

**EARLY HEARING DETECTION AND INTERVENTION IN KWAZULU-NATAL:
ANALYSIS OF BARRIERS AND FACILITATORS FROM GUIDELINE
GENERATION TO CLINICAL APPLICATION**

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DECLARATION

As the candidate's supervisor, I agree/do not agree to the submission of this dissertation.

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I, NAEDENE NAIDOO, declare that the research reported for the development of this thesis is my original work, except where otherwise indicated. This research has not been submitted to any other university or institute for examination purposes. The information obtained from other sources has been acknowledged and referenced accordingly. This research does not contain other persons' data, pictures or graphs unless specifically acknowledged as being sourced from other persons.



28/09/2020

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Date

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ABSTRACT

Background: There is slow progress in early hearing detection and intervention (EHDI) services within South Africa. Despite enabling guidelines, such as the Joint committee on Infant Hearing (JCIH) and Health Professionals Council of South Africa (HPCSA), EHDI guidelines supporting EHDI as a standard of care, various barriers hinder the translation of these guidelines into clinical practice, as envisaged. Audiologists are EHDI gatekeepers and can provide valuable insights into these challenges, as well as strengths or opportunities that can progressively move EHDI towards best practice in South Africa. **Objective:** The study aimed to determine the barriers and facilitators to EHDI in KwaZulu-Natal (KZN) as reported by audiologists/speech therapists and audiologists' (A/STAs). **Method:** An exploratory-descriptive qualitative approach was used, by conducting telephonic interviews with 12 A/STAs working in public and private healthcare facilities, within KwaZulu-Natal. Data was analysed using thematic analysis, in conjunction with NVivo software. **Results:** Five main themes emerged from the data as follows: improving EHDI guidelines; investing in resources and infrastructure for EHDI service provision; facilitating professional development, training and education and strengthening intersectoral collaboration for EHDI services; managing follow-up and evaluating protocols and procedures for screening; and engaging, understanding and supporting caregivers/families. **Conclusion:** Despite the availability of EHDI guidelines and some progress in service delivery, participants indicated that implementation of EHDI remains a challenge. Strategies such as an increase in resources, further education and training, development of contextually relevant, culturally and linguistically diverse practices and protocols need to be in place to improve EHDI implementation.

Keywords: early hearing detection and intervention (EHDI), barriers, facilitators, audiologists/speech therapists and audiologists (A/STAs), KwaZulu-Natal (KZN)

TABLE OF CONTENTS

DECLARATION.....	i
ACKNOWLEDGEMENTS.....	ii
ABSTRACT.....	iii
ABBREVIATIONS.....	vi
LIST OF TABLES.....	vii
LIST OF FIGURES.....	viii
LIST OF APPENDICES.....	ix
CHAPTER 1. INTRODUCTION.....	1
1.1. Introduction.....	1
1.2. Study background.....	1
1.3. Problem statement.....	4
1.4. The rationale of the study.....	5
1.5. Outline of chapters.....	6
CHAPTER 2. CONCEPTUAL AND THEORETICAL FRAMEWORK AND LITERATURE REVIEW.....	7
2.1. Introduction.....	7
2.2. Conceptual and theoretical framework.....	7
2.3. Literature review.....	9
2.3.1. Overview.....	9
2.3.2. Age of identification, diagnosis and intervention.....	11
2.3.3. Screening platforms and practices by healthcare facilities.....	14
2.3.4. Follow-up rates influenced by knowledge levels about EHDI services.....	17
2.3.5. Parental beliefs influencing screening refusal.....	19
2.4. Conclusion.....	20
CHAPTER 3. METHODOLOGY.....	22
3.1. Introduction.....	22
3.2. Aim.....	22
3.3. Objectives.....	22
3.4. Research design.....	22
3.5. Study setting and population.....	23
3.5.1. Participant selection criterion.....	23
3.6. Sampling.....	24

3.7. Data collection tool.....	26
3.7.1. Advantages and disadvantages of telephonic interviews.....	28
3.8. Data collection procedure.....	28
3.8.1. Guidelines for the telephonic interview.....	30
3.9. Pilot study.....	30
3.9.1. Results from the pilot study.....	30
3.10. Data analysis.....	31
3.11. Data representation and management.....	33
3.12. Dissemination.....	33
3.13. Research credibility and trustworthiness.....	34
3.14. Ethical and legal considerations.....	34
CHAPTER 4. RESULTS AND DISCUSSION.....	36
4.1. Introduction.....	36
4.2. Main themes identified.....	37
4.2.1. Improving EHDI guidelines.....	37
4.2.2. Investing in resources and infrastructure for EHDI service provision.....	45
4.2.3. Facilitating professional development, training and education and strengthening intersectoral collaboration for EHDI services.....	55
4.2.4. Managing follow-up and evaluating protocols and procedures for screening.....	63
4.2.5. Engaging, understanding and supporting caregivers/families.....	70
4.3. Conclusion.....	77
CHAPTER 5. CONCLUSION, LIMITATIONS AND IMPLICATIONS.....	78
5.1. Introduction.....	78
5.2. Concluding summary.....	78
5.3. Limitations.....	80
5.4. Research implications.....	81
5.5. Clinical implications.....	81
REFERENCES.....	83

ABBREVIATIONS

AABR	automated auditory brainstem response
AAP	American Academy of Pediatrics
ABR	auditory brainstem response
AOAE	automated otoacoustic emission
A/STAs	audiologist/speech therapists and audiologists
ASSR	auditory steady-state response
CDC	Centers for Disease Control and Prevention
DoE	Department of Education
DoH	Department of Health
DPAOE	distortion product otoacoustic emissions
EHDI	early hearing detection and intervention
HIV/AIDS	human immunodeficiency virus/acquired human immunodeficiency syndrome
HPCSA	Health Professions Council of South Africa
HSSREC	Humanities and Social Science Research Ethics Committee
JCIH	Joint Committee on Infant Hearing
KZN	KwaZulu-Natal
MDT	multidisciplinary team
NHS	newborn hearing screening
NICU	neonatal intensive care unit
OAE	otoacoustic emissions
SASLHA	South African Speech-Language-Hearing-Association
TB	Tuberculosis
TEOAE	transient evoked otoacoustic emission
UKZN	University of KwaZulu-Natal
UNHS	universal newborn hearing screening
USA	United States of America
WHO	World Health Organisation

LIST OF TABLES

Table 1	Demographical characteristics of participants.....	25
Table 2	Telephonic interview questions and motivations summary.....	27
Table 3	Main themes identified from the research study	37
Table 4	Analysis and description of strengths, weaknesses, opportunities and threats identified from the study.....	122

LIST OF FIGURES

Figure 1	The SWOT conceptual framework together with the barriers and facilitators at different levels.....	9
Figure 2	Thematic analysis stages.	32
Figure 3	Improving EHDI guidelines: strengths, weaknesses, opportunities and threats.....	38
Figure 4	Types of data management systems for NHS reported by participants.....	41
Figure 5	Investing in resources and infrastructure for EHDI service provision: strengths, weaknesses, opportunities and threats.....	46
Figure 6	Facilitating professional development, training and education and strengthening intersectoral collaboration for EHDI services: strength, weaknesses, opportunities and threats.....	56
Figure 7	Challenges reported by participants regarding the inclusion of nurses in hearing screening.....	58
Figure 8	Managing follow-up and evaluating protocols and procedures for screening: strengths, weaknesses, opportunities and threats.....	64
Figure 9	Engaging, understanding and supporting caregivers or families: strengths, weaknesses, opportunities and threats.....	71
Figure 10	Mind map developed: Improving EHDI guidelines.....	124
Figure 11	Mind map developed: Investing in resources and infrastructure for EHDI service provision.....	125
Figure 12	Mind map developed: Facilitating professional development, training and education and strengthening inter-sectoral collaboration for EHDI.....	126
Figure 13	Mind map developed: Managing follow-up and evaluating protocols and procedures for screening.....	127
Figure 14	Mind map developed: Engaging, understanding and supporting caregivers or families.....	128

LIST OF APPENDICES

Appendix A	Telephonic interview schedule.....	107
Appendix B	Probe questions for telephonic interview.....	111
Appendix C	Ethical approval letter.....	112
Appendix D	Amended ethical approval letter.....	113
Appendix E	Informed consent letter.....	114
Appendix F	General telephonic interview guideline.....	117
Appendix G	Pilot study feedback form.....	120
Appendix H	Researcher ethics certificates	121
Appendix I	Overview of strengths, weaknesses, opportunities and threats.....	122
Appendix J	Mind map: Theme One.....	124
Appendix K	Mind map: Theme Two.....	125
Appendix L	Mind map: Theme Three.....	126
Appendix M	Mind map: Theme Four.....	127
Appendix N	Mind map: Theme Five.....	128

CHAPTER 1. INTRODUCTION

“Look up at the stars and not down at your feet. Try to make sense of what you see, and wonder about what makes the universe exist. Be curious”

Stephen Hawking

1.1. Introduction

This chapter provides information regarding the study background, problem statement, rationale of the study and concludes with an outline of the following chapters.

1.2. Study Background

Hearing loss is seen as a silent epidemic due to its invisible nature, as many clinical examinations fail to identify it (Petersen & Ramma, 2015) and is more predominant in neonates compared to other disorders normally screened for (Imam et al., 2013). Undetected hearing loss in a newborn can result in devastating long-term consequences such as; emotional disturbance, communication delays, cognitive deficits and social-emotional problems leading to educational barriers, career limitations and employment difficulties (Bezuidenhout et al., 2018; Olusanya, 2008). Early hearing detection and intervention (EHDI) programmes are the proposed standard of care for newborns and infants presenting with a hearing loss, thereby allowing them to develop to their full potential to contribute and participate in their community (Health Professions Council of South Africa [HPCSA], 2018).

According to the World Health Organisation (WHO), it is estimated that more than 5% of the world's population, presents with a disabling hearing loss (approximately 432 million adults and 34 million children) (World Health Organisation [WHO], 2019). By 2050, it is estimated that, one out of ten people will have a disabling hearing loss (WHO, 2019). Infant hearing loss estimates in the United States of America (USA), are between 1-6 per 1000 newborns (American Speech-Language-Hearing Association [ASHA], 2005). In South Africa, approximately 6357 children annually are born with a permanent hearing loss or develop it at an early age, with the majority being born in the public healthcare sector (Teixeira & Joubert, 2014). The prevalence of infants born with a hearing loss in the public sector in South Africa is 3-6 per 1000 births (Khoza-Shangase et al., 2017; Michal & Khoza-Shangase, 2014).

Two guidelines have been released by the Health Professions Council of South Africa (HPCSA) regarding EHDI services (Health Professions Council of South Africa [HPCSA], 2007; HPCSA, 2018). The Joint Committee on Infant Hearing (JCIH) 2000 and 2007 position statement and the American Academy of Paediatrics (AAP) 1999, have been used for developing the HPCSA EHDI 2007 and 2018 guidelines. “The purpose of the EHDI programme is to detect, diagnose and treat newborns and infants with hearing loss at an early age” (Opperman & Kanji, 2015, p. 38). The first stage is the early detection of hearing loss, which is facilitated by newborn hearing screening (NHS) (Khoza-Shangase et al., 2017; Michal & Khoza-Shangase, 2014; HPCSA, 2007). NHS can be achieved by implementing a screening programme of all newborns, after birth and before discharge, called universal newborn hearing screening (UNHS) (Harbinson & Khoza-Shangase, 2015).

Screening for hearing loss is identified as a preventative method, which is mandated in several developed countries (Harbinson & Khoza-Shangase, 2015). In the USA, 43 out of 50 states have legislative or regulatory mandates related to UNHS (National Center for Hearing Assessment and Management [NCHAM], 2019), with the Centers for Disease Control and Prevention (CDC) funding the EHDI programme, to ensure all children receive crucial services (Centers for Disease Control and Prevention [CDC], 2019). EHDI is the standard of care for infants with a hearing loss in developed countries (HPCSA, 2018). Approximately 95% of neonates in the USA are screened shortly after birth for hearing loss and 77% of those identified are provided with intervention by six months of age (Petersen & Ramma, 2015). The USA, China and half of the European countries screen between 90-98% of infants, with no other hearing screening programme revealing the same efficacy, in reducing the age of identification of hearing loss with positive outcomes (HPCSA, 2018).

UNHS is becoming a standard practice internationally however, this has been mainly limited to the developed world and needs to be emphasized in the developing world, like Asia and Africa, as the majority of hearing-impaired children are living in third-world countries (Harbinson & Khoza-Shangase, 2015). Research has suggested that UNHS may not be applicable in South Africa, mainly the public healthcare sector, because of insufficient manpower, considering that more than 80% of the population access healthcare services (Khoza-Shangase et al., 2017; Kanji, 2016). This is further exacerbated, in Sub-Saharan Africa, as additional burdens such as poverty or life-threatening conditions, i.e. tuberculosis (TB) and human immunodeficiency virus/ acquired immunodeficiency syndrome (HIV/AIDS), are

viewed as an urgent priority, while hearing loss may be viewed as less urgent (Petrocchi-Bartal & Khoza-Shangase, 2016).

UNHS and timely diagnosis of infant hearing loss has become a relatively new practice in South Africa, compared to international progress (Moodley & Störbeck, 2015). However, some progress has been noted, as one year after the HPCSA (2007) guidelines, 27% of public healthcare facilities, within South Africa, implemented a form of NHS (Theunissen & Swanepoel, 2008). Few healthcare facilities in South Africa offer NHS, resulting in late diagnosis and intervention of these children (Petersen & Ramma, 2015), due to the large burden of infectious diseases, limited resources and lack of tertiary training for healthcare specialists and audiologists (Swanepoel et al., 2009). Nevertheless, improvement in the initial age of screening was noted from a study, that revealed the median age for initial hearing screening was 11 months (Opperman & Kanji, 2015). Unfortunately, this still does not meet the HPCSA EHDI stipulated guidelines (HPCSA, 2007; HPCSA, 2018), but is a positive finding which emphasizes with continued implementation, the guidelines can be met.

A report in the Western Cape revealed an average diagnosis age of two years and enrolment into intervention programmes being at two and a half years or later, thus indicating that the intervention critical period, of before 6-9 months, was not accessed (Nelson et al., 2008; Watkin et al., 2007; Yoshinago-Itano, 2004). Another report from Gauteng, revealed averages of, 31 months for diagnosis, 39 months for initial hearing aid fit and early intervention enrolment at 43 months (Venter & Viljoen, 2008). The region in Western Cape, has well-established infrastructure to conduct EDHI services, compared to other regions in the country, which could be indicative of yielding better results than other regions (Swanepoel et al., 2009). Thus, delays may be considerably worse in other areas, especially rural contexts, due to poor awareness or limited resources (Van der Spuy & Pottas, 2008). Thus, evaluation of the feasibility of the HPCSA EHDI guidelines and practices, to determine barriers and facilitators is essential within the South African context (Petrocchi-Bartal & Khoza-Shangase, 2014), specifically in KwaZulu-Natal (KZN).

1.3. Problem Statement

Despite EHDI guidelines being evidence based, there is a mismatch between the development and implementation, in the South African context (Kanji, 2018; Bezuidenhout et al., 2018; Khoza-Shangase et al., 2017). A national survey conducted in the public healthcare sector, that caters for approximately 80% of the population (Dambisya & Modipa, 2009; South African National Treasury, 2010), revealed that in South Africa only 7.5% of public healthcare facilities conduct NHS, with a limited 1% conducting UNHS (Theunissen & Swanepoel, 2008). The manpower needed to identify the high prevalence rate of infant hearing loss in the public sector in South Africa is unfortunately not met, as the private healthcare sector contains the majority of audiologists (Kanji, 2016).

The lack of aetiological and prevalence data for hearing loss from low-and-middle income countries is an obstacle affecting planning programmes and support for children (Khoza-Shangase et al., 2017). Babies with hearing loss in Africa and other developing countries, do not have equal opportunities as hearing individuals, because of the shortage of early identification programs (Olusanya et al., 2007). The detection of hearing loss can start from as late as two years and may extend into adolescence (Olusanya, 2001; Russo, 2000), which further exacerbate the effect of hearing loss in young children (Olusanya, 2005). Hence, leading them to have secluded lives with little to no access to employment and education opportunities, especially in low-and-middle income countries (Olusanya, 2005). Emerging data from South Africa, indicates the mean age of diagnosis of hearing loss is from 23 to 44.5 months (Van der Spuy & Pottas, 2008; Butler et al., 2013; Khoza-Shangase & Michal, 2014; Swanepoel et al., 2013; Störbeck & Young, 2016), even though it may be suspected earlier between 12 to 18 months (Swanepoel et al., 2013; Störbeck & Young, 2016).

In South Africa, early identification is not attained apart from isolated programmes, in the public and private healthcare sectors (Swanepoel, 2006; Swanepoel et al., 2004). The public and private sectors have challenges such as; cost, lack of personnel or understaffing, lack of resources, poor infrastructure and limited hearing screening programs, affecting implementation of NHS across low-and-middle income countries (Krishnan & Donaldson, 2013). There also seems to be limited collaboration between stakeholders and other professionals such as; nurses, early interventionists and otolaryngologists in developing the EHDI guidelines, which are important for successful UNHS program implementation. Thus, there seems to be “a sense that we are working within our individual departments and in silos

within the bigger picture of the healthcare system in our context” (Kanji, 2018, p. 1). The above poses significant barriers or challenges to the progress of EHDI services in the South Africa context.

1.4. The rationale of the study

In low-and middle income countries like South Africa, there are limited studies that support the efficacy of EHDI, which could be the result of an absence of integrated EHDI programmes (Kanji, 2016; Petrocchi-Bartal & Khoza-Shangase, 2016). To enable effective implementation of EHDI services and improve the existing limited services and identify challenges, the need for more evidence-based assessments and studies is needed in the South African context (Khoza-Shangase et al., 2017).

The researcher completed her community service in audiology in 2018, while working in a government hospital in KwaZulu-Natal where NHS was not conducted. Recently, she had exposure to NHS in the private sector, specifically the Netcare hearing screening program. In the researcher’s opinion, whilst this is a good initiative, it advantages only those that can afford the health services and disadvantages the public sector, where the majority of individuals require these services. In South Africa, children are diagnosed with hearing loss at a later age compared to the recommended norms, which could be due to a lack of implementation of UNHS (Teixeira & Joubert, 2014) and thus, the reason for motivating the researcher to conduct a study to determine the feasibility to EHDI implementation in the South African context. Audiologists/speech therapists and audiologists’ (A/STAs) are the gatekeepers of the EHDI guidelines and are essential for its implementation into practice. Information and recommendations provided by A/STAs will enable the researcher to identify barriers and facilitators to EHDI, thus creating more awareness and opportunities for improved implementation of EHDI in the future. In this way, it is envisaged that we can progressively transform EHDI from a concept to a standard of care in South Africa.

The majority of studies that have been published focus on implementation and challenges or barriers to EHDI services (Theunissen & Swanepoel, 2008; Petrocchi-Bartal & Khoza-Shangase, 2014; Khoza-Shangase et al., 2010). However, the strengths and achievements should also be identified for best practice and standard of care in EHDI service delivery. Although EDHI is becoming a growing area, there is still limited information and evidence from studies conducted in South Africa (Petrocchi-Bartal & Khoza-Shangase, 2016). Current hearing screening practices are targeted to babies presenting with risk factors to hearing loss

rather than UNHS, which is disadvantageous as context-relevant risk factors are not well documented (Khoza-Shangase et al., 2017). Currently, there is paucity in the research of implementation UHNS programmes in South Africa. More information needs to be provided regarding the appropriateness and feasibility of the guidelines in the South African context. Context-relevant research targeted at implementing effective EHDI services in South Africa is needed (Khoza-Shangase et al., 2017). Analysis of the EHDI guideline and context-relevant practices have not been well documented in South Africa and it is envisaged that this will contribute to discipline-specific literature.

