen (2006), it is essential for all health care workers to be aware of the possible side effects of ototoxic chemicals administered during the chemotherapeutic process and to provide adequate information to patients so that patients can be managed accordingly. Current authors believe that it should be a mandatory requirement that the oncologists be aware of the ototoxic effects before they treat the patients.

Furthermore, Table 1 indicates that a large majority (90%) of the oncologists do not enquire about family history of ototoxicity from patients even though literature states that some individuals may be genetically susceptible to ototoxicity (Roeser et al., 2000). It would seem though that it is imperative that oncologists enquire about family history of ototoxicity from patients in order to identify patients at risk for ototoxicity. By taking a very detailed case history, identification of patients at risk for ototoxicity may be achieved early in the process. This identifycation is essential in order to ensure that appropriate management options may be considered in an attempt to reduce ototoxicity or to provide appropriate compensatory

Table 1. Summary of oncologists' responses to the ototoxicity section.

Questions	% of Participants who answered Yes	% of Participants who answered No	% of Participants who answered Not Sure
1. Is there a hearing Ototoxicity- monitoring program offered for your patients at this oncology department?	0%	70%	30%
2. Do you give patients information regarding the ototoxic effects of medication?	80%	20%	N/A
3. Do you enquire about family history of Ototoxicity from patients?	10%	90%	N/A
4. Do you enquire about the patient's history of previous drugs used to treat conditions such as malaria, TB and pain and fever?	Malaria-80% TB- 100% Pain & fever-60%	Malaria-20% TB- 0% Pain & fever-40%	N/A

Key: N/A = Not Applicable.

tools such as amplification in an attempt to improve an individual's quality of life

Drugs used to treat common illnesses like malaria (for example. quinine and chloroquine), TB (for example. aminoglycosides) and pain and fever (for example. aspirin) have been found and reported to be ototoxic (Roeser et al., 2000) and yet the history of their use is not explored by all oncologists as seen in Table 1. This lack of consideration of previous exposure to ototoxic drugs prior to administration of cancer chemotherapy is a concern because these patients may be at a greater risk of developing ototoxicity due to prior exposure to ototoxic drugs which may have already caused subclinical damage to the auditory structures which may consequently become measurable following the cummulative effect of also receiving chemotherapy.

Audiologists are deemed professionals who assist people with hearing impairment. Their role also involves educating individuals about hearing and to engage in preventative measures such as monitoring the hearing of those who are at risk for hearing loss (Katz, 2002). Audiologists may also play a role in counselling people to understand their problems and options and to avoid potential hearing problems in the future (Katz, 2002). In addition to this, audiologists provide services to individuals with hearing problems through the introduction of hearing aids, assistive listening devices and implantable devices (Roeser et al., 2000). It is essential that oncologists be aware of the role of the audiologist and the audiological adverse effects of ototoxicity so that appropriate referrals can be made. Without this knowledge oncologists may be in a poor position to provide patients with possible management options for dealing with ototoxicity. This may result in fewer referrals being made to audiologist for appropriate management and may; conesquently, result in a greater number of patients struggling with hearing related difficulties.

The fact that 50% of oncologists reported lack of audiologists as members of the oncology team, while the other half were not sure of the availability of audiologists on their teams (Figure 6) is disconcerting. From a review of the literature, it is evident that patients who are subjected to chemotherapy, especially cisplatin, may develop ototoxicity (Dutta et al., 2005). This threat of ototoxicity is thought to be sufficient to warrant the need for an audiologist to be part of the team of professionals who deal with cancer patients, hence implications for personnel placements of audiologist within these units in state hospitals. The poor oncologists' referrals for audiology evaluation also need highlighting as only 50% of the sample stated that they do refer to an audiologist. This lack of holistic management of patients may impact on the maximum benefit that patients may attain if seen by all relevant disciplines within the health sector. The ability to provide this holistic management may be influenced by the current findings that reveal that none of the respondents reported availability of institutional protocols which are in place that specify how often a patient's hearing should be monitored during cancer chemotherapy. According to Vasquez and Mattucci (2003), prior to treatment, each patient should obtain a baseline audiologic evaluation. This evaluation usually consists of otoscopy, pure tone audiometry, speech audiometry and tympanometry. However, monitoring the robustness of otoacoustic emissions and noting changes in the response over time may also be useful for obtaining an early indication of hair-cell damage (Vasquez and Mattucci, 2003). In addition to the baseline evaluation, it is suggested that testing should be performed within 24 h prior to the commencement of treatment, once a week during the treatment, immediately prior to the initiation of each new treatment cycle, and at the completion of treatment (Vasquez and Mattucci, 2003). Also, post-treatment assessments should take place at 2, 4, 12 weeks, and 6 months follow-