1.5. Outline of Chapters

The study is presented in the following chapters

Chapter 1: Introduction. This chapter provided an overview of the background of the study and the importance of the research study. The problem statement and rationale of the study were explored.

Chapter 2: Literature Review. This chapter outlines the conceptual and theoretical framework used for the study. It also reviews the aspects of EHDI implementation, hearing screening services and practices in healthcare facilities by A/STAs. In addition, the various studies, mainly those South Africa were critically analysed.

Chapter 3: Methodology. This chapter outlines the aims and objectives, the study design, sample size, sampling method, data collection procedure and tool as well as the ethical and legal considerations of the study.

Chapter 4: Results and Discussion. This chapter presents the results of the study, which have been analysed using qualitative methods of analysis. In addition, it further interprets and explains the results from the study with relevant comparisons to the literature.

Chapter 5: Conclusion. This chapter indicates the extent to which the study aim was achieved and the problem addressed. It outlines the limitations of the research study and provides recommendations for future research and practice.

CHAPTER 2. CONCEPTUAL AND THEORETICAL FRAMEWORK AND LITERATURE REVIEW

*“Research is to see what everybody else has seen, and to think what nobody else has
thought”*

Albert Szent-Gyorgyi

2.1. Introduction

This chapter covers the conceptual and theoretical framework used in the study and provides a detailed literature review that highlights current practices, with regards to EHDI implementation in South Africa and the related challenges.

2.2. Conceptual and theoretical framework

The conceptual framework comprises of concepts which form a part of a concept from different theories or a theory (Ngulube, 2018). It was used to learn about experiences from A/STAs, to enable the researcher to cultivate perspectives and knowledge (Ravitch & Riggan, 2012; Ravitch & Riggan, 2016). Theoretical frameworks are developed from established theories, which have been tested (Ngulube, 2018). Therefore, relevant literature around the aim was used to develop a theoretical and conceptual framework for the study. The theoretical framework focused on the various components of EHDI in South Africa and the barriers and facilitators related to practice and implementation, which is further illustrated in Figure 1.

The strengths, weaknesses, opportunities and threats (SWOT) framework, was used to shape the research study. The SWOT is a qualitative research tool that observes external factors (threats and opportunities) and internal factors (weaknesses and strengths) (Silva et al., 2014). It contrasts and compares weaknesses, strengths, threats and opportunities to a set of criteria (Silva et al., 2014). A comprehensive analysis allows one to capitalize on advantages or strengths and provides one with the foresight to detect looming threats to prepare (Silva et al., 2014; Sarsby, 2016).

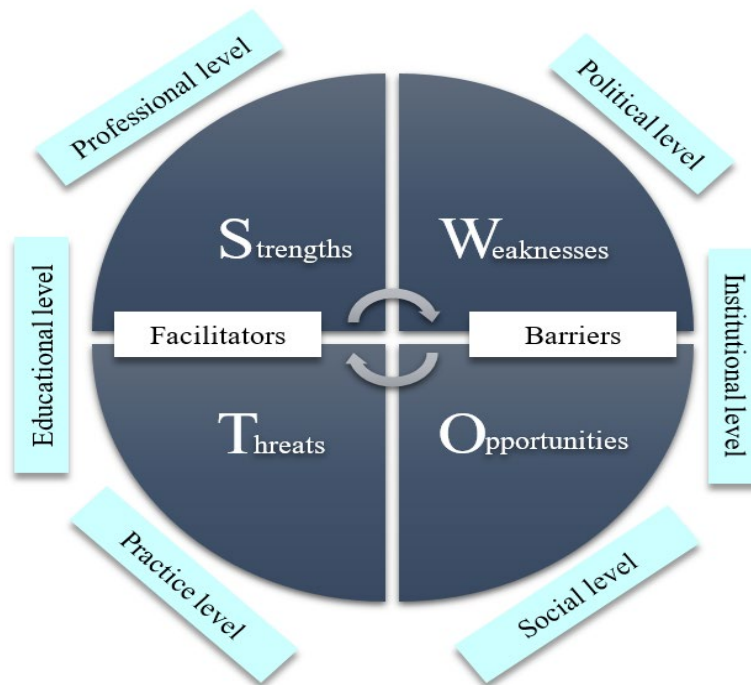
Strengths are positive or advantageous characteristics which play an important role in achieving goals (Gürel & Tat, 2017). Weaknesses are defined as disadvantageous, negative and unfavourable characteristics, which can limit or impede service delivery (Gürel & Tat, 2017). Opportunities indicate a condition or situation favourable to conduct an activity, which yields

positive results and also takes advantage of strengths (Gürel & Tat, 2017). Threats are obstacles which make it impossible or difficult to reach goals and can impede the effectiveness and efficiency of service delivery (Gürel & Tat, 2017). In the context of healthcare settings, the strengths, weaknesses, opportunities and threats reported by A/STAs will aid in identifying the barriers and facilitators affecting EHDI service delivery, i.e. challenges faced in public versus private, limitations, methods to adopt to effectively render EHDI services etc.

Barriers and facilitators in the proposed study have been identified at any of the different levels, which include, professional, political, social, institutional, practice and educational (Haines et al., 2004). Professional level factors are the standards of practice, policies and guidelines such as the HPCSA EDHI guidelines, JCIH position statement etc. This relates to the appropriateness, practicality and feasibility of the guidelines towards rendering EHDI services in the South African context. Political level areas include the governmental departments of health or education who play a big role in the decision making process, such as the employment of audiologists for NHS or funding to public healthcare facilities for equipment. Institutional level factors include resources i.e. paediatric screening and diagnostic equipment, staff available in healthcare facilities, type, structure and area of healthcare facilities. Practice level areas include the protocols in healthcare facilities, healthcare professionals' practices and settings of practice. This relates to practices by A/STAs towards implementing EHDI services and areas in which services are being carried out, rural versus urban or private versus public and availability of these services. Social level factors include people's beliefs about the health system and their health-seeking behaviours, i.e. parental or community views about the importance of audiology services and NHS services, which affects service delivery. Educational level areas include knowledge, information and training about health services by healthcare professionals, parents or caregivers and the government. Information such as knowledge about audiology, NHS and importance of EHDI services as well as the negative consequences. The SWOT framework as depicted in figure 1 was adopted for the proposed research study.

Figure 1

The SWOT conceptual framework together with the barriers and facilitators at different levels



Note. The above conceptual framework was adapted from Sarsby (2016) and Haines et al. (2004)

2.3. Literature review

2.3.1. Overview

The identification of hearing loss in children can be dated back to more than 200 years (Tharpe & Seewald, 2016). Noisemakers were used as early as the 1940s to test infant hearing, but only those with the severe and profound losses were identified (Tharpe & Seewald, 2016). The average age of diagnosis of severe hearing loss was 2-3 years, (Nikolopoulos, 2015) moderate-to-severe hearing losses in children were only identified after the newborn period, with milder hearing losses identified only when children were school-aged (Joint Committee on Infant Hearing [JCIH], 2007). The etiology of early-onset or congenital hearing loss varies between countries because of infections (meningitis, cytomegalovirus); diseases (measles, chronic otitis media); perinatal conditions (hyperbilirubinemia, low birth weight) and head trauma (WHO, 2010).

The guidelines by the JCIH serve as a reference document globally, including middle and low-income countries which are resource-constrained, as this represents the international gold standard (Olusanya, 2015). The prevalence of hearing impairments in developed countries compared to resource-poor countries, is between 2-4 per 1000 births and six per 1000 births, respectively (Olusanya, 2008). EHDI is used as a measure of best practice for child healthcare, with UNHS being the preferred model (Petrocchi-Bartal & Khoza-Shangase, 2014). The HPCSA EHDI guidelines were first released in 2007 and approximately ten years later the document was revised, reviewed, and released in 2018 (HPCSA, 2007; HPCSA, 2018). Guidelines for EHDI programmes recommend the international gold standard of one-three-six months, indicating by one month infants should be screened for hearing loss, diagnosed by three months and intervention provided by six months (HPCSA, 2018). This timeframe was further contextualized for South Africa, indicating hearing screening by one month and no later than six weeks, diagnosed by three months and no later than four months and intervention by six months and no later than 8 months (HPCSA, 2018). Facilities that implement infant hearing screening programmes need protocols to achieve the goal of identifying all newborns with hearing loss, therefore the JCIH recommends screening all infants before discharge from the nursery (JCIH, 2007).

EHDI and in particular NHS programmes in low-and-middle income countries are minimal due to factors such as lack of human or financial resources, socio-economic and health barriers and limited context-based research (WHO, 2010). South Africa is privileged as it has the ability to train motivated, caring and skilled healthcare professionals to provide care at the highest professional standard, in both public and private healthcare institutions (Benatar, 2013). Nevertheless, with the private sector servicing 16% and the public servicing 84%, of the population (South Africa National Treasury, 2010), attaining equality at the current levels as in private healthcare, for individuals, would necessitate need for increased material and human resources, which may not be possible (Benatar, 2013).

The urban and rural areas in South Africa have poor health outcomes, despite spending a considerable amount on health compared to other developing and middle-income countries which yield better outcomes (Bloom & McIntyre, 1998; Chopra et al., 2009). There seems to be a large gap between public and private healthcare, specifically in South Africa (Young, 2016). Public healthcare is funded by the government, but faces disadvantages which include long waiting times, rushed appointments, reduced quality of care and poor disease prevention and control (Young, 2016). In comparison, the private healthcare sector does not face the

aforementioned challenges however, these services are expensive for patients to access (Young, 2016). The added burden of fatal and communicable diseases which include, HIV/AIDS, malaria and tuberculosis faced by the government often leads to hearing loss being marginalised (Chapchap et al., 2007).

Hearing loss is unfortunately neglected even though the majority of individuals with disabling hearing loss live in low-and-middle income countries (Olusanya & Newton, 2007). In India, hearing loss is also a common but neglected disability, leading to a loss in speech and language (Merugumala et al., 2017). The absence of UNHS in low-to-middle income countries, results in late identification of deaf children (Merugumala et al., 2017). Hence, available resources should be equitably distributed in favour of ignored non-life-threatening conditions, like infant hearing loss to amend past negligence and create integrated and holistic improvement in healthcare (HPCSA, 2018).

2.3.2. Age of identification, diagnosis and intervention

Recent data from the United States, indicated that 98.2% of infants receive NHS (CDC, 2018), with the essential role of NHS emphasized as 43 states in the United States have laws mandating UNHS and the remaining states implementing UNHS without legislation (Shearer et al., 2019). According to research studies conducted in South Africa, EHDI guidelines are not being translated into clinical practice for several reasons (Theunissen & Swanepoel, 2008; Meyer & Swanepoel, 2011; Petrocchi-Bartal & Khoza-Shangase, 2014; Khoza-Shangase et al., 2017). Thus, successful EHDI programmes conducted in accordance with guidelines is challenging without aid from government and or/ related agencies (Park et al., 2020).

Some healthcare facilities are implementing UNHS as stipulated by the HPCSA EHDI guidelines, which is emphasized by a study conducted at Maternal and Child Healthcare clinics in Cape Town (Friderichs et al., 2012). Results from the study revealed a mean age of 3.9 weeks and 8.4 weeks, for the first and second stages of hearing screening respectively (Friderichs et al., 2012). A total of 98.5% of infants were successfully screened however, the overall coverage rate across the clinics was 32.4% and did not meet the required 95% benchmark stipulated by the HPCSA EHDI guidelines (Friderichs et al., 2012, HPCSA, 2007; HPCSA, 2018). In comparison, a study conducted in a state-owned tertiary maternity hospital in Lagos, Nigeria, revealed a screening rate of 98.7% with the mean age for screening being 2.6 days (Olusanya et al., 2008). These results correlated Sharma et al.'s (2015) study, indicating a screening coverage rate of 97.42% which was better than the JCIH (2007) and

HPCSA (2018) recommended benchmark of 95%. Thus, showing the success of NHS in low-and-middle income countries, if implemented effectively and thoroughly.

A study by Bezuidenhout et al. (2018) conducted at a secondary level hospital in Johannesburg, revealed that only 24% of the neonates identified had an initial screening performed, with a minimal 35.1% returning for their follow-up. The primary barrier was because of a lack of audiologists and additionally, audiologists do not receive financial remuneration for overtime, thus screening only occurs within regular working hours (Bezuidenhout et al., 2018). Audiologists are central to the EHDI process from identification, evaluation and to auditory habilitation, as they are experts in newborn hearing loss and should be the main member supervising the EHDI program (HPCSA, 2007). Results from Pillay et al.'s (2020) study indicated a ratio of 0.57 per 10 000 of speech-therapists, STAs and audiologists in South Africa, with KZN having a professional to population ratio of 0.53 per 10 000.

South Africa unfortunately has insufficient audiologists within government hospitals (Theunissen & Swanepoel, 2008), with the workforce being a minimal 22% whom are employed in the public healthcare sector (Pillay et al., 2020). Therefore, screening personnel has been recommended in the HPCSA EHDI guidelines to include, trained nursing workers, community health staff and volunteers, which should be guided by context-specific human resources (HPCSA, 2018). A South African study indicated that using dedicated screeners had a positive influence towards programme administration and efficiency (De Kock et al., 2016). Another study that evaluated a community-based hearing screening programme conducted in South Africa, emphasised the need of dedicated screening personnel compared to additionally burdening nursing staff, to reach appropriate coverage (Friderichs et al., 2012). Additionally, in South Africa, as resources and healthcare practitioners fluent in the African languages are limited, lay volunteers may be a valuable resource to UNHS programmes (HPCSA, 2018).

Targeted or risk-based hearing screening is conducted in many healthcare facilities, mainly because of limited staffing of audiologists. Risk factors for hearing loss are suggested by the JCIH however, these are not recommended to identify children who should have hearing screening (JCIH, 2007; JCIH, 2019). Approximately 50% of the paediatric population, who have congenital hearing loss are identified by utilizing risk factors when screening (Colella-Santos et al., 2014). Findings from a study by Imam et al. (2013) conducted at a center in Egypt, revealed, that by limiting hearing screening to only at-risk neonates, 8% of well-baby neonates who failed the auditory brainstem response (ABR) test would not have been identified. Hence,

emphasizing the importance of UNHS, as infants presenting with hearing impairments may not have risk factors (Imam et al., 2013). Nonetheless, it is still essential to be aware of the risk factors, as infants displaying these are more at risk to develop hearing loss (Colella-Santos et al., 2014).

Hearing is important for language and speech development, learning and communication, as hearing impairment negatively impacts the conveyance of the sound signal to the brain (Sahli, 2018). Permanent hearing loss of 40 decibels (dB) or more averaged over 500, 1000, 2000 and 4000 Hertz is the targeted hearing loss, which serves as the minimum screening program criterion in South Africa (HPCSA, 2007; HPCSA, 2018). Many existing NHS programs usually target permanent conductive or sensory hearing loss, between 30-40dB or greater, in the frequency range necessary for speech recognition (between 500-4000 Hertz) (WHO, 2010). Hearing loss within the 20-30dB range is important and should be identified early, as this can have negative consequences later on, in the development of children (WHO, 2010). Diagnosing hearing loss and identifying the degree and type should be conducted by a registered audiologist who has experience in infant hearing loss (HPCSA, 2018). The audiological evaluation test battery should include physiological and developmentally appropriate behavioural measures, to cross-check results (HPCSA, 2018).

A study by Butler et al. (2013) conducted at a public hospital in Bloemfontein revealed, the median age infants were diagnosed with a hearing loss was at 3.7 years, which correlated with results from Khosa-Shangase et al.'s (2010) study. In contrast the median age of diagnosis of congenital hearing loss in the private healthcare sector in Bloemfontein was 2.24 years (Butler et al., 2013; Butler et al., 2015). The median age of diagnosis for infants, in the private healthcare sector, who were not screened at birth compared to those that were was 3.01 years and 1.25 years respectively (Butler et al., 2015). This is significant as implementation of NHS programs can create a reduction in the diagnosis age of infants from 3.01 years to 1.25 years; however, the benchmarks stated in the guidelines are still not met (Butler et al., 2015; HPCSA, 2018).

Further results indicated the median age of the infant's first visit to the clinic was at 3.4 years, with the median timeframe between the first visit and diagnosis being 49 days (Butler et al., 2013). There seems to be a large gap in the recommended age of diagnosis by three months, latest four months at clinic-based settings, as recommended by the HPCSA EHDI guidelines (Butler et al., 2013; HPCSA, 2018). Hence, suggesting the implementation of UNHS is only

one factor affecting the age of diagnosis; access to timely diagnostic and screening audiology services if parental concern is reported, is extremely important as well (Butler et al., 2015). The variability with the level of diagnostic follow-up services was identified to be a challenge with the EHDI system (Moodley & Störbeck, 2017).

Audiologists are required to perform the hearing aid selection including timeous fitting, to minimise delays between diagnosis and amplification (JCIH, 2007). A retrospective study by Sahli (2018), revealed a mean age of hearing aid use of 5.83 months, with onset of auditory-verbal-training at 6.7 months, which is consistent guidelines from early intervention programmes worldwide. In contrast to a South African study by Khoza-Shangase et al.'s (2010) which indicated that amplification was provided only after the child was two years, because of a lack of adequate resources, audiological equipment and limited parental knowledge regarding early intervention services. All children and infants identified with the targeted hearing loss, are recommended a form of personal amplification or a sensory device, for which families are responsible to choose (HPCSA, 2018). Lack of early infant and childhood auditory stimulation can cause; permanent functional communication handicaps, impaired cognitive development, emotional or psychological issues and learning difficulties, thereby resulting in negative future socio-economic and vocational outcomes (HPCSA, 2007; HPCSA, 2018).

2.3.3. Screening platforms and practices by healthcare professionals

At a practice level, there are various screening protocols and procedures of detecting childhood hearing loss which have developed over the years, with modern technology allowing for screening in neonates within the first 12-24 hours of life (Petersen & Ramma, 2015). These are quick, non-invasive and reliable tests such as, automated auditory brainstem response (AABR) test and otoacoustic emissions (OAEs) test, which can be performed by well-trained non-audiologists (Petersen & Ramma, 2015). Protocols for NHS vary worldwide, with some countries or regions use AABR testing and transient evoked OAEs (TEOAEs), while others use distortion product OAEs (DPOAEs) for screening (Kanji et al., 2018).

Screening protocols for India comprises of three stages, with TEOAEs used at the first and second stage and an AABR conducted at the third stage (Kanji et al., 2018). In comparison, the United States (US) that has a two-stage protocol consisting of TEOAEs and AABR screening at both stages (WHO, 2010). The JCIH position statement recommends using OAE or AABR to test infants in the nursery and AABR for infants admitted to the neonatal intensive care unit (NICU), while the HPCSA EHDI guideline recommends using OAE for screening during

immunisation visits and AABR for infants in the NICU, in the South African context (Khoza-Shangase et al., 2017; HPCSA, 2007; HPCSA, 2018; JCIH, 2007). A combination of TEOAE and AABR screening is the most common method used for NICU infants within developed contexts (Kanji et al., 2018). Results from a study by Meyer et al. (2012), indicated the majority of programs used only automated OAEs (AOAEs) for babies in the nursery, while 47% of programs only used AOAEs for babies in the NICU. A limited 16% of programs used a two-stage hearing screening protocol of AOAE and AABR (Meyer et al., 2012). In contrast, protocols identified from Khoza-Shangase et al.'s (2017) study revealed, that the majority of participants used DPOAE and AABR testing for NHS. Additional barriers identified were, timing of screening, noise interference, equipment failure, vernix caseosa in the ear canal and early discharge for neonates born via normal delivery (Bezuidenhout et al., 2018).