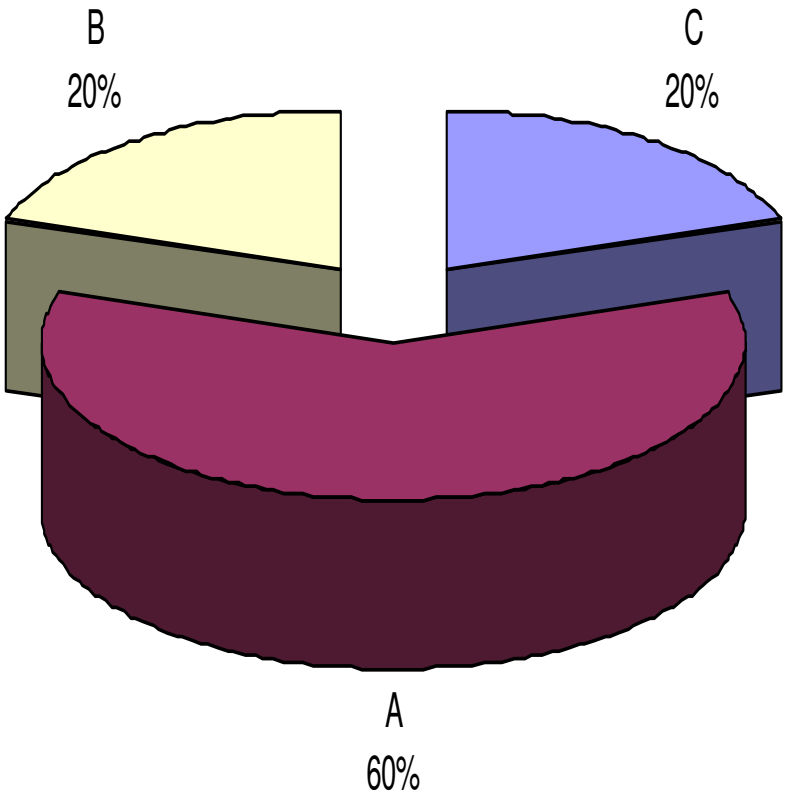

Figure 8. Representation of the summary of recommendations made by oncologists to patients regarding hearing conservation (n =10).
A = None
B = to be aware of hearing problems.
C = to report any hearing problems to the oncology clinic.

ing the completion of treatment (Vasquez and Mattucci, 2003). Without a protocol in this regard, there is no guideline for practitioners to follow and if they are uncertain about when and how often a patient's hearing should be monitored , patients will not know that their hearing needs to be monitored and this monitoring will not take place. This once again may imply that patients receiving cancer chemotherapy at government hospitals in the Gauteng region may not be receiving the most effective treatment for dealing with their health.

Besides identification and monitoring of ototoxicity, patients on cancer chemotherapy may also require recommendations regarding hearing conservation from their attending oncologist. Figure 8 shows that over half of the sample reported that they do not provide any hearing conservation recommendations to their patients. If these recommendations are not readily and consistently provided, patients may not be empowered to seek audiological help when required. These results may also highlight the need for increased patient education about their disease, the possible treatment options available for their disease as well as the possible side effects of the treatment and moreover which professionals to contact in order to manage the side effects.

Even though 40% of oncologists reported that some recommendations regarding hearing conservation are made to patients, the recommendations made appeared to be lacking detail as no recommendations regarding possible assessment and management options are made to patients. If this information is not provided to patients it may result in patients ignoring the possible symptoms of ototoxicity because they are unaware that it may be assessed and managed in order to improve their quality of life. A possible reason for oncologists not providing patients with recommendations regarding hearing conservation may be related to the limited awareness of oncologists with regards to the symptoms of ototoxicity, physical changes of the auditory system resulting from ototoxicity, the role of the audiologist and the lack of available protocols for monitoring ototoxicity.

Conclusions

Results of the current study have clinical relevance par-

ticularly for developing countries where quality of life may not have usually been given first priority in the management of patients with cancer with top priority being given to sustaining life. To this end, the current study firstly, reveals that the participant oncologists appear to present with superficial knowledge regarding the symptoms of ototoxic hearing loss, physical changes to the auditory system following the administration of cancer chemotherapy, ototoxicity as well as the role of the audiologist. It is very important that oncologists be able to inform patients about the symptoms of ototoxicity as well as possible options for management of ototoxicity. In order to ensure that clients receive optimal care, there needs to be a strong liaison between oncologists and audiologists. According to Vasquez and Mattucci (2003), the audiologist may be the first to recognize slight changes regarding a patient's abnormalities in the cochlea. Hence, input from the audiologist is critical and therefore an audiologist should be part of the team of professionals who deal with cancer patients.