The study by Petrocchi-Bartal and Khoza-Shangase, conducted in Gauteng and North West provinces, on primary health care nurses revealed the majority of respondents presented environmental sounds (banging a door, shaking a rattle, talking to the baby), and monitored the infant's behavioural responses when screening for hearing loss (Petrocchi-Bartal & Khoza-Shangase, 2014). This was unfortunately only conducted when a hearing related problem was indicated or during milestone assessments (Petrocchi-Bartal & Khoza-Shangase, 2014). Therefore, indicating that all respondents did not conduct any formalized hearing screening because of a lack of equipment and knowledge (Petrocchi-Bartal & Khoza-Shangase, 2014). Correlations were noted with a recent study by Khoza-Shangase et al.'s (2017), that indicated clinics did not have necessary hearing screening equipment and would rely significantly on otoscopy and medical records. Hence, suggesting primary healthcare clinics were not performing hearing screening as per the HPCSA EHDI guidelines (Khoza-Shangase et al., 2017; Petrocchi-Bartal & Khoza-Shangase, 2014).

Teixeria and Joubert's (2014) study conducted in the private and public healthcare sectors in Gauteng revealed that all departments that rendered paediatric services had access to sound-treated booths, screening OAEs, otoscopes and diagnostic audiometers. Sixty-one percent of departments had access to diagnostic ABR equipment, only 39% of departments had real ear measurement equipment for hearing aid fitting, with a minimal 28% having paediatric hearing aid protocols in place (Teixeira & Joubert, 2014). Every child with a hearing loss needs to have access to the necessary resources to enable them to develop to their maximum potential (JCIH, 2007). There have been no studies conducted in KZN to date, to identify what paediatric equipment is in place in audiology departments for rendering EHDI services. This has negative

consequences for EHDI practice and implementation, if appropriate equipment is not in place to provide necessary services. Additionally, as not all hospitals have paediatric audiological equipment, patients in need of such testing are referred to other hospitals, leading to lengthy waiting lists (Khoza-Shangase et al., 2010).

Findings from Khoza-Shangase's (2019) study found that the majority of respondents used natural sleep when conducting electrophysiological testing in paediatrics. This was reported to be consistent in South Africa, as clinics do not have registered nurses or physicians, thus the utilization of natural sleep (Khoza-Shangase, 2019). Furthermore, frustration was reported among respondents, when using conscious sedation, as this resulted in repeated tests and appointment visits (Khoza-Shangase, 2019). Therefore, creating challenges with the time spent on each patient, further delaying diagnosis and intervention (Khoza-Shangase, 2019). Results from the study indicated a lack of standardized and uniform sedation practices, for paediatric electrophysiological testing in South Africa, due to varied resource allocation, training-related issues and issues with the scope of practice (Khoza-Shangase, 2019).

No standardized and formalized system of NHS exists within the state-run hospitals in Johannesburg (Bezuidenhout et al., 2018). Evidence from published literature indicated no uniformity with screening measures at an institutional level, thus the choice of screening protocol depends on the feasibility of tests within each context and influencing factors such as costs, infrastructure, follow-up and referral rates (Kanji et al., 2018). Several screening programs in hospitals and South African communities have been implemented however, outcomes from research are isolated and broader studies to determine the status and knowledge base of EHDI, in South Africa, are needed (Moodley & Störbeck, 2015).

A national database is needed to correlate data uniformly and facilitate communication with screening and intervention services (HPCSA, 2018). A study by Moodley and Störbeck (2017), conducted on audiologists within three provinces, including the public and private sector, revealed the majority of respondents from the study used a paper-based system to record EHDI data, while a few reported additional use of a computer-based system. This corresponds with Meyer et al.'s (2012) study indicating that 90% of hearing screening programs relied on paper-based systems, to track patient and hearing screening information. The most common challenges reported with implementing an online-based system included limited staff and lack of time, as well as electricity cuts and low budgets (Moodley & Störbeck, 2017).

Data sharing was also assessed in Moodley and Störbeck's (2017) study, with results indicating the majority of the Gauteng and KZN public sector utilized systems available to other health professionals based in the hospital. However, only two audiology departments in Gauteng had systems that allowed data to be accessible to medical professionals from other hospitals, in contrast to the private sector that had no sharing of data across hospitals (Moodley & Störbeck, 2017). Furthermore, Joubert and Casoojee's (2013) study conducted at primary healthcare clinics in Gauteng on nurses performing immunisations, indicated the majority of nurses did not record screening results on either card or chart (Road-to-Health Chart and City of Johannesburg Child Health Services Blue Card). This can lead to poor follow-up rates and hinder the continuity of care for patients who return (Joubert & Casoojee, 2013). The lack of standardisation of data reporting for screening and diagnostic testing has contributed to the loss-to-follow-up rates (Alam et al., 2016). According to the HPCSA EHDI guidelines it is compulsory to record hearing screening results and it should be included in the Road-to-Health Card of all infants (HPCSA, 2018).

2.3.4. Follow-up rates influenced by knowledge levels about EHDI services

Many studies have shown that poor follow-up rates are a major barrier to successful NHS program implementation (Bezuidenhout et al., 2018; Kanji et al., 2018; Opperman & Kanji, 2015). Fifty-five percent of participants from Opperman and Kanji's (2015) study, who referred at the initial screening did not return for a follow-up. Results from Meyer et al.'s (2012) study indicated that for 44% of the programs the follow-up rate was reported to be between 21% to 69%, while only 28% of the programs had a 70% or higher follow-up rate. Poor follow-up rates and audiological protocol used for children from zero to thirty-five months, could influence the late age of diagnosis (Opperman & Kanji, 2015) and thereafter intervention. Follow-up rates and screening refusal needs to decrease, to facilitate age-appropriate speech and language development for infants with hearing loss (Scheepers et al., 2014).

EHDI success depends on the partnership between families and professionals working in a coordinated team, as well as the birth hospital who is a key member (JCIH, 2007). A study by Scheepers et al. (2014) conducted at two private healthcare hospitals in the Western Cape, indicated that the most common reasons for refusal of testing were due to cost, NHS education and knowledge and team collaboration. Nearly all respondents reported if hearing screening costs were included in the birthing package or covered by medical aid, they would more likely agree for the test (Scheepers et al., 2014). Thus, indicating the importance of collaboration from

the government at a political level, to include screening in birthing packages, which can facilitate improved EHDI services.

Essential members for EHDI services include, audiologists, families, primary care physicians or paediatricians, otorhinolaryngologists, nurses, speech-language therapists, educators, community workers and other early interventionists or interpreters when needed (HPCSA, 2018). EHDI programmes depend on an inter-professional multidisciplinary team approach to facilitate collaboration between healthcare professionals who are knowledgeable regarding childhood hearing loss (JCIH, 2007). Paediatricians or primary care physicians play a role in advocating for the child's health and medical wellbeing (HPCSA, 2018). NHS should be a component in the neonatal examination to facilitate timeous referrals from paediatricians to audiologists or otorhinolaryngologists (Olusanya, 2012). Furthermore, assisting with prompt referrals of high risk neonates in contexts that do not have fully established UNHS programmes (Olusanya, 2012).

Results from a study by Ravi et al. (2017), conducted in India, indicated that 95% of the paediatricians were aware of the importance of UNHS and were confident about their knowledge of NHS. Knowledge, attitudes and practices of individuals in the multidisciplinary team are essential for successful programs and to prevent loss-to-follow-up (Ravi et al., 2018). The success of NHS relies on timeous identification, diagnosis and intervention of infants and children with hearing losses, which is accomplished through multidisciplinary teamwork (Ravi et al., 2018). However, this is in contrast to Mazlan and Min's (2018) study conducted on healthcare professionals' attitudes and knowledge in Malaysia, which indicated that the overall knowledge about NHS was poor with all healthcare professionals part of the NHS program, even though the majority of the respondents were aware of the benefits and importance of NHS. The deficits in knowledge of healthcare professionals is a concern as it could result in non-compliance or reluctance of parents towards NHS and may increase loss-to-follow-ups (Mazlan & Min, 2018).

Further findings revealed that NICU nurses had a less positive attitude towards NHS compared to paediatricians and Ear, Nose and Throat (ENTs) doctors (Mazlan & Min, 2018). Encouragingly 92.5% of nurses were aware of the importance of screening babies for hearing loss however, 74.76% of respondents were unaware of their role in NHS programs and follow-ups (Ravi et al., 2017). The nurse, being a healthcare professional has an ideal opportunity to explain to parents or caregivers about the importance of screening, follow-ups, diagnostic

assessments and intervention options (Moodley & Störbeck, 2012). Nurses are easily available and more accessible compared to doctors, thus are a vital emotional support system for caregivers or parents from diverse cultural and socio-economic backgrounds, for NHS (Ravi et al., 2017). Unfortunately, in South Africa, there are no published studies to date that have been conducted on healthcare workers' knowledge and awareness regarding NHS and EHDI services.

2.3.5. Parental beliefs influencing screening refusal

The stigma that can be associated with deafness can be a barrier preventing individuals from accessing rehabilitative services (Das et al., 2020). The distance of healthcare facilities may be a hindrance for mothers, especially in rural areas (Merugumala et al., 2017). Challenges identified from Merugumala et al.'s (2017) study related to cultural, educational, transportation and financial barriers affecting access of services, especially those in rural areas and from lower socio-economic statuses. Intervention services are usually provided at health facility levels (HPCSA, 2018), thus access to support, assessment and intervention may be challenging for the vulnerable population or families (Samuels et al., 2012).

According to Swanepoel and Almec's study (2008), 57% of the respondents had at least one superstitious cultural belief, for the possible cause of a hearing loss. This further correlated with Govender and Khan's (2017) study, which found that 62% of participants believed ancestral curses and bewitchment to be causes of hearing loss. In contrast, Rajagopalan et al.'s (2014) study revealed that the majority of respondents indicated bewitchment and ancestral sins were not the cause of the hearing loss.

Cultural beliefs may be associated with hearing loss, thus healthcare professionals should demonstrate cultural competence when providing services, in countries that are culturally and linguistically diverse, like South Africa (Govender & Khan, 2017). A deaf child's parents may spend large sums of money in the beginning, visiting orthodox medical practitioners thereafter traditional healers before receiving rehabilitative intervention (Rajagopalan et al., 2014). These attitudes may arise from indigenous traditions attributed to the stigma of hearing loss and deafness, leading to resistance to hearing aids and sign language (Rajagopalan et al., 2014). South Africa is a multicultural context and the manner information is provided to parents regarding the importance of hearing screening is essential (Moodley & Störbeck, 2012).

Few studies have investigated parental attitudes of NHS in relation to knowledge towards the NHS process (Krishnan et al., 2019). Despite, overall success of UNHS in the United States,

there is still a lack of parental awareness towards the process (Krishnan et al., 2019). A study by Jatto et al. (2018) conducted in South-West Nigeria at immunisation clinics revealed findings of, 62.5% of mothers being unaware of NHS, with the awareness level being significantly related to socio-economic factors. A national survey conducted in the United States, indicated that only 62.9% of parents were able to recall the hearing screening, therefore changes were needed to increase parental awareness (Pynnonen et al., 2016). Caregiver or parental knowledge about EHDI services is an important, as the EHDI guidelines advocate for family-centered intervention, to ensure timeous and culturally congruent services are provided (HPCSA, 2018). A study conducted in South Africa, emphasised the need for swift and efficient action regarding maternal suspicion towards hearing loss (Störbeck & Young, 2016), which can substantially decrease identification ages (HPCSA, 2018).

Furthermore, willingness for NHS services seemed to increase, when educational level and socioeconomic status increase (Jatto et al., 2018). While Rajagopalan et al.'s (2014) study indicated only 12% of grandmothers were aware of NHS. Maternal education about early identification and risk factors for hearing loss will aid in the realisation of the aim for UNHS (Das et al., 2020). Another study by Lam et al. (2018) indicated that most mothers underestimated the ongoing risks of hearing loss in infants. Eighty percent of mothers believed infants could not develop a hearing loss after passing the screening (Lam et al., 2018). While one-third of mothers believed that babies could not develop hearing loss later in childhood (Lam et al., 2018). Educational level, family income, parental perception and social factors are barriers which impacts timely screening and management (Yun et al., 2017), therefore it is necessary to gather information about parental or caregiver perspectives on NHS to ensure appropriate advocacy and interventions (Jatto et al., 2018). NHS programs are not mandatory in South Africa, thus necessitating the need for parents to be aware and knowledgeable of risk factors for infant hearing loss (Govender & Khan, 2017).

2.4. Conclusion

Significant progress has been reported internationally however, particularly in Africa there is a lack of recognition of individuals with disabilities and lack of prominence of early screening, including identification of disability (Moodley & Störbeck, 2012). In developing countries, especially Africa, infants presenting with hearing loss do not have equal opportunities as hearing peers since limited early intervention systems exist (Chap-chap et al., 2007). In South Africa, this is true, even though there is better health infrastructure compared to other African

countries, as well as “being the only country on the continent training audiologists” (HPCSA, 2018, p. 45). Therefore, South Africa presents with the opportunity and moral obligation to invest in infants with hearing impairments, by implementing EHDI programs and assisting other African countries to provide services to infants with hearing loss (HPCSA, 2018).

This study aimed to explore the barriers and facilitators to EHDI in KZN, as reported by A/STAs from guideline generation to clinical application.

Therefore the research question is: What are the barriers and facilitators of EHDI in KZN from guideline generation to clinical application, as described by A/STAs?

CHAPTER 3. METHODOLOGY

“Research is formalized curiosity. It is poking and prying with a purpose”

Zora Neale Hurston

3.1. Introduction

This chapter describes the methodology utilized in the study. It includes information regarding the aim and objectives, study design, study setting and population, sampling techniques used, data collection tool and procedures followed to obtain data. The data analysis is documented and issues relating to the validity and reliability are addressed, as are the ethical and legal considerations.

3.2. Aim

The study aimed to explore the barriers and facilitators to EHDI in KZN, as reported by A/STAs, from guideline generation to clinical application.

3.3. Objectives

The following objectives were identified to complete the aim of the research study.

1. To describe the barriers (weaknesses and threats), identified by A/STAs to EHDI in relation to the professional, political, social, institutional, practice and educational levels.
2. To describe the facilitators (strengths and opportunities), identified by A/STAs to EHDI in relation to the professional, political, social, institutional, practice and educational levels.

3.4. Research design

An exploratory-descriptive research design was used in this study with qualitative methods of analysis. This enabled the researcher to obtain a rich description of reality where little is known (Allen, 2017; Taylor et al., 2015; Kumar, 2014) and further provided an outline regarding the status of a phenomenon (Allen, 2017). This also allowed behaviours and characteristics of a particular population to be identified (Korrapati, 2017). The qualitative method follows a flexible, open and unstructured approach aimed at exploring diversity, perceptions and experiences to descriptively and narratively communicate results (Kumar, 2014).

Qualitative interviews were used as the research strategy, specifically telephonic interviews which was used as the data collection tool for the proposed research study. Due to the COVID-19 virus that had arisen and resulting in the lockdown of South Africa during the research timeframe, the data collection method was changed from a focus group interview schedule to a telephonic interview schedule. This method still enabled the researcher to obtain in-depth information from the participants, which provided answers to the proposed research question.

3.5. Study setting and population

The proposed research study was conducted with A/STAs working in a variety of settings including public healthcare facilities and private practices. The population in a research study is everyone who has a specific characteristic which is of interest to the researcher (Allen, 2017). The population for the proposed research study was A/STAs working in healthcare facilities, within KZN and who had been exposed to some form of NHS.

No guidelines are available to determine the sample size in a qualitative study however, the aim and objectives of the study should be accomplished (Emmel, 2013). According to Seidman, two criteria are used to identify how many participants are enough, which is sufficiency and saturation of information (Seidman, 2019). According to Creswell (1998, 2014) between five to twenty-five, participants are recommended for interviews, with Green and Thorogood (2004), indicating that in most qualitative research interview studies, little new information is obtained after approximately 20 interviews. Therefore, for this research study once the saturation point was reached the researcher and supervisor decided to finalize the data collection process and stopped after 12 participant interviews as no new information was being generated. From the 12 telephonic interviews conducted, a total of 11 full interviews were completed with one participant completing only half of the telephonic interview.

Table 1 depicts the demographical characteristics of participants.

The following inclusion and exclusion criterion was applied to the study:

3.5.1. Participant selection criterion

- A/STAs who had obtained a minimum requirement of a Bachelor of Audiology or a Bachelor in Speech and Hearing Therapy.
- A/STAs registered with the Health Professionals Council of South Africa.

- A/STAs who were practicing audiology irrespective of which facility e.g. assessment centre, public hospital, private practice etc.
- A/STAs, including community service students, who had conducted NHS or were involved in newborn screening or EHDI programmes at other facilities.
- A/STAs of all ages, race groups and genders were considered for the study, to ensure data is diverse and a wide range of opinions, expertise, knowledge and beliefs were obtained, provided they had some exposure to newborn screening or EHDI programmes.
- A/STAs employed in academia were excluded from the study, as the focus was on obtaining information regarding barriers and facilitators specifically in healthcare facilities.

3.6. Sampling

Non-probability sampling was used for the study, as the chance of being chosen for the study was unknown and not everyone had an equal chance (Crowther & Lauesen, 2017). The type of non-probability sampling used was purposive, convenience sampling, as conveniently situated participants with specific characteristics were intentionally chosen to participate in the study (Ritchie et al., 2013).

The researcher completed her community service recently and had attended workshops regarding NHS in 2019, therefore was aware of A/STAs working public and private healthcare facilities who had some involvement in NHS. Those individuals were identified to participate in the research study. Thus, through the researcher's knowledge and by utilizing the researcher's supervisor as a key reference, together with recommendations from the pilot participants, other study participants were identified. The selection of participants was criterion-based and included diversity, to allow different characteristics to be explored (Ritchie et al., 2013), thus enabling the researcher to obtain information regarding the aim and objectives of the research study.

Table 1*Demographical characteristics of participants*

Participant	Age	Gender	Race	Demographical Information					District
				Level of education	Years in practice	Healthcare sector	Setting of practice	Level of healthcare facility	
Participant A	21-30 years	female	Indian	bachelors	6-10 years	public	urban	provincial (level 3)	eThekwini
Participant B	31-40 years	female	African	bachelors	6-10 years	public	urban	provincial (level 3)	eThekwini
Participant C	21-30 years	female	Indian	bachelors	6-10 years	public	rural	regional (level 2) community-based	Amajuba
Participant D	51-60 years	female	Indian	bachelors	>20 years	public	urban	clinic/rehab facility	eThekwini
Participant E	51-60 years	female	Indian	bachelors	>20 years	private	urban	N/A	King Cetshwayo
Participant F	21-30 years	female	Indian	bachelors	1-5 years	private	urban	N/A	King Cetshwayo
Participant G	31-40 years	female	African	bachelors	6-10 years	public	rural	district (level 1)	Zululand
Participant H	31-40 years	female	White	bachelors	11-15 years	private	urban	N/A	eThekwini
Participant I	31-40 years	female	White	doctoral	16-20 years	private	urban	N/A	eThekwini
Participant J	21-30 years	male	African	bachelors	1-5 years (community service)	public	rural	district (level 1)	Amajuba
Participant K	21-30 years	male	African	bachelors	(community service)	public	rural	district (level 1)	uMgungundlovu
Participant L	21-30 years	female	Indian	bachelors	1-5 years	private	urban	N/A	eThekwini

3.7. Data collection tool

Telephonic interviews were used to collect detailed information, in a semi-structured session through the use of general guideline questions (Carey & Asbury, 2016). The telephonic interview schedule (Appendix A) was utilized as the data collection tool, as it was flexible and allowed the researcher to acquire extensive data regarding the research topic (Galletta, 2013; Olson, 2016). The telephonic interview schedule comprised of 8 main open-ended questions, along with a set of probe questions (Appendix B) to enable the research to gather relevant, in-depth data from the participants. Open-ended questions allowed the researcher to gather rich contextually relevant, informal and free-flowing information, which allowed the participants to respond in any way they chose (Brace, 2013; Magnusson & Marecek, 2015). The telephonic interview schedule was adapted from White and Blaiser's (2011) *Online Survey Used in SWOT Analysis of State EHDI*, and all principles mentioned in the HPCSA EHDI (2018) guidelines were included in the data collection tool. The telephonic interviews took between 45-60 minutes and was audio-recorded for ease of analysis.

The SWOT conceptual framework was used to guide the telephonic interviews to identify contextually relevant strengths, weaknesses, opportunities, and threats. This enabled the researcher to make relevant recommendations regarding EHDI implementation and effectiveness of programs.

Table 2 describes the areas targeted in in the telephonic interview schedule, along with motivations for each area.

Table 2*Telephonic interview questions and motivations summary*

Question	Motivation
Demographical Information	Demographical information should be obtained for administration purposes and enabled the researcher to identify patterns and make inferences among healthcare settings.
Question 1: EHDI guidelines	EHDI is important to identify, diagnose and treat infants and newborns presenting with a hearing loss as early as possible (Opperman & Kanji, 2015), therefore enabling them to communicate effectively to develop to their full potential to partake and contribute in society (HPCSA, 2007).
Question 2: Newborn hearing screening	Approximately 6357 children annually, in South Africa, are born with a permanent hearing loss or develop hearing loss at an early age (Teixeira & Joubert, 2014). Research suggests that the absence of UNHS programmes is detrimental to children who are hearing impaired as a child may be only identified when they are at a school-going age (Harbinson & Khoza-Shangase, 2015).
Question 3-4: Initial age of screening	Facilities that implement infant hearing screening programmes need protocols to achieve the goal of identifying all newborns with hearing loss, thus the JCIH recommends screening all infants before discharge from the nursery (JCIH, 1995; JCIH, 2007). Infants who are missed are recommended to have their hearing evaluated before 3 months of age to identify hearing loss (JCIH, 1995; JCIH, 2007).
Question 5: Screening protocols and platforms	The majority of babies, in South Africa, are not screened at hospital-based programmes (HPCSA, 2018), with NHS protocols varied worldwide (Kanji et al., 2018).
Question 6: Loss to follow up	In research, a current challenge to NHS programmes worldwide is the loss-to-follow-up (HPCSA, 2018). Many studies have shown that poor follow-up rates are a major barrier to successful NHS program implementation (Bezuidenhout et al., 2018; Kanji, 2018; Opperman & Kanji, 2015).

Question 7: Age of diagnosis and intervention	The audiological evaluation should be conducted by a registered audiologist and needs to include physiological and developmentally appropriate behavioural measures to cross-check results (HPCSA, 2018).
Question 8: Data management	The national database can assist in obtaining accurate prevalence rates for newborn and infant hearing loss in the South African context and provide information regarding the initial age of hearing screening and diagnosis (HPCSA, 2018).

3.7.1. Advantages and disadvantages of telephonic interviews

Telephonic interviews are a cost-effective alternative compared to face-to-face interviews (Sreejesh et al., 2013). It has the potential to improve quality and co-operation with participants, as they may be more comfortable responding to telephonic interviews, as opposed to face-to-face interviews (Sreejesh et al., 2013). There is also a greater speed in data collection (Sreejesh et al., 2013) and further allows for a greater, diverse sample. Another advantage is the anonymity of telephonic interviews compared to face-to-face interviews, as both the interviewer and interviewee are not visible to each other (Baarda, 2019).

One of the disadvantages of telephonic interviews is that there may be a tendency among participants to give shorter answers to questions, compared to face-to-face interviews (Sreejesh et al., 2013). The lack of face-to-face contact may result in the participant continuing to talk without realising the interviewer may still be noting down the response (Sreejesh et al., 2013). Also, the lack of visual cues with telephonic interviews can make it harder to identify participant moods, attitudes and intentions (Coolican, 2018).

3.8. Data collection procedure

The data collection procedure is the method used to collect the data from the participants and plays an important role in the study (Sahu, 2013). The following steps were identified and followed for this research study.

The proposed research study was sent to the Humanities and Social Science Research Ethics Committee (HSSREC) to obtain ethical approval to conduct the study. Ethical approval was obtained [HSSREC/00001003/2020] (Appendix C) however, due to the COVID-19 pandemic and the lockdown, the data collection tool was changed from a focus group interview to a telephonic interview. Amendments were made to the proposed research study and it was resubmitted for ethical approval. Once the amended ethical approval (Appendix D) was

obtained, participants were recruited by the researcher, through the researcher's knowledge and by using the researcher's supervisor as a key reference.

The pilot study participants were identified first and contacted through phone calls. The informed consent letter (Appendix E) was then emailed to the two identified pilot study participants. The letter contained information regarding the aim and purpose of the study, as well as permission for the interview to be audio-recorded. Once confirmation was received, details of the interview, such as time and date were scheduled with the participants. The day before the scheduled telephonic interview, the participants were emailed a general telephonic interview guideline (Appendix F), which included a section for demographical information to be completed. The participants were also emailed the pilot study feedback form (Appendix G), which was to be completed after the telephonic interview. The pilot study telephonic interview was conducted with the participants, for approximately 45-60 minutes and was audio-recorded. Once the interviews were completed, the participants were requested to email both the completed forms to the researcher. Amendments were then made to the telephonic interview schedule, as suggested by the pilot study participants.

Thereafter, participants for the main study were identified by the researcher and were contacted through phone calls. They were then emailed the informed consent letter (Appendix E), which included information regarding the aim and purpose of the study and the role of the participant. The letter also included a section for the telephonic interviews to be audio-recorded for analysis purposes. Once consent was obtained from the participants, date and time arrangements were scheduled, for data collection. The day before the scheduled telephonic interview, participants were emailed the general telephonic interview guideline (Appendix F), which included a section for demographical information to be completed. The telephonic interviews were conducted with the participants for approximately 45-60 minutes, during which the interviews were audio-recorded for analysis. After the interviews were completed the participants were requested to email the completed form to the researcher.

Once all 12 of the telephonic interviews were conducted and completed, the data was transcribed by the researcher. Thereafter, member checking was conducted, as copies of the transcribed interviews were emailed to the participants to check their accuracy (Kiyimba et al., 2018) and ensure the credibility and trustworthiness of the data. Only eleven interviews were fully completed with one participant only completing half the interview and therefore, 11 of the completed transcribed interviews were sent to the participants for proof reading or making

any adjustments. A total of six of the eleven participants emailed their transcribed interviews back the researcher, with no changes being made to the transcribed interviews.

3.8.1. *Guidelines for the telephonic interview*

The following guidelines were used to conduct the telephonic interviews:

- A low-noisy space that was easily accessible and convenient for the researcher and participants was required, to avoid interruptions and allow for easy recording of the conversation (Edwards & Holland, 2013).
- The telephonic interviews were audio-recorded for accuracy and to enable the researcher to correctly transcribe and analyse participants' responses.
- The telephonic interview was scheduled for approximately 45-60 minutes and depended on the knowledge and experience of participants.

3.9. Pilot study

A pilot study was conducted as a pre-study or miniature version of the main study (Collins, 2017) to gather more information about the main study (Allen, 2017). The pilot study commenced once ethical clearance was obtained from the HSSREC. A telephonic interview pilot study was conducted with two participants who were not a part of the main study, to enable the researcher to identify any issues regarding the data collection tool and modify them for the main study (Allen, 2017; Leedy & Ormrod, 2015).

The participants were provided with an informed consent letter (Appendix E) and a pilot study feedback form (Appendix G). The information obtained from the feedback form was regarding the flow of questions, ease of understanding, the relevancy of questions and length of the interview etc. The pilot study also provided information about the amount of involvement, influence and attributing opinions of the researcher during the interview (Breen, 2006).

3.9.1. *Results from the pilot study*

The results from the pilot study indicated that the data collection method was appropriate. Both participants had no concerns with the time limit for the telephonic interview. No concerns were reported regarding the understanding of the questions however, one participant indicated that some of the questions were too long and required multiple aspects. Thus, the questions were simplified to enable the researcher to gather more relevant information from the participants. Another concern reported by one participant was that questions about the diagnostic and

intervention aspects of EHDI should be further probed and not only on screening. Therefore, adjustments were made to the content of the telephonic interview schedule, questions were separated and more probing questions were added.

3.10. Data analysis

Qualitative data analysis was used to describe and analyse the phenomenon in detail (Flick, 2013), specifically the facilitators and barriers to EHDI, in KwaZulu-Natal. Once the telephonic interviews were conducted the audio-recordings were transcribed for analysis (Ezzy, 2013). Transcription was used to get the dialogue off the recording device and onto a written document (Grbich, 2012), for easy analysis. After transcription, member checking was conducted as the transcribed telephonic interviews were emailed to 11 of the participants who completed the full interview, to ensure the credibility of the results and enhance the accuracy of the data (Birt et al., 2016). Participants were given three to five days to check the transcribed interviews and make adjustments, thereafter they were required to email it back to the researcher.

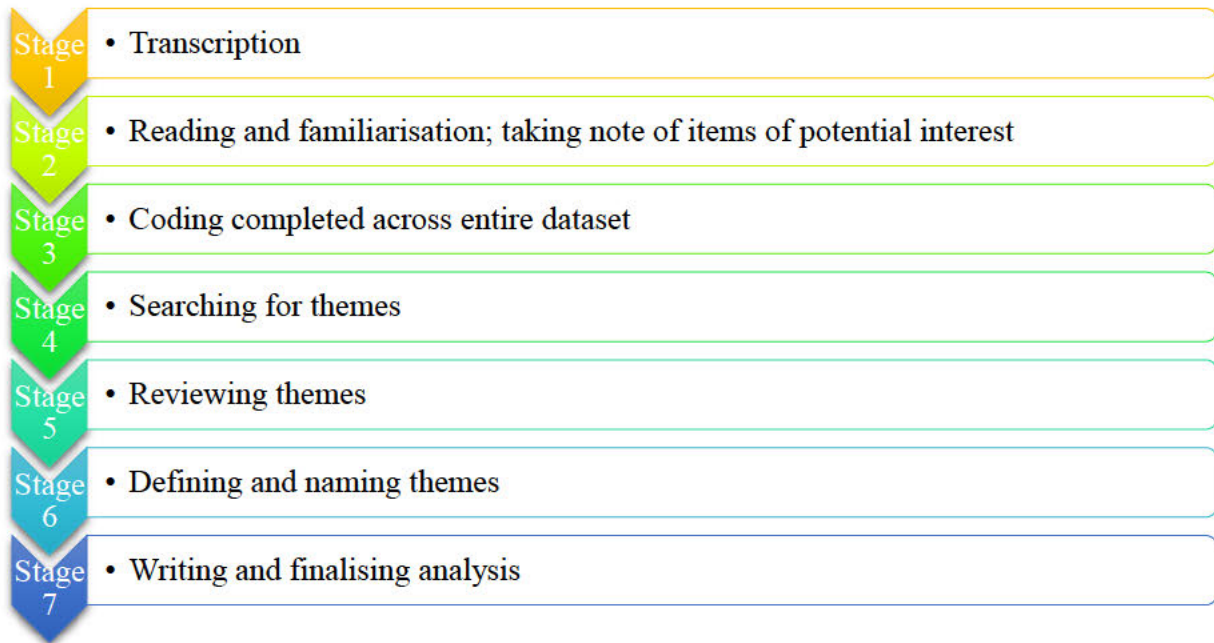
Once member checking was completed the researcher contacted a statistician to aid with analysis of the data. The statistician advised the researcher to include all 11 full completed interviews and the half interview for analysis purposes, thus a total of 12 telephonic interviews were analysed. The data for each question was moved onto an excel spreadsheet and further cleaned. The excel spreadsheet for each question was then imported onto the NVivo software for further coding, analysis, management and representation (Saldana, 2012). Coding is an important aspect of qualitative research, that assists with the identification of differences and commonalities in datasets (Harding, 2013). The NVivo software was used as the sole coding method for the first round of data analysis and is reported to be the best method for small-scale studies (Saldana, 2012).

The second part of coding involved thematic analysis, whereby categories were used to label similar coded data (Saldana, 2012). Thematic analysis is a method of data reduction and an analytic option for qualitative research (Grbich, 2012). An inductive thematic analysis was conducted, i.e. bottom-up approach, as the data was used for identifying and developing meaningful codes and themes (Willig & Rogers, 2017).

Figure 2 illustrates the stages of coding and analysis for thematic analysis. The SWOT conceptual framework was utilized to guide the telephonic interviews and also used to guide relevant themes for the final analysis.

Figure 2

Thematic analysis stages



Note. Adapted from Braun & Clarke (2013)

There are 6 stages of thematic analysis which are:

- 1) Data familiarisation - Data was transcribed and the researcher became familiar with the information obtained, which enabled her to form coherent patterns from the data.
- 2) Initial coding generation - The researcher coded the data before generation of the main themes and it was also used to capture segments of the data's essence.
- 3) Themes identified on initial coding - The themes were a result of categorising codes into meaningful groups. The SWOT conceptual framework was used to guide the themes generated from the data codes.
- 4) Review of the themes - The themes generated were examined against the raw data, to refine and ensure consistency to the aim and objectives of the study.
- 5) Theme definition and labels - Interpretation and description of the generated themes, along with identification of subthemes continued during this stage.

- 6) Report writing - The analysis was written up in the form of a dissertation by the researcher.

(Howitt, 2016)

3.11. Data representation and management

The study was qualitative and results were represented in the form of themes and subthemes, which emerged during data analysis (Howitt, 2016). The NVivo software was used for data representation and some extracts by participants were displayed to ensure transparency of results.

Data management includes planning, documenting and organising data, improving data analysis procedures, securing data properly, acquiring adequate backups and storage for data, appropriate care and sharing of data after completion of the research study and finding data if needed to use in a new research study (Briney, 2015). Hard copies of all appendices used in the research study and the transcribed data were kept with the researcher for confidentiality. Research-based information and the final dissertation was stored on a password-protected laptop for safety. The audio-recordings from the telephonic interviews were saved on a USB as a backup device, to ensure data was not lost due to any unforeseen circumstances. Data was handled with respect and care to ensure confidentiality.

3.12. Dissemination

Dissemination formed an integral part in the final phase for research, regarding reporting back findings to participants, community or funding body and also includes a set of activities i.e. seminars, scholarly publications or presentations at conferences (Groundwater-Smith et al., 2014). Upon completion of the research study, the dissertation was submitted to the University of KwaZulu-Natal (UKZN) for review and examination. A copy of the research study will also be available to the students and staff of UKZN, Westville Campus, Audiology Department.

The Helsinki declaration was used to ensure that human participants' rights are protected and treated with respect (Gallin et al., 2017). All data collected was available only to the researcher and supervisor. Anonymity and confidentiality were maintained throughout the study as information regarding the participants (i.e. names) was not part of the completed research study.

3.13. Research credibility and trustworthiness

Alternative criteria have been developed to assess qualitative research such as trustworthiness, dependability, credibility, confirmability and transferability (Flick, 2014; Ravitch & Carl, 2015).

In qualitative research, internal validity also known as credibility is defined as the researcher's capability to be aware of all complexities presented in the study and understand patterns that are not explained easily (Ravitch & Carl, 2015). The researcher was aware of all complexities of the study to an extent and strived to view the findings as an outsider.

Transferability or generalisability, also known as external validity is defined as the way qualitative studies can be applied to broader contexts, while retaining context-rich information (Ravitch & Carl, 2015). The participants from the study were chosen specifically from different work environments and thus context-rich and detailed information was obtained.

To ensure the dependability or consistency of the data obtained in the study (Ravitch & Carl, 2015), a telephonic interview was conducted with all the participants and specific questions were used to guide responses to ensure consistency of responses. The same data collection approach, method, analysis and interpretation were used for each participant.

Confirmability can also be described as objectivity and is essential that the researcher ensure that findings are confirmed (Ravitch & Carl, 2015). This was done through member checking as the transcribed telephonic interviews were emailed back to the participants, to ensure their responses during the interview were transcribed accurately.

3.14. Ethical and legal considerations

Ethics is defined as the moral difference between right and wrong and can vary between societies (Bhattacharjee, 2012; Sibinga, 2018), therefore an ethics course was completed by the researcher to ensure ethical standards and rules were followed throughout the research study (Appendix H). Ethical clearance [HSSREC/00001003/2020] was obtained from the ethics committee at UKZN before the research study was conducted by the researcher (Appendix C and D). HSSREC templates were also used to design all appendices accordingly.

Transparency of purpose means that the participants should be aware of the purpose and intent of the research study, with informed consent being obtained before they partake in the study (Crowther & Lauesen, 2017; Bhattacharjee, 2012). An informed consent letter (Appendix E)

was provided to participants once they were identified, as consent is voluntary and participants should be aware that they can withdraw at any time during the study (Bhattacharjee, 2012; Crowther & Lauesen, 2017). The aforementioned letter included the researcher and supervisor's contact details, as well as the research office contact details so that if the participants had any inquiries they could contact the necessary person.

Confidentiality was maintained in the research study, as the data collected from the research study was not used in a way that would be attributed or identified with a specific individual and anonymity was maintained at all times, (Crowther & Lauesen, 2017) within the researcher's capacity. The data collected was only used for the study and available to those involved in the proposed research study, such as the researcher, supervisor and statistician. The data will be stored for five years and will be disposed of in January 2025, through shredding.

CHAPTER 4. RESULTS AND DISCUSSION

“Imagination is the highest form of research”

Albert Einstein

4.1. Introduction

This chapter presents the data which has been collected and provides the reader with an analysis and integration of results. The results obtained focuses on describing the barriers and facilitators as reported by A/STAs to EHDI practice and implementation in KZN. The data gathered from A/STAs through telephonic interviews was transcribed and then analysed using thematic analysis, with the aid of NVivo qualitative analysis software. As stated in Chapter 2, the SWOT conceptual framework design was adopted together with the levels to obtain results from the participants. The key results obtained from the thematic analysis are displayed.

Analysis from the NVivo software revealed 168 codes, which were further broken down into 589 sub-codes. The data was then analysed and five main themes were identified by the researcher, that addressed the aim and objectives of the study. Essentially participants had to provide strengths, weaknesses, opportunities and threats related to EHDI implementation in KZN, at any of the following levels, which included: political, professional, institutional, practice, social and educational.

The results of each theme are followed by a discussion relating to that particular theme.

An overview of the strengths, weaknesses, opportunities and threats that have been identified from the codes and sub-codes, which eventually lead to the formation of the five main themes, is further detailed in Appendix I.