Secondly, findings from the current study imply the need to highlight: the role of an audiologist; the symptoms of ototoxicity; the physical changes to the auditory system following the administration of cancer chemotherapy; the relevant case history information that needs to be obtained to identify patients who may be at a greater risk for ototoxicity; the relevant recommendations regarding ototoxicity which should be given to patients. Without this information, oncologists may be in a compromised position to educate patients about the effects of cancer chemotherapy on hearing which may hamper early identification of possible ototoxicity. However, in order for oncologists to provide that audiological input, audiologists also need to market their profession and gain recognition so that ototoxicity-monitoring programmes can be established within oncology departments in Gauteng. This establishment and implementation of protocols is essential for early identification of possible ototoxicity and appropriate management which will result in an improved quality of life of a patient.

Thirdly, the current study reveals that no ototoxicity-monitoring programmes or protocols are available within two very large oncology departments in government hospitals in Gauteng. Without the availability of protocols, there is no guideline for practitioners to follow in this regard, hence patients will not be provided with the necessary knowledge and in turn adequate auditory monitoring will not take place. This has implications for patients receiving cancer chemotherapy at government hospitals in the Gauteng region with regards to accessing the most beneficial management from their attending doctors. Such programs need to be established and be sensitive to the South African context. Audiologists, together with other members of the team, may come together to draw up best practice guidelines in order to improve the quality of life of patients undergoing cancer chemotherapy.

Fourthly, the results of this study may also suggest the need for public awareness campaigns in order to educate the general public about ototoxicity and chemotherapy. In this way, if people need chemotherapy, they are empowered to be able to request a baseline evaluation as well as constant monitoring of their hearing function. Moreover, because chemotherapy has the established potential to cause hearing impairment (singly or in interaction with other factors) this hearing loss requires constant monitoring to ensure that prompt management is provided as soon as the speech frequencies are involved. Prolonged monitoring of patients on cancer chemotherapeutic drugs could potentially enable oncologists to discover when clinical hearing loss commences, which could guide management protocols. This strategy would also allow oncologists to explore factors such as drug changes, dosing alterations, and provision of otoprotective agents along with chemotherapy since termination of drug use is not an option in these cases (Campbell, 2007). Finally, the current research has highlighted the need for future research in this area, including the need to replicate this study on a larger sample size across other provinces in South Africa in order to obtain a national view of the perceptions of oncologists regarding the ototoxic effects of chemotherapy which could lead to the implementation of an effective ototoxicity-monitoring program within the South African context. It may also be useful to gain information from other members of the oncology team, for example, social workers, dieticians, pharmacists, etc. regarding the ototoxic effects of chemotherapy. Furthermore, future research could look at obtaining information regarding the perceptions of health care workers with regards to other ototoxic medications.

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Appendix 1: Questionnaire

1. How long have you been practicing in this oncology department?

_____

2. a. To your knowledge, do any of the chemotherapy drugs have an impact on hearing?

Yes		No		Not Sure	

2. b. If yes, what are the hearings related symptoms of someone receiving chemotherapy?

_____

_____3.a. To your knowledge, do chemotherapy drugs have a physical effect on the auditory system?

Yes		No	

3. b. If yes, please explain the biologic changes in the ear.

_____

_____

4. a. Is there a hearing ototoxicity- monitoring program offered for your patients at this oncology department?

Yes		No		Not Sure	

4. b. If yes, what does that hearing ototoxicity program contain?

_____

_____

5. What information regarding the ototoxic effects of medication do you give patients?

_____

_____

6. Do you enquire about family history of ototoxicity from patients?

Yes		No		Not Sure	

7. Do you enquire about the patient's history of previous drugs used to treat conditions such as:

malaria		TB		Pain & fever	

8. To your knowledge, what is an audiologist?

_____

_____

9. Are there any audiologists in the team who deal with cancer patients?

Yes		No		Not Sure	

10. During the chemotherapeutic treatment, do you refer patients to an audiologist?

Yes		No		Not Sure	

11. Is there a protocol in this department (that is. oncology department) that states how often a patient's hearing should be monitored?

Yes		No		Not Sure	

12. What recommendations regarding hearing conservation are made to out- patients?

_____

_____

_____