4.2. Main themes identified from the research study

Table 3

Main themes identified from the research study

	Theme title
1.	Improving EHDI guidelines
2.	Investing in resources and infrastructure for EHDI service provision
3.	Facilitating professional development, training and education and strengthening intersectoral collaboration for EHDI services
4.	Managing follow-up and evaluating protocols and procedures for screening
5.	Engaging, understanding and supporting caregivers or families

4.2.1. Improving EHDI guidelines

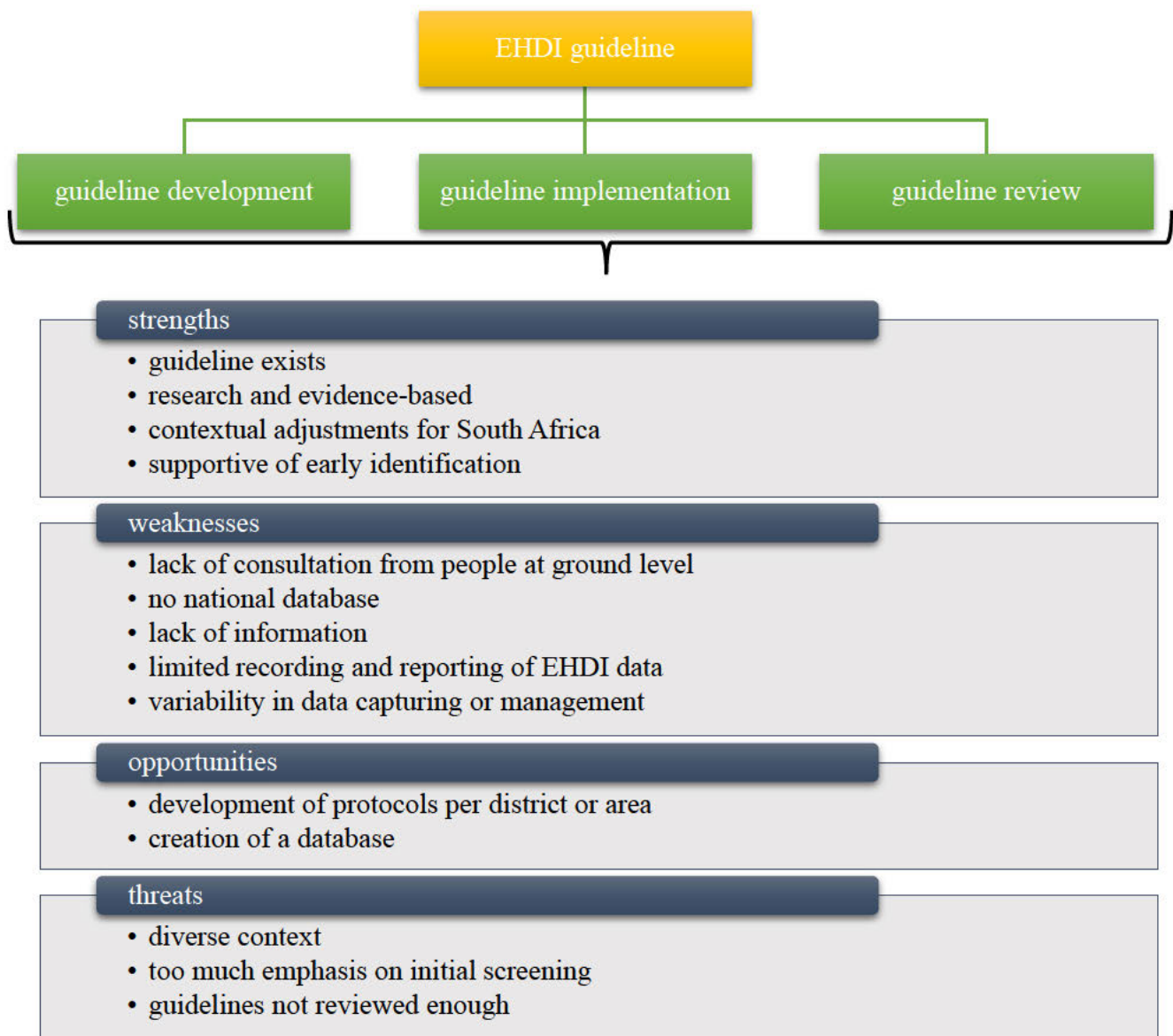
The first main theme identified from the research study is related to the HPCSA EHDI guideline. Analysis from the NVivo software enabled the researcher to review and form a mind map in relation to the first theme (Appendix J). The results were then generated and are discussed under the three subthemes which are, EHDI guideline development, EHDI guideline implementation and EHDI guideline review.

The barriers identified relate to limited context-specific information, as there seems to be a lack of inclusion from people at ground level in developing the guidelines. There also seems to be more emphasis and focus on initial screening as compared to the diagnosis and intervention aspect. Lastly, the lack of a national data management system impacts availability of information and data collected, to review guidelines. Some facilitators mentioned were, availability of the guideline and timeframe as the gold standard and the development of context-specific protocols based on each area or district to improve EHDI implementation.

The aforementioned information is further illustrated and in Figure 3.

Figure 3

Improving EHDI guidelines: strengths, weaknesses, opportunities and threats



4.2.1.1. EHDI guideline development. All of the participants reported that at a professional level it was beneficial that there is a guideline in place, which provides information about EHDI and can be used to guide practice. They reported that the timeframe of one-three-six, as stated in the HPCSA EHDI (2018) guideline is a good timeframe, because it was based on research and evidence. The inclusion of the two-four-eight timeframe for babies born in community-based settings was further reported as advantageous, as it was contextualized for the South African context. Participants stated that the earlier a hearing loss is identified the

better it is, and as healthcare professionals we should find means to work and achieve the goals set by the HPCSA EHDI (2018) guidelines.

Participant D “...that’s the ideal and in terms of the principles of EHDI and early intervention and capitalising on ...you know critical periods of language learning, that’s the ideal, that’s ultimately what you want to see...” (TE#1)

Participant K “...so if there's like no timeline, anyone can do whatever they want, whenever they want to...” (TE#2)

Some participants mentioned that the HPCSA EHDI guideline may be more suited towards private healthcare compared to public healthcare. Furthermore, stating the one-three-six timeframe may be easier to achieve in the private healthcare sector, compared to the public healthcare sector.

According to the participants, the people that usually develop guidelines or policies are not always the individuals working at ground level, which was reported by participants to be a major flaw in the health system.

4.2.1.2. EHDI guideline implementation. The participants recommended that at a professional level, the guidelines should be made more practical and contextualized, especially as South Africa presents with a multicultural and multilingual population. They indicated that the challenges faced by the private and public healthcare sector are different, with challenges faced in rural versus urban areas also varied therefore, contextualization’s should be made based on each context.

Participants indicated that EHDI should be used as the main guideline but an opportunity identified would be to develop a general protocol based on EHDI, for each area or district. Therefore, healthcare facilities within that area or district would have to follow that general protocol at an institutional or practice level. Furthermore, it was mentioned that as urban and rural areas have different barriers, the level of resources within districts may not be the same. Development of protocols based on what each area or district has, can facilitate feasible and effective implementation to ensure improved service delivery. Once a standard has been reached in that area or district, further review of the protocols can be conducted to standardize it across a larger area.

The majority of participants indicated that EHDI implementation is better in private compared to the public healthcare sector. They also stated that the barriers from a socio-economic level, such as lack of resources and long waiting lists in public healthcare facilities, were not experienced by the private healthcare sector.

Participants reported that there seems to be a lot of focus and emphasis on the initial screening, because it is the first stage of the EHDI program. However, A/STAs need to be aware that the diagnostic and intervention services are as important to meet the timeframe and ensure holistic and proper implementation of EHDI services.

Participant D *“...you can’t do screening without follow-up, so if you doing screening you have to go through with your intervention and management thereafter. I will refuse to screen if we can’t...that’s why we don’t do universal screening because we don’t have the manpower and the personnel to follow in terms of intervention, management, hearing aids fittings etc. You don’t screen and put them on a waiting list...you screen to diagnose and treat and manage them.”* (TE#3)

4.2.1.3. EHDI guideline review. The participants indicated that in their opinion the guidelines should have been revised or reviewed earlier and not after approximately ten years. They stated that if it was reviewed earlier, the problematic areas could have been improved on and solutions identified. Some participants believed that one of the reasons the guidelines may not have been reviewed earlier could have been because NHS implementation, in South Africa, is still very limited. Furthermore, participants indicated that there is a lack of EHDI statistical data for South Africa, as there is no national data management system.

Most of the participants reported that an online system or computer-based data capturing system would not be practical in certain rural areas, due to lack of resources. It was mentioned that some NHS programs which are being conducted, such as the Netcare screening program have their own data capturing methods, thus indicating various methods were being used over all the programs. Participants also stated it would be time-consuming to upload all the information onto an excel document as recommended by the guidelines.

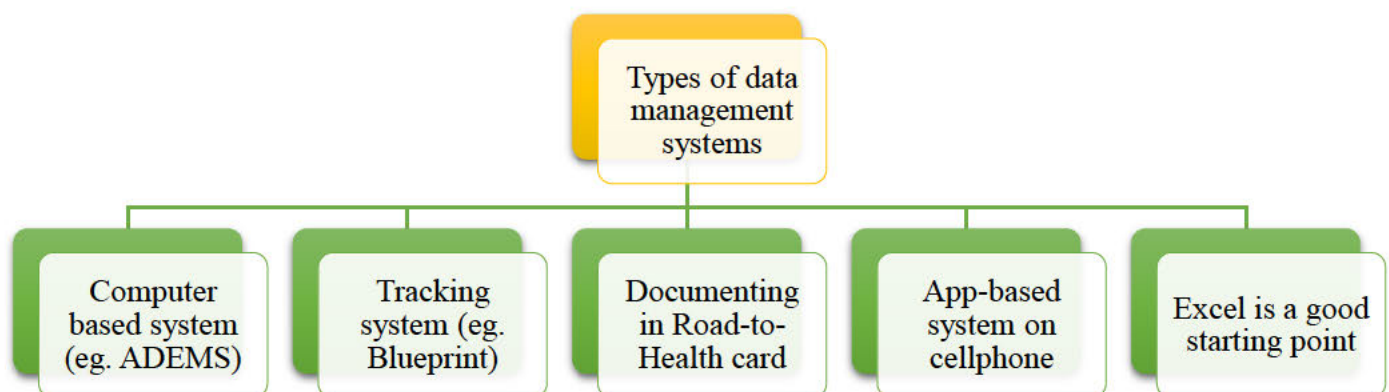
Participant C *“It is a good way in terms of you know going paperless...and ...sort of you know...(getting) all the information on one database and things like that. I think in terms of the practicality of it...it's a bit iffy...you could say...”* (TE#4)

One participant stated that an idea would be to develop a proper data management system like a tracking system e.g. Blueprint. Therefore, facilitating data sharing with healthcare professionals and enabling them to access the baby's information if they went to any hospital and for follow-up purposes. Another suggestion was the creation of a program, like the program developed for capturing assistive devices (ADEMS) prescribed to patients, which would be an ideal method to track babies. Some participants also mentioned the use of the Road-to-Health card, where a page or space is dedicated for recording the hearing screening results. Therefore, if the baby is seen at another facility, the healthcare professional present there would be able to see what has been done. This method was indicated to be more feasible, as it would work in all healthcare settings because all parents are provided with the Road-to-Health card upon their baby's birth.

Further information regarding types of data management systems is illustrated in Figure 4 below.

Figure 4

Types of data management systems for NHS reported by participants



UNHS, was initially viewed as unrealistic and impractical, but is currently a standard of care in the United States, with every state within the United States, comprising of established EHDI programmes (White & Blaiser, 2011). The South African governmental policy guidelines are in favour of NHS however, implementation of the guidelines is still not being achieved (HPCSA, 2018). Evaluation and interrogation of the feasibility of hearing screening programs, by A/STAs is critical in determining the practicality of the HPCSA EHDI guidelines and associated UNHS benchmarks, within the South African context (Petrocchi-Bartal & Khoza-Shangase, 2014). EHDI programs are recommended for early identification, diagnosis,

intervention and management for infants and newborns with hearing loss (HPCSA, 2018). It is aimed at ensuring cost-effective, optimum solutions to enable individuals to effectively communicate (HPCSA, 2018). At a professional level, all of the participants thought that the EHDI guideline was a good guideline to have in place, thereby aiding healthcare professionals with a reference document regarding the importance of EHDI. However, we should ask ourselves how contextualized is it for South Africa? A top-down approach seems to be used for developing the EHDI guidelines and even though there is some involvement by stakeholders at ground level, it is limited.

Numerous studies have identified the impracticalities of implementing first-world models for hearing screening, in low-and-middle income countries (Swanepoel et al., 2004; Swanepoel et al., 2005). An opportunity identified from the participants was that the task-team involved in developing the guidelines should include more A/STAs from ground level, who are employed in healthcare facilities, within the various provinces. This will facilitate the development of more contextually relevant guidelines and would enable one to understand the barriers experienced to determine cost-effective solutions. Therefore, proper strategies can be identified to improve implementation, as according to research early identification of hearing loss has not been achieved in South Africa (Swanepoel, 2006; Swanepoel et al., 2004).

According to the JCIH, the international gold standard for EHDI is the one-three-six principle (JCIH, 2007). The goal of screening all infants before one month has been significantly achieved in the United States, with the only challenge being the births occurring outside of hospitals (White & Blaiser, 2011), the latter being a similar challenge faced in South Africa as the majority of births occur outside hospital-based settings (HPCSA, 2018). Results from the current study indicated that the majority of participants believed the timeframe was better suited to the private healthcare sector compared to the public healthcare sector. Further contextualization's were made for South Africa, as a large number of babies are not screened at hospitals, to initial screening at no later than six-weeks, diagnosed no later than four-months and intervention no later than eight-months (HPCSA, 2018). According to participants this contextualization was reported to be beneficial to include in the guideline. Nonetheless, research indicates that infants with a hearing loss receiving intervention within six-months of birth can develop linguistic, speech and cognitive skills similar to normal hearing individuals, compared to those identified late, which is in contrast to the eight-month intervention as suggested by the guidelines (Kennedy et al., 2005; Moeller 2000; Yoshinaga-Itano 2004;

HPCSA, 2018). Although the EHDI guidelines have been contextualized with the addition of the new timeframes, we need to ask ourselves is it feasible and practical to translate into practice, given the diverse population in South Africa?

Annually approximately 740 000 children in low-and-middle-income countries have sensorineural hearing loss within the first month of life, compared to 28 000 in high-income-countries (Olusanya, 2015). The guidelines were somewhat contextualized for South Africa, however, participants felt that it should have been more contextually relevant. According to the guidelines, academic hospitals are ideal contexts for pilot programs to facilitate the establishment of centres of excellence, which can be used as a national resource, for protocol development and research (HPCSA, 2018). In the United States, national goals for EHDI programmes have been developed which include: hospitals having written protocols ensuring every birth is screened; states developing audiological diagnostic guidelines along with a list of qualified healthcare providers ensuring infants who referred on their screening receive diagnostic audiological assessments before 3 months and; states developing resources for parents of children with hearing impairments to ensure they receive appropriate intervention services (CDC, 2010). One recommendation identified by the participants from the current study, was that specific protocols for EHDI should have been outlined in the guidelines for each area or district or province based on the resources and challenges identified. According to the HPCSA EHDI guidelines hearing screening protocols should be adapted and reviewed from evidence-based findings (HPCSA, 2018). NHS and the HPCSA EHDI (2007) position statement, should be more adaptable to district-level hearing screening practices, to enable them to be applicable and fit the screening process (Khoza-Shangase et al., 2017).

Additionally, there needs to be more exploration of current diagnostic practices by audiologists relating to paediatric hearing loss (Moodley & Störbeck, 2015). Some participants recommended that all healthcare facilities should develop specific referral protocols when sending patients for diagnostic evaluations, to facilitate EHDI implementation and practice, which is similar to the aforementioned national goals for EHDI programmes as developed in the United States. Audiologists conducting screening in hospitals must also have access to diagnostic equipment to evaluate these babies (Teixeira & Joubert, 2014), which will ensure that EHDI services are carried through. Developments and reports for infant hearing loss have shown little available information in terms of intervention, amplification or even cochlear implant programs (Swanepoel et al., 2009). Accurate diagnosis is essential for appropriate intervention and amplification however, there seems to be a lot of focus on screening (Moodley

& Störbeck, 2015), which could be because it is the first stage, but for EHDI programs to be successful all aspects, i.e. identification, diagnosis, intervention, should be focussed on.

Continuously evaluating hearing screening position statements or guidelines facilitates, evidence-based practice and ensures program implementation (Khoza-Shangase et al., 2017). The NHS programme, in England started across the country through an organised nationally phased process during 2002 to 2006, and full implementation was attained in March 2006 (Wood et al., 2015). In contrast, in South Africa, the EHDI guidelines were first released in 2007, thereafter a revised guideline was released in 2018, leaving an approximate ten-year gap between the two (HPCSA, 2007; HPCSA, 2018), but full implementation has not been achieved to date. UNHS is practically non-existent because of the lack of routine or systematic programs in low-and-middle income countries (HPCSA, 2018). All of the participants stated that the guideline should have been reviewed earlier. However, with the initial release of the 2007 EHDI position statement, limited studies on NHS were conducted, but in recent years the pick-up of NHS has increased considerably (Moodley & Störbeck, 2015).

A key element related to EHDI program success, is the development of a database that will enable one to track infants and newborns enrolled in the program (HPCSA, 2018). In the United States, results from a study revealed that 91.4% of healthcare facilities were compliant in reporting paediatric hearing data to state EHDI programmes (Chung et al., 2017). Sixty-seven percent of healthcare facilities are required to report NHS EHDI data to the State Department of Health, indicating that these states treat EHDI like a public health programme (White, 2014). Whereas, currently in South Africa specifically KZN, there is no standardized national data management system in place, which is a huge weakness impacting how the program is evaluated, monitored and reviewed. The absence of a proper database or data management system, is a threat affecting monitoring of NHS in South Africa. A proper database will assist in obtaining accurate prevalence rates of infant and newborn hearing loss in South Africa and can provide information regarding the age of hearing screening and diagnosis (HPCSA, 2018).

According to the guidelines it has been recommended that for data collection the provincial co-ordinators develop and circulate an Excel template, which should be supervised or compiled by the area manager and thereafter sent to a provincial co-ordinator monthly (HPCSA, 2018). Unfortunately, the completion of an Excel document was reported to be infeasible, especially with the high workload and time constraints faced by audiologists, especially in public healthcare facilities. Data management systems have been reported to be varied in the public

and private healthcare sectors, as some use computer-based systems while others use paper-based systems to capture data (Moodley & Störbeck, 2017). The commonest difficulty with implementing an online or electronic system is the limited staff for data entry and lack of time (Moodley & Störbeck, 2017). Research studies conducted indicate that the majority of hearing screening results are recorded on the clinic records instead of the Road-to-Health cards, indicating a lack of consistency within clinics (Petrocchi-Bartal, 2011; Joubert & Casoojee, 2013). Some participants were in favour of computer-based or electronic systems for data management. However, other participants indicated that many healthcare facilities, especially in the rural areas, would have issues with internet connectivity and lack of access to computers. Therefore, online or electronic forms of data management may not be feasible or practical which further correlated with Moodley & Störbeck's (2017) study. Frequent electricity cuts and limited budget were some of the other barriers faced by public and private healthcare facilities (Moodley & Störbeck, 2017).

Other opportunities to improve data management as reported by participants included, using Road-to-Health card or the use of a system like ADEMS, allowing all audiologists access and facilitating data sharing. To ensure cohesive EHDI services in South Africa, there is a need for increased information sharing regarding tests and procedures across the various levels of healthcare (Mostert-Phipps et al., 2012; Moodley & Störbeck, 2017). The recognition of the significance of accurate data collection and recording from different stakeholders is important, for future successful EHDI programs in South Africa (Joubert & Casoojee, 2013).

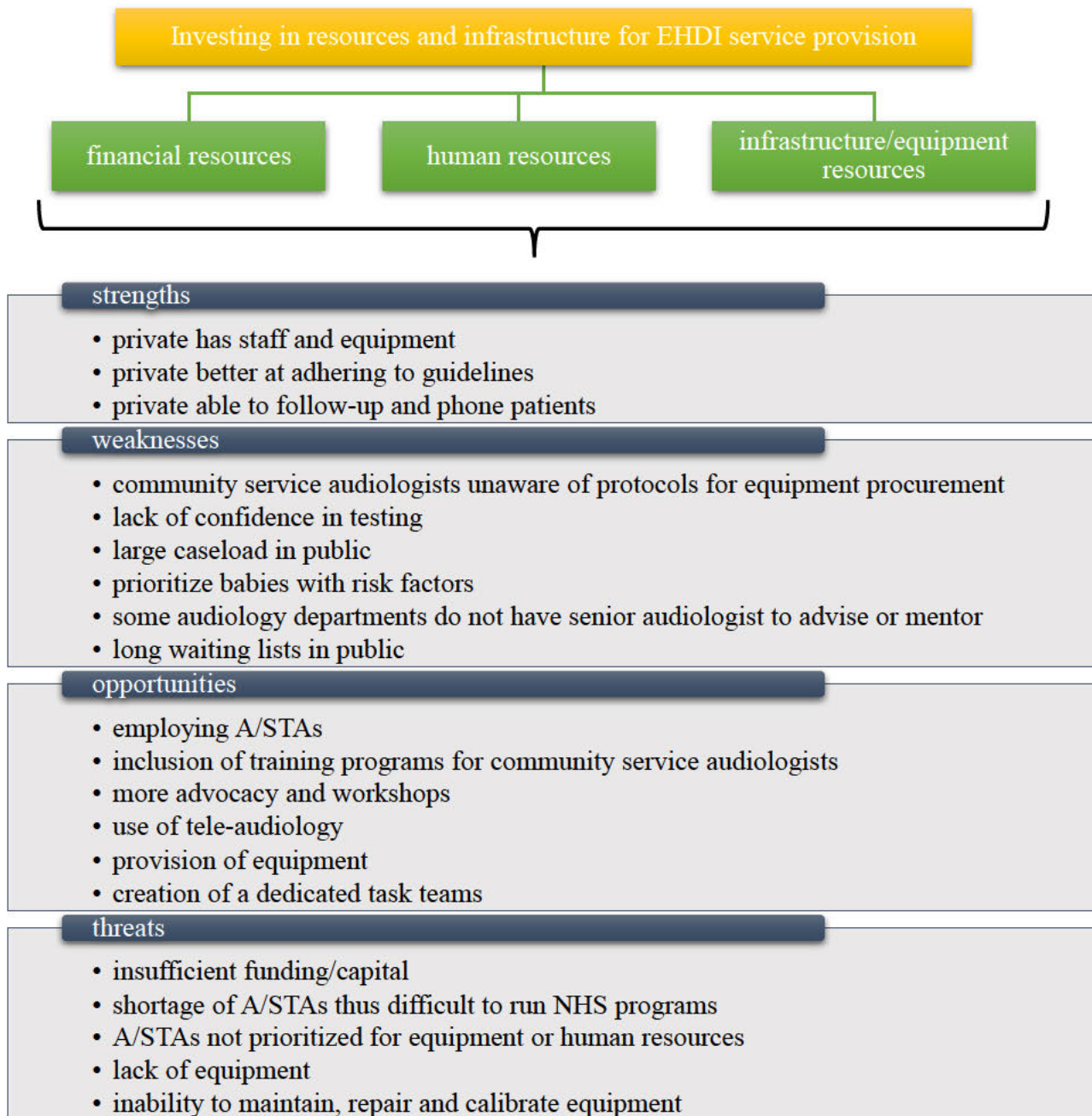
4.2.2. Investing in resources and infrastructure for EHDI

The second main theme identified from the research study, is related to resources available for EHDI service provision. Analysis from the NVivo software allowed the researcher to review and form a mind map in relation to the second theme (Appendix K). The results were then generated and are discussed under the three subthemes which are, budgetary/financial resources, human resources and infrastructure/equipment resources. The barriers identified relate to a lack of resources, i.e. audiologists, equipment and budget for EHDI services. Some of the facilitators mentioned was the employment of audiologists, provision of equipment and the development of a task team specifically for NHS services.

The abovementioned information has been further illustrated in Figure 5.

Figure 5

Investing in resources and infrastructure for EHDI service provision: strengths, weaknesses, opportunities and threats



4.2.2.1. Funding from government and hospital budget allocation. One of the main threats identified by the participants was the lack of funding or initial capital, to get appropriate resources needed for conducting audiology services. The limited budget provided to public healthcare facilities and shortage of audiologists, is a political level issue as it is dependent on the government, specifically the Department of Health (DoH). Participants indicated that audiology services are highly dependent on equipment and therefore service delivery becomes compromised if proper funds are not allocated for procuring equipment. At an institutional level, participants stated when A/STAs tried to motivate for equipment in public healthcare facilities, they were always told that there is no budget or funds.

Participant G *“There’s no budget and limited budget and in our hospital we always told that the hospital has overspent the previous budget.”* (TE#5)

4.2.2.2. Shortage of audiologists. All of the participants reported that the lack of audiologists employed in healthcare facilities, is a huge threat affecting NHS implementation and practice. In the participants' opinion at an institutional level, most public healthcare facilities have limited audiologists employed for the normal running of the department and it is even more difficult to conduct another program, like UNHS or NHS. It was also mentioned that there seems to be a large number of qualified audiologists that are currently unemployed, because hospitals are not employing them. An opportunity to improve EHDI service implementation, in the participant’s opinion is the employment of more audiologists. They reported that the government should be creating more posts for audiologists and employing them in healthcare facilities, which will have a positive effect on EHDI implementation and practice.

Participant C *“I just think having a permanent audiologist because that will then promote...that will then advocate for audiology you know...”* (TE#6)

Participant B *“...employing people to do the work...like it’s the simplest thing, like there is enough people to do the work in the different facilities and the rural facilities...”* (TE#7)

At a practice level, participants reported with shortage of audiologists in healthcare facilities, it was difficult to conduct UNHS, therefore they would only conduct targeted or high-risk screening programs at their healthcare facility. A weakness identified was that babies with risk factors are prioritized, opposed to ones without. It was believed by participants that the private

healthcare sector may be better adhering to the EHDI guidelines and following the UNHS program, compared to the public healthcare sector.

Participants also indicated that a large number of the individuals access public healthcare services compared to private, which impacts how much time is spent on patients and amount of information is provided by A/STAs, as well as other healthcare professionals, such as doctors or nurses. This may negatively impact parents or caregivers level of understanding and importance of hearing screening. The participants also reported that the private sector has a smaller workload compared to the public, because more babies are born in public. Therefore, in private practice A/STAs can follow-up and phone patients when they do not come, compared to the public sector which often does not have enough manpower to phone and follow-up with patients.

Further results indicated that in healthcare facilities there seems to be a lack of confidence with audiologists, in providing diagnostic services to babies. It was reported that many community service audiologists are unemployed after completing community service and require more training if they are employed in a hospital after a few years. Undertaking a NHS program for community service audiologists, especially being the only audiologist in the hospital is a huge responsibility, as indicated by participants. Another barrier identified at a practice level, was regarding the continuation of services which would be inconsistent, if one year there is a community service audiologist and the next year there is not. Therefore, participants indicated the necessity of having at least a permanent audiologist to make sure that the program is being run properly and ensuring babies are being screened, diagnosed and provided with appropriate intervention. Results indicated that A/STAs with more experience are more comfortable in providing EHDI services, testing and providing feedback to patients. The lack of experience was also reported to be dependent on the equipment available and how much exposure the audiologist has towards paediatric testing and providing intervention services. One participant believed that people may rely too much on the hearing aids for intervention and forget about other aspects, such as aural rehabilitation.

Participant F *“That’s a large factor in why we are failing, even when we have the equipment, we can still be failing because we’re not good at diagnosing children at a young age.”* (TE#8)

Some facilitators identified included, the inclusion of more training programs, workshops, courses, incorporation of tele-audiology and more practical exposure in undergraduate studies

to provide A/STAs with more exposure and knowledge when assessing babies or young children.

One participant indicated an opportunity may be to create a dedicated task team of audiologists in each province who would be in charge of the hearing screening, allowing the services to be maintained. The team would be standalone and would have a team of individuals who are unbiased towards a certain mode of communication. The tracking system for data management would work in co-ordination and the team would be responsible for maintaining the program. Then, those identified should get a notification with a list of healthcare facilities within their area to go to for the diagnostic assessment, which would speed up the referral process.

Participant I *“If they had to make a dedicated task team of audiologists in every province that goes out and only does hearing screening and it's paid properly then it would be maintained. Those patients should then get notification and then say for example, you get an email and say please select from this list which would be the best for you in terms of geographical location, this is how much it's going to cost and then you tick it and then they create an appointment.”* (TE#9)

4.2.2.3. Lack of equipment. A threat described by the participants was that many public healthcare facilities do not have the appropriate equipment, i.e. screening and diagnostic equipment to provide the necessary services. In certain instances, healthcare facilities may have the staff but not all the required equipment to conduct the services. All of the participants reported that if they could be provided with equipment, even basic screening equipment i.e. OAE screener, they would then be able to carry out the services.

Participant H *“...initial capital to buy the equipment, like the rural hospitals or all the provincial hospitals and...and maintain it, maintaining it would be of utmost...and to get reliable equipment, not just the cheapest one on the tender.”* (TE#10)

One participant mentioned if you are the only community service audiologist in a specific healthcare facility, it is challenging to identify the procedures to motivate and procure equipment. Thereafter, the continuation is lacking if there is no audiologist the next year, at that specific healthcare facility. Results from the study indicated that A/STAs can motivate a lot in the hospitals however, it depends heavily on whether the medical or finance manager sees the importance of getting audiology equipment, compared to medical equipment for doctors.

Participant G “...problem with us is that we don't in the rehab department, we don't have a supervisor or we don't have a manager. So when they... whenever they sit to approve stuff ... (they sit) ...alone without any rehab person to represent us.” (TE#11)

Participant D “It's whether your finance manager will see it important...compared to getting ventilators at the hospital, getting equipment for cardiology...it just depends where you fall in that rank...” (TE#12)

In KZN, a challenge reported was that many A/STAs are not able to utilize equipment at their disposal to try and facilitate some sort of hearing screening or awareness. A recommendation stated by one participant is that A/STAs need to work with the resources at their institute to promote, advocate and increase awareness about EHDI services.

Participant A “...and I think that's our biggest challenge that we don't think of that...other ways to solve our problems you know. We already know that we are an under-resourced province, we don't always meet target with everything, especially with this.” (TE#13)

Not all healthcare facilities, both public and private are equipped to test paediatrics. Many hospitals may not have diagnostic equipment to test babies or children, therefore they end up being referred from facility to facility and placed on lengthy waiting lists. All of the participants reported that the waiting list or appointment date given in public healthcare facilities is long, resulting in parents or caregivers not bringing the child for the test, as they may have forgotten. In the government sector, a huge barrier mentioned by the participants is the date for the ABR or auditory steady-state response test (ASSR) creating a gap, which delays the diagnosis, in turn delaying intervention. Participants stated that even when the child is diagnosed with a hearing loss, they still have to wait for a couple of months to get a hearing aid from a public healthcare facility, which impacts meeting the gold standard of one-three-six months.

Barriers to EHDI in the public sector as described by the participants at a political level relate to lack of finance and funding in government and healthcare facilities, affecting the employment of staff and provision of equipment, which is consistent with other studies conducted (Theunissen & Swanepoel, 2008; Petrocchi-Bartal & Khoza-Shangase, 2014; Khoza-Shangase et al., 2017). Forty percent of healthcare expenditure is from the National Treasury, with public healthcare only utilizing 11% of the total government budget (Cylus et al., 2015; Jobson, 2015). The Provincial Directorate of Finance along with research councils, even international organisations like the WHO, World Bank or UNICEF/United Nations

Children's Fund, has the responsibility to ensure sufficient allocation of funds towards programmes or projects such as EHDI (HPCSA, 2018). The lack of funding and budget constraints is a huge threat that impacts timely access to NHS and meeting of the gold standard. In public healthcare facilities the budget is highly dependent on whether the need and importance for audiology services are understood by the medical or finance managers, which is similar in government. Individuals with hearing loss, in developed countries have income levels which are 40-45% less compared to those normal-hearing persons (Olusanya et al., 2006). This is more evident in low-and-middle income countries like South Africa, resulting in people with hearing-impairments being the lowliest of the poor (Olusanya et al., 2006). Individuals presenting with a hearing loss who do not receive suitable intervention, can lead to them becoming isolated, stigmatised and even affect their ability to perform or keep a job (Moeller 2000; Yoshinaga-Itano, 2004). Thus, necessitating the need and importance for EHDI programs, as evidence indicates the benefits of NHS programs (HPCSA, 2018).

“South Africa is the only country in sub-Saharan Africa which offers a professional tertiary qualification for audiology” (Swanepoel et al., 2009, p. 2). Audiologists are crucial for each aspect of the EHDI process (HPCSA, 2007), and as experts in infant hearing loss they should be the program manager supervising the EDHI program (HPCSA, 2018). There is a shortage of qualified audiologists in South Africa, compared to the population size, with the most obvious mismatch occurring in the public sector (Petrocchi-Bartal & Khoza-Shangase, 2016), which poses as a threat to NHS (Kanji, 2018). The number of audiologists, including community service audiologists working in healthcare facilities directly impacts whether a NHS program can be run and how effective it will be.

At a practice level, a weakness identified from the study is that many audiologists, specifically community service audiologists, are working in facilities with no paediatric equipment and those who have not been working for some time, lack experience and confidence in conducting diagnostic assessments on infants. Challenges affecting provision of best services to children with hearing impairments and their family, include lack of well-trained speech-language therapists and audiologists (Alanazi & Nicholson, 2019). Further emphasized by Zaitoun et al.'s (2019) study, that indicated audiologists who had more training with ABR, were able to identify more cases of hearing loss and were more accurate in threshold estimation compared to those that had no training. Training in ABR analysis could improve audiologists' performance and can also help new graduates and less experienced audiologists to gain practice in analysing ABR cases before seeing real patients (Zaitoun et al., 2019).

There seems to be limited undergraduate practical exposure to paediatric testing, which may cause newly graduated community service audiologists to be apprehensive and hesitant when working with infants and young children. Additionally, many hospitals in KZN only have community service audiologists, with no permanent audiologist, leading to challenges in continuation of services and a lack of knowledge as they are just starting out. Results from the study indicated that community service audiologists are often overwhelmed and or/ have a poor understanding of what procedures to follow, which takes a toll on the service delivery, as each year a new graduate comes and they may do things differently. Improvements can be made by increasing the number of properly trained audiologists through intensive training in paediatric audiology (Russ et al., 2010).

The lack of staff in the public sector affects the type of screening audiologists would conduct, as participants mentioned that they would only conduct targeted or high-risk NHS programs. Limiting hearing screening to at-risk babies is not recommended (JCIH, 2007), although it may be a practical and feasible approach in resource-constrained contexts (Das et al., 2020). It should be noted that by conducting high-risk screening 50% of cases of individuals who may present with hearing loss could be missed (Rai & Thakur, 2013), while UNHS allows for early detection of most of the newborn deafness cases early, facilitating timely intervention (Das et al., 2020). Children identified within one year of birth through targeted NHS programs have a higher occurrence of secondary disabilities, approximately 66%, compared to approximately 30% for those identified through UNHS programs in the well-baby nursery (HPCSA, 2018). Although, one should be cognisant that all programs have to start somewhere, thus recognise that targeted or high-risk screening is a good foundation or starting point, compared to doing nothing at all, especially as the public sector is under-resourced (Kanji, 2018).

Results from the study indicate that participants were under the belief that screening programs in the private sector focussed on UNHS, rather than at-risk screening like the public sector. Furthermore, participants were of the opinion that screening in private sector adhered to EHDI guidelines better compared to public, as the barriers such as lack of staffing and equipment are not faced in private. Two studies conducted, one in 2008 and another in 2011, revealed 27% of public healthcare facilities compared 14% of private healthcare obstetric units, conducted some form of NHS (Theunissen & Swanepoel, 2008; Meyer & Swanepoel, 2011), which is in stark contrast to participants beliefs. Nevertheless, NHS in the private sector is highly dependent on initiatives by private practices (Scheepers et al., 2014), consequently resulting in the services being unsystematic, unstructured and not available in all hospitals (Swanepoel et al., 2009).

This is evident as illustrated by the Netcare screening program that was recently launched at all Netcare based private hospitals, which is a good initiative, but unfortunately only advantages a limited sector of individuals who can access those services. NHS challenges in the private sector differ from public and mainly relate to the service not being integrated into birthing packages, poor follow-up or lost-to-refer rates correlating with other studies (Meyer & Swanepoel, 2012; Meyer & Swanepoel, 2011; Meyer et al., 2012; Khoza-Shangase et al., 2017) and cost of the services as it is not covered by medical aids.

The current South African healthcare comprises of a large public healthcare sector that is state-funded (Kanji, 2018). Eighty-four percent of South African's are serviced by the public healthcare sector, while 16% are serviced by the private healthcare sector (Pillay et al., 2020; Swanepoel et al., 2009). Therefore, the public sector is often under-resourced and under-staffed with the given population to effectively provide services. Individuals who can afford to go to private healthcare facilities receive state-of-the-art services, while the majority of individuals rely on public healthcare, receiving less-resourced services, even though it may be free or at a minimal cost (Swanepoel et al., 2009). Results from the study indicated that at a practice level, participants felt due to the large workload, a barrier was the time spent on each patient which may be limited. This is also true of doctors and nurses who have large workloads in public, with a weakness being the amount of information provided by them to parents or caregivers about the importance of NHS. The workload and number of patients seen in public compared to private differ, as the public sector is where most South Africans access clinical services (Petrocchi-Bartal & Khoza-Shangase, 2014). The public healthcare system is accessed by the majority of the population, but serviced by only 30% of healthcare professionals (Naidoo, 2012; DoH, 2011; van Rensburg, 2014). No studies however, have been conducted on NHS in the private sector or public sector in KZN to date.

This is further exacerbated because many public healthcare facilities do not have the appropriate equipment to run a NHS program (Petrocchi-Bartal & Khoza-Shangase, 2014), even if they have the proper staffing which in many cases is limited. Efforts to attain sustainable improvements in healthcare with limited resources indicate the need for improvement of healthcare management and shifts in attitude to better services with fewer resources (Mayosi & Benatar, 2014). The public sector is restricted compared to private, in terms of access to specific equipment and face other threats such as the timely repairing of equipment (Teixeira & Joubert, 2014). Another weakness is the lack of understanding of equipment procurement

procedures by community service audiologists and continuation for follow-ups in the next year, if no one is employed, creating gaps in service delivery. All this impacts the audiologist's ability to conduct evidence-based audiological assessments (Teixeira & Joubert, 2014).

At an institutional level, many healthcare facilities in the public sector are under-resourced and do not have the necessary diagnostic equipment to facilitate diagnostic services. Owing to this many patients are referred to other healthcare facilities for further assessments, leading to long waiting lists. Thereby, creating a delay in providing diagnostic services, prolonging meeting of the gold standard, even if the initial screening was conducted within the appropriate timeframe. Research studies indicate that the median age of diagnosis in the public and private sector is 3,71 years and 2.24 years respectively, but this still does not meet the HPCSA EHDI (2018) guidelines (Butler et al., 2013; Butler et al., 2015). Audiologists who lack equipment or experience must refer infants to audiology centres, to ensure timely and comprehensive assessments are conducted (JCIH, 2019). Diagnostic assessments should be booked at the nearest healthcare facility, that has the necessary equipment for conducting appropriate evaluations, including auditory evoked potential equipment and diagnostic OAEs (HPCSA, 2018). The absence of awareness of existing resources may result in rendering inappropriate services or underutilisation of equipment (Teixeira & Joubert, 2014). Emphasis is greatly placed on NHS in the HPCSA guidelines however, one should be aware that the absence of diagnostic assessment implementation and intervention EHDI programmes cannot be successful (HPCSA, 2018).

Budget constraints as mentioned previously, also impact the availability of hearing aids in healthcare facilities, specifically the public sector. According to the EHDI guidelines, a sensory device or personal amplification is recommended for infants and children that have been identified with a targeted hearing loss (HPCSA, 2018). Amplification is seldom provided before 12 months to infants and children, which is far from the set standards recommended by the JCIH and HPCSA EHDI guidelines (Khoza-Shangase et al., 2010; JCIH, 2007; HPCSA, 2018). Once again in the public sector patients may have to be put on lengthy waiting lists before they can get hearing aids further delaying the process. Thereafter, if the child has been fitted with hearing aids they may not be provided with appropriate and intensive aural rehabilitation as compared to the private sector due to the large workload in public. A large number of patients may not receive intensive intervention, negatively impacting cognitive and communication development (Khoza-Shangase et al., 2010).

Professional expertise and centres of excellence need to be accessed to monitor the progress of intervention services, for infants and young children with hearing loss from the age of diagnosis (HPCSA, 2018), which was recommended by one participant in the current study. The lack of adequate resources, such as skilled paediatric audiologists and equipment, as well as evidence-based protocols will continue to be a challenge for the sustainable implementation of EHDI programs in South Africa (Teixeira & Joubert, 2014). One participant indicated that the inclusion of tele-audiology may have a positive impact on practice, as audiologists would be able to assist and guide each other, especially those less confident when working with paediatrics, to facilitate improved implementation. Utilizing communication and information technology in healthcare, such as telehealth should improve access to healthcare, quality of service, efficiency and effectiveness of services (Swanepoel & Hall, 2010). Employing various models of telehealth in audiology may increase access to services in under-served communities globally (Swanepoel & Hall, 2010).

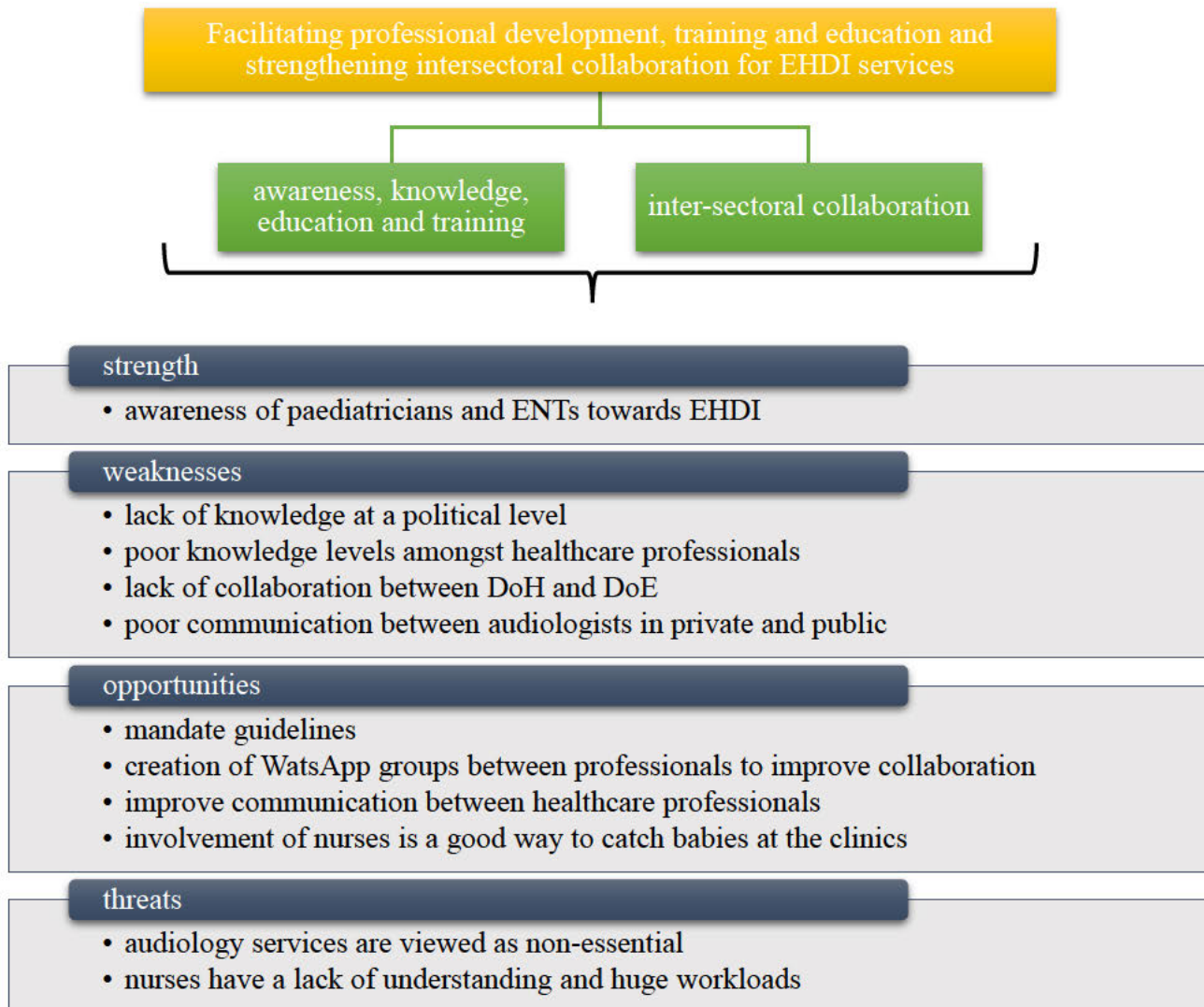
4.2.3. Facilitating professional development, training and education and strengthening intersectoral collaboration for EHDI services

The third main theme identified from the research study is related to the awareness, knowledge and collaboration within government and healthcare professionals in the multidisciplinary team (MDT) for EHDI service provision. Analysis from the NVivo software allowed the researcher to review and form a mind map in relation to the third theme (Appendix L). The results were generated and are discussed under two subthemes which are knowledge, awareness and education and inter-sectoral collaboration within governmental departments and the MDT. The barriers identified relate to poor levels of knowledge and awareness of EHDI and audiology services and limited inter-sectoral collaboration by healthcare professionals and at a governmental level. Some of the facilitators mentioned include mandating the HPCSA EHDI guideline and inclusion of outreach programs and workshops to increase awareness.

The abovementioned information has been further illustrated in Figure 6.

Figure 6

Facilitating professional development, training and education and strengthening intersectoral collaboration for EHDI services: strength, weaknesses, opportunities and threats



4.2.3.1. Awareness and knowledge about audiology services displayed by government and healthcare professionals. The poor levels of knowledge and awareness at a governmental or political level regarding audiology and EHDI services was identified as a weakness. The majority of participants believed that individuals working in government were not aware of audiology and the need for audiology services. They further emphasized that audiology services are not viewed as a priority, but rather as non-essential by the DoH.

Participant C “...but if you look at the quality of life, if you do develop a hearing loss or even if you're born with a hearing loss, I mean your quality of life, is severely affected.” (TE#14)

All of the participants stated that there is a lack of awareness and knowledge about EHDI services amongst healthcare professionals. Paediatricians and ENTs were reported to have an understanding of NHS, but not the timeframes itself. An opportunity identified by some of the participants was mandating of the HPCSA EHDI guidelines. Therefore, making it compulsory for all babies to have their hearing screened, which may lead to an increase in awareness and implementation of EHDI services.

Participant E “Unfortunately, that’s something that’s human nature. It something that needs to be mandatory before it’s implemented to the full extent.” (TE#15)

Another opportunity indicated was the inclusion of nurses, which was reported to be a good way to catch the babies being missed at hospitals and who go to clinics for baby’s follow-up. Participants stated that some nurses do show interest in what the A/STA is doing thus, the key would be identifying those that are interested and passionate to do the hearing screening. A few participants mentioned that key nurses (one or two) should be identified who would be held accountable for running the program and following up with the audiologist. An A/STA would also need to also be available nearby or in a neighboring hospital, to be able to provide assistance and monitor the program.

Participant B “...but if you have one person who is there... who is running the program and just having people coming in, the ones that come in and out, just coming to assist. Then that way would be more viable and more...you'd have a bit more of a success rate because you can carry it forward. It would be sustainable...” (TE#16)

Participant F “...not all nurses in the clinic necessarily need to be trained on it. I think one nurse you know, the way you get forensic nurses and occupational health nurses, they should do one...one training for one nurse and the hearing screening should be her responsibility or his responsibility. Just one nurse per clinic or two nurses per clinic, but I don't think it should become every nurse’s responsibility because that's when we lose our...accountability.” (TE#17)

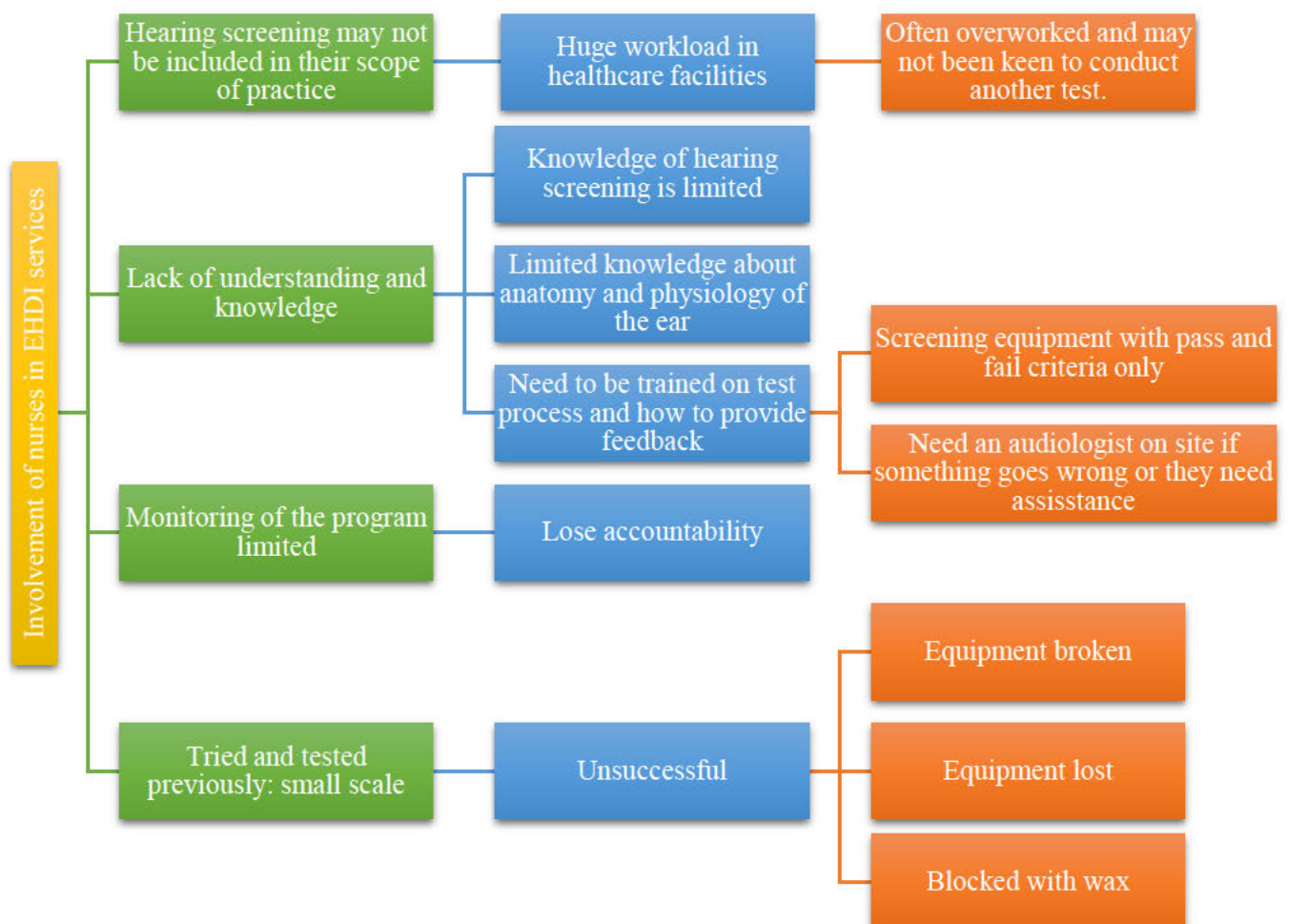
Nevertheless, results showed contrasting views from participants regarding the involvement of nurses in EHDI service provision. Participants believed that nurses were not aware of hearing

screening services and its importance, so as nurses are key members, their lack of awareness hinders knowledge provided to parents or caregivers. Some of the participants were not in favour of including nurses in hearing screening and they further stated that the funding or budget for training and compensation purposes should be provided to audiologists for staffing or equipment. One participant reported the involvement of nurses was attempted previously, but it was unsuccessful.

Other key challenges as described by the participants included: 1) lack of understanding of the anatomy and physiology of the ear; 2) large workload; 3) willingness to perform another test which may not be part of their scope of practice; 4) lack of accountability; and 5) difficulty monitoring and evaluating the program. This is further illustrated in Figure 7.

Figure 7

Challenges reported by participants regarding the inclusion of nurses in hearing screening



4.2.3.2. Inter-sectoral collaboration between the Department of Health and Education and the MDT for EHDI. There seems to be little to no collaboration between the DoH and the Department of Education (DoE), rather a disconnect as indicated by participants, which is a barrier to EHDI implementation. Participants also reported that in their opinion audiologists from both sectors do not collaborate as effectively as they should to ensure that holistic services are being provided to the child.

Participant D “... *in fact there was a memorandum of understanding that was done a few years ago between DOE and DOH in terms of how we should work together...(but) that never really took off the ground.*” (TE#18)

According to the participant's improved collaboration between the MDT will improve EHDI service delivery. This will create increased awareness between professionals about services offered and knowledge which can be passed down to parents. One participant recommended that WhatsApp groups could be created between professionals working in DoE and DoH, to facilitate open communication and build relationships between professionals and colleagues. Participants also recommended that there needs to be improved communication and collaboration between the public and private sectors, which will assist in improving EHDI services to effectively improve abiding and meeting of the guideline.

Participant F “...*because what can happen is they can share policies, they can share information, expertise, and we can uplift the public side of our healthcare system. If we have a little bit more collaboration between...between both sides. I think that's one thing I'd really like to see, which will facilitate screening services.*” (TE#19)

As early as 1965, the health, welfare and education departments in the USA, recommended universal assessment of hearing loss at a national level, compared to South Africa which is a relatively new practice (Moodley & Störbeck, 2015). Early identification of hearing loss in South Africa is still not being achieved, apart from isolated programs in the public and private healthcare sector (Swanepoel, 2006; Swanepoel et al., 2004). In low-and-middle income countries, like South Africa, one of the challenges is the burden of HIV/AIDS on healthcare (HPCSA, 2018). Despite this, priority should be invested in children with hearing loss to ensure they have equal opportunities as hearing individuals (HPCSA, 2018). All the participants stated that there is a lack of awareness at the government level regarding audiology services. They indicated that this is further emphasized because audiologists are not being employed in healthcare facilities or even in special schools. There have been no studies conducted in South

Africa, to evaluate or describe the knowledge level and awareness of individuals working in government and this should be an area that is explored. Effective and quality healthcare is dependent on professionals as well as the main stakeholders which are the government and other civil organisations (Moyakhe, 2014).

Periodic evaluations of hearing healthcare services in South Africa, to infants with hearing impairments and their families should be a research priority, which will assist in advocating for EHDI implementation by the South African Government (HPCSA, 2018). Results from the study correlated with other studies which indicated that at a political level, mandating the guidelines would reduce challenges (Swanepoel et al., 2009; Olusanya et al., 2008; Swanepoel et al., 2007) and draw more attention towards EHDI services to improve implementation. In the United States, 18 states where UNHS was not legislated had 53% of infants who were screened, in comparison to 95% where UNHS was fully legislated (Grosse et al., 2018). The gap diminished by 2003, to 90% and 95% screened, in states with and without legislation accordingly (Grosse et al., 2018). “Comprehensive and integrated EHDI programmes are therefore accepted and proposed as the standard of care for service-delivery to newborns and infants with hearing loss” (HPCSA, 2018, p. 7). Thus, advocating for EHDI to be made mandatory may improve UNHS implementation. The Gauteng DoH has taken an initial step for implementation of these policies, through circular 19 in October 2013, which supports the implementation of EHDI and recommends that all healthcare facilities, in the province, implement this program (HPCSA, 2018). According to the HPCSA EHDI guidelines, within the following few years, the South African National DoH can decide that it will be mandatory that all provincial healthcare departments phase in UNHS (HPCSA, 2018).

NHS should become a mandated birthing facility practice and therefore, individual preferences will not hinder best practice and facilitate healthcare professionals’ education and support (Scheepers et al., 2014). Currently, UNHS has not been mandated by the DoH and additionally, there is a scarcity in contextually relevant evidence-based challenges regarding implementation of NHS in the public healthcare sector (Bezuidenhout et al., 2018). Hearing screening program performance needs to be audited through formalized evaluations of pilot programs, that should include primary, secondary and tertiary healthcare contexts which are coordinated by the DoH in conjunction with tertiary hospitals (HPCSA, 2007; HPCSA, 2018).

Awareness and knowledge of hearing screening services were also reported to be problematic in hospitals, since many healthcare professionals are unaware of the need and importance of

NHS. According to the EHDI guidelines, essential team members are audiologists, families, paediatricians, otorhinolaryngologists, speech-language therapists, nurses, educators, community workers, primary care physicians, and early interventionists and interpreters where needed (HPCSA, 2018). However, results from the study revealed that most of the aforementioned professionals are unaware of their roles, responsibilities and the EHDI guideline, which is a weakness as they are part of the team responsible for carrying out these services. Further correlating Ravi et al.'s study, that indicated NHS team members showed gaps in their knowledge, necessitating the need for educational and outreach programs (Ravi et al., 2018).

Paediatricians were reported to be more aware and carrying out the services sometimes indirectly, but they still seem to be unaware of the timeframes as stated in the HPCSA EHDI (2018) guidelines. Paediatricians play an important role to ensure that infants have their hearing screened and necessary follow-up assessment (Ravi et al., 2017). There may be some debate between audiologists and speech therapists as to who conducts the aural rehabilitation services and this poses as a challenge, therefore specific roles should be clearly defined to ensure that the infant or child is provided with appropriate services. The results from the current study correlate with findings from another study, that indicated some factors which may compromise EI services include: lack of knowledge between professionals and teachers about hearing loss, conflicting opinions regarding diagnosis and treatment and lack of community awareness of hearing loss and services available (Khoza-Shangase, 2019).

Repeated presentations, in-service training, advocating and creating awareness was reported to be the best ways to improve awareness about the HPCSA EHDI guidelines. There are however, little to no studies conducted in South Africa on the healthcare professionals knowledge and awareness levels, which is needed to facilitate improved EHDI service delivery. The success of a NHS program depends on identifying, diagnosing, and managing newborns or infants timeously via the MDT assessment (Ravi et al., 2018), therefore healthcare professionals must be aware of EHDI services.

Another opportunity as stated in the HPCSA EHDI guideline is the inclusion of screening personnel for NHS, depending on the human resources available in that context (HPCSA, 2018). Recommended screening personnel includes; trained nursing staff, community volunteers, community healthcare workers, and speech-language-hearing mid-level profession-specific workers (HPCSA, 2018). Screening in healthcare centres that offer immunisations or post-natal follow-ups, allow community-based healthcare nurses to be the

frontline healthcare professional in the early intervention team (HPCSA, 2018). Controversial views and opinions were obtained from participants, regarding the involvement of nurses in hearing screening. Some participants mentioned if UNHS is the aim, the inclusion of nurses would be ideal to screen babies who are being seen at clinics. However, it was also mentioned that there would be difficulty with monitoring the program and providing assistance if there was no audiologist available at that setting or nearby.

Other challenges identified was nurses poor knowledge, understanding and a huge workload in public healthcare facilities. Nevertheless, participants did report that some nurses are keen to understand the importance of hearing screening and the key would be to target them. Therefore, rather than training all nurses, participants indicated that one or two key nurses should be trained to run the NHS program, ensuring accountability is maintained. Involvement of nurses in hearing screening was attempted previously as reported by one participant, but the program was indicated to be unsuccessful. This is contrary to successful programs in the United Kingdom, which indicates ninety-nine percent of parents allow for NHS services, which is conducted during a home visit by a nurse or in hospital (WHO, 2010).

Furthermore, the equipment being utilized by nurses would have to be basic screening equipment yielding a pass or fail result, to reduce screener bias and ensure consistency across all newborns, screening personnel and test conditions (JCIH, 2007). Screening implementation is an essential first step within the EHDI process of which the nurse plays an important role (Moodley & Störbeck, 2012). It is necessary for personnel such as nurses, to perform hearing screening tests (Theunissen & Swanepoel, 2008). Hospital-based UNHS is feasible in a rural-based tertiary care centre, using non-specialists who are vital in achieving a satisfactory referral rate (Sharma et al., 2015; Olusanya et al., 2008), thus reducing the shortage of healthcare professionals in resource-poor settings (Olusanya et al., 2008). Due to the high patient-audiologist ratio, current studies and guidelines recommend de-specialisation of hearing screening services to other personnel who will be trained and will have to adhere to regulated standards (Khoza-Shangase et al., 2017).

Early detection of hearing loss is attained through inter-sectoral collaboration with all government departments, including health, education, social development and the private sector (HPCSA, 2018). Results from the study indicated that many participants believed at a political level, there is poor and limited collaboration between the DoH and DoE, which is a barrier to EHDI. The accountability and responsibility for EHDI programs should be instituted

at all the levels of healthcare (HPCSA, 2018). It should be incorporated with early childhood development initiatives from the Department of Health and Social Development, to ensure ongoing monitoring of EHDI development and status (HPCSA, 2018).

Participants also indicated that communication and collaboration between audiologists in private and public sectors, as well as in the health and education departments is poor. Communication and collaboration between professionals is a key aspect and effective EHDI services rely on a team approach (HPCSA, 2018). This will help facilitate a seamless flow of children from the health sector to the education sector. It was recommended by one participant that WhatsApp groups can be created between professionals within a specific areas or districts. Therefore, facilitating information sharing between professionals and enhancing awareness about services offered, which will aid in effective service delivery.

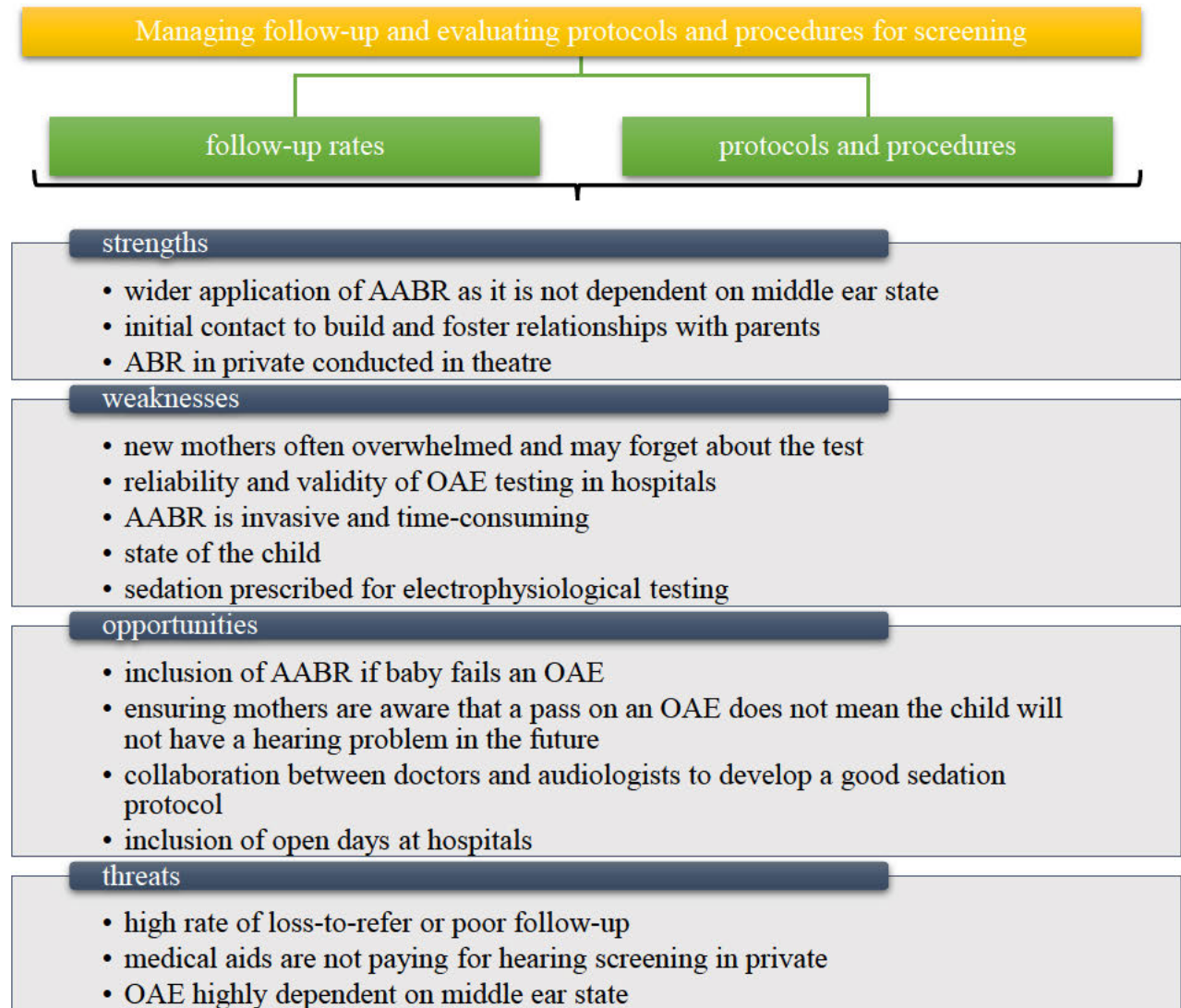
4.2.4. Managing follow-up and evaluating protocols and procedures for screening

The fourth main theme identified from the research study is related to the follow-up rates, protocols and procedures for EHDI service delivery. Analysis from the NVivo software allowed the researcher to review and form a mind map in relation to the fourth theme (Appendix M). The results were generated and are discussed under the two subthemes, which are the follow-up rates and procedures and protocols followed in healthcare facilities. The barriers identified relate to poor follow-up rates, high failure rates with the OAE and challenges with the state of the child when testing. Some of the facilitators mentioned was the inclusion of AABR testing, the importance of the initial contact with parents and the development of a sedation protocol.

The abovementioned information is further illustrated in figure 8.

Figure 8

Managing follow-up and evaluating protocols and procedures for screening: strengths, weaknesses, opportunities and threats



4.2.4.1. Poor follow-up or lost-to-refer rate. A threat identified by the participants at an institutional level is the high rate of loss-to-refer or the poor follow-up rate, experienced in both the public and private healthcare settings. Participants further reported that in private healthcare facilities, the paediatricians also have issues with the babies not returning for follow-ups.

Participant E “...patients or babies that are not coming back for their retest. So we've seen with the netcare program that is almost a watertight program... but we are still getting that loss to refer...” (TE#20)

Results also revealed that the medical aids, specifically for the private sector, are not paying for the hearing screening, therefore parents or caregivers may not want to incur additional costs for the test. Another reason identified was that some participants believed that new mothers may be overwhelmed and worried about other things, which may lead to them forgetting to return for the follow-up test.

4.2.4.2. High failure rate of the OAE. Some participants mentioned that using an OAE to screen babies before discharge from the hospital may not be a practical method. It was reported that using OAE to screen babies born via natural delivery, whom are discharged within the day or after two days is challenging, because the OAE is highly dependent on the middle ear state, which can have vernix or birth fluid. The size of the baby’s ear was also identified to play a role in whether a proper result is obtained or not, thus emphasizing the need for those babies to come back for their follow-up, which we know in South Africa is lacking.

Participant E “I'm always worried about giving the results to mom if the baby has passed the OAE because we don't know about those auditory neuropathies....so I feel that we are missing that...but that is my personal opinion...I always maintain that.” (TE#21)

The inclusion of an AABR was noted to be debatable between A/STAs, as some stated it would be a good opportunity to include because it is not dependent on the middle ear state and tests a larger auditory pathway compared to the OAE. However, some participants reported that the AABR is invasive and time-consuming to conduct for every baby. They believed that the AABR could be a test to fall back on if needed, but does not necessarily need to be conducted for every baby.

Participants did mention that even if the baby refers for the initial screening for any reason, at least that initial contact was made with the parent and therefore they will be aware of the test and other services offered. A recommendation was facilitating open days where knowledge and information can be imparted to parents, may be helpful in ensuring better follow-ups. An important aspect of the job as A/STAs who are specialists in the area, is providing information and building that relationship with parents, which was reported by participants.

Participant A *“So as a specialist in that field, we should explain to them why they coming and the reason we doing this hearing screening for them. Just to make them more aware and make them understand why (the) follow-up appointments (are) also quite important for them to come back if they needed to come back.”* (TE#22)

4.2.4.3. State of the infant or child and sedation prescribed. In public healthcare facilities, the sedation provided to the child, specifically for electrophysiological testing, was reported to be a problem by participants. In many instances the infant or child does not fall asleep and they are rebooked to redo or continue the test, thus drawing out the timeframe. The state of the child was also identified to be a barrier to OAE testing, as the child has to be still and quiet, so if the child wriggles or cries the results may not be true. These were identified by participants as unforeseen obstacles playing a role in EHDI service delivery.

Participant A *“It all depends on the state of your child...but certain times, in certain cases, you can say...Oh, I should have done like two in this...in this session time, you know, because your baby is fast asleep and you can get everything done ... but no we not meeting it at all.”* (TE#23)

An opportunity mentioned by one participant was the collaboration between doctors and audiologists in developing a good sedation protocol for all health professionals to follow, specifically for babies requiring further electrophysiological testing i.e. ABR, ASSR. This would in turn limit the follow-ups and retests for the babies who may not have fallen asleep with the prescribed sedations. The private practices were reported to be doing a good job, as diagnostic electrophysiological testing is conducted in theatre for babies and young children, which is an idea the public sector could adopt.

Participant E *“I think that private audiologists are doing a very good job of this where they’ve started doing that ABRs under sedation in theatre and things. I think that’s...that’s been very helpful.”* (TE#24)

The loss to follow-up or loss-to-refer is a challenge in NHS programs worldwide (HPCSA, 2018). Results from the study indicated that the high rate of loss-to-refer is a problem in both the public and private healthcare sectors. The outpatient follow-up rescreen should be available to families, without barriers like language, literacy levels, transportation or cost (Thompson & Yoshinaga-Itano, 2018). According to the HPCSA, it is essential to rescreen after a refer on the initial OAE screening to minimise false positives (HPCSA, 2007). It was identified that, in the private sector, the cost of the test could be influencing parents or caregiver’s decisions to bring

their baby back for the follow-up test. This correlated with results from another study that indicated one of the most common reasons for follow-up default was due to cost (Scheepers et al., 2014). Furthermore, results from the current study revealed that paediatricians in the private sector also face challenges as some babies do not return for their follow-up visits.

According to a study by Thompson and Yoshinaga-Itano, the best follow-up rates were obtained with programs that had an audiology department (Thompson & Yoshinaga-Itano, 2018). Furthermore, when hospitals referred the family outside the hospital for the follow-up, results showed a 40% chance that the family or caregiver would not return (Thompson & Yoshinaga-Itano, 2018). Scheepers et al.'s (2014) study indicated that only half of the caregivers that defaulted were aware of the results from the initial screening, with 60% being aware of the recommended follow-up screening. Another aspect mentioned was that first time mothers could be overwhelmed or worried and therefore forget about coming back for the retest. According to the HPCSA guidelines, some of the barriers affecting follow up include: 1) shortage of resources, i.e. lack of paediatric audiologists, screening equipment, family support programs and early intervention services; 2) limited healthcare worker knowledge related to a lack of expertise, knowledge and protocols of intervention services; 3) socio-economic barriers linked to transport, language barriers and costs; 4) gaps in information because of limited effective data management systems, and 5) lack of caregiver knowledge about screening outcomes and follow-up recommendations (HPCSA, 2018).

The commonest strategy reported by studies to improve the loss-to follow-up was having a suitable data management system or an electronic system (Ravi et al., 2016). Reducing the poor follow-up rates necessitates the need for proactive reminders and more effective communication with caregivers (Scheepers et al., 2014). The poor timely follow-up rates contribute to further delays in the diagnosis and intervention aspects of hearing loss, which may cause poor childhood development and academic achievement (Olusanya, 2007). Participants also mentioned the importance of the initial contact with parents or caregivers, even if the baby fails or refers on the test due to vernix or fluid in their ear. Education to caregivers or parents about the effects of late identification of hearing loss, benefits of early identification and intervention, as well as the importance of the follow-up appointment is an essential component (HPCSA, 2018). An opportunity recommended by the participants was the inclusion of open days at hospitals, which are essential in creating awareness about the hearing screening services and should be implemented in all healthcare facilities. The team members are key in providing information about the importance of hearing screening to parents

or caregivers before and after birth. Education should begin antenatally and information about hearing and hearing screening regarding antenatal care is an opportunity that should be explored (HPCSA, 2018).

Physiological measures of testing and identifying newborns and infants is the preferred method and should be employed (WHO, 2010; Olusanya, 2011). The utilization of devices like rattles, whistles or the whisper test, are not objective measures of testing and are not endorsed for screening (HPCSA, 2018). The JCIH recommends the use of OAE or AABR to test infants in the nurseries and use to the AABR for infants admitted to the neonatal intensive care unit (NICU), while the HPCSA guidelines recommend OAE for screening during immunisation visits and AABR for infants in the NICU, in the South African context (JCIH, 2007; Khoza-Shangase et al., 2017; HPCSA, 2007; HPCSA, 2018). Otoacoustic emissions testing, specifically DPOAEs and TEOAEs and AABRs have been endorsed as the physiological measures for hearing screening (HPCSA, 2018). Results from the study indicate that in government hospitals, babies born via natural delivery are discharged within the day or by the next day, which poses a challenge as the OAE dependant on the state of the middle ear. Thus, as the guideline states screening should be conducted before discharge (HPCSA, 2018), it can be problematic as babies' ears can have vernix, birth fluid or wax, which can prevent obtaining a true result. Ambient noise levels should also be considered when screening with OAEs to minimise false positives (HPCSA, 2018), thus signal processing and noise reduction capabilities of the specific OAE equipment needs to be explored, because not all OAE equipment may be appropriate for UNHS (Olusanya, 2010)

Furthermore, the OAE test does not assess the neural pathway therefore, babies presenting with auditory neuropathy can be missed. Screening using AABR provides advantages of a higher rate of true positives, lower referral rates, effective screening at a younger age and the ability to identify neural hearing losses (De Kock et al., 2016). A recommendation from some participants was the inclusion of an AABR for testing well-babies and not only for NICU babies. While other participants believed the inclusion of an AABR would be too invasive and time-consuming, to be conducted for every baby. There have been new developments in AABR technology, which addresses the problems with preparation, test time and disposable costs (Cebulla & Shehata-Dieler, 2012; Cebulla et al., 2014) and are broadening the application opportunities for AABR screening even in community-based contexts settings (De Kock et al., 2016).

Unfortunately, immittance testing has not been recommended to be part of the NHS protocol, but high-frequency tympanometry (1000 hertz) testing can be used for follow-up testing for differentiation of OAE refer results (Swanepoel et al., 2007). South African specific protocols should be context-developed to maximise follow-up return rates and decrease false-positives for audiological assessments (HPCSA, 2018). The test battery for infants below six months needs to include; family and child history, electrophysiological measures, immittance measures, parental report regarding emerging auditory and communication behaviours and observations regarding the infant's response to sound (JCIH, 2007). Infants between 6-36 months' test battery needs to include; family and child history, developmentally appropriate behavioural response audiometry (ear-specific), speech detection and or recognition testing, parental report of visual and auditory behaviours and screening of language and communication milestones (JCIH, 2007).

ABR is used as an objective test for young children because of their age and developmental skills, with more often than not sedation being required to obtain accurate results (Abulebda et al., 2017). The state and sedation utilized was identified as a weakness by A/STAs, especially when conducting electrophysiological assessments. ABR testing under sedation is currently gold standard and used to diagnose hearing loss in young children and infants who are unable to complete behavioral testing or not developmentally ready (Abulebda et. al., 2017). There is no specific sedation protocol that is recommended by the HPCSA EHDI guidelines (HPCSA, 2018) and therefore hospitals follow different protocols, depending on what is prescribed by general practitioners or doctors.

The type of sedation prescribed influences whether the infant or child will sleep long enough for the necessary audiological testing. In certain instances, the child may not sleep which affects the reliability of the test results, causing the child to be rebooked. In the public sector, the waiting lists are extremely long, which delays timely access to EHDI services. Khoza-Shangase's (2019) study, revealed that only 38% of participants who tested children below two years would test the child under natural sleep, with only 29% using medical sedation. According to the HPCSA EHDI guidelines, sedation practices should be considered when doing electrophysiological testing, specifically recommending natural sleep for babies under six months (HPCSA, 2018). It has been recommended that audiologists and doctors or paediatricians should work together to develop a sedation protocol guideline that can be included in the EHDI guidelines, which may improve EHDI service delivery. The private sector

has started conducting electrophysiological testing in hospitals in theatre working in conjunction with anesthesiologists. This idea was indicated by some participants, to be adopted or considered in public, as it minimizes retesting or rebooking if results are obtained during the first appointment.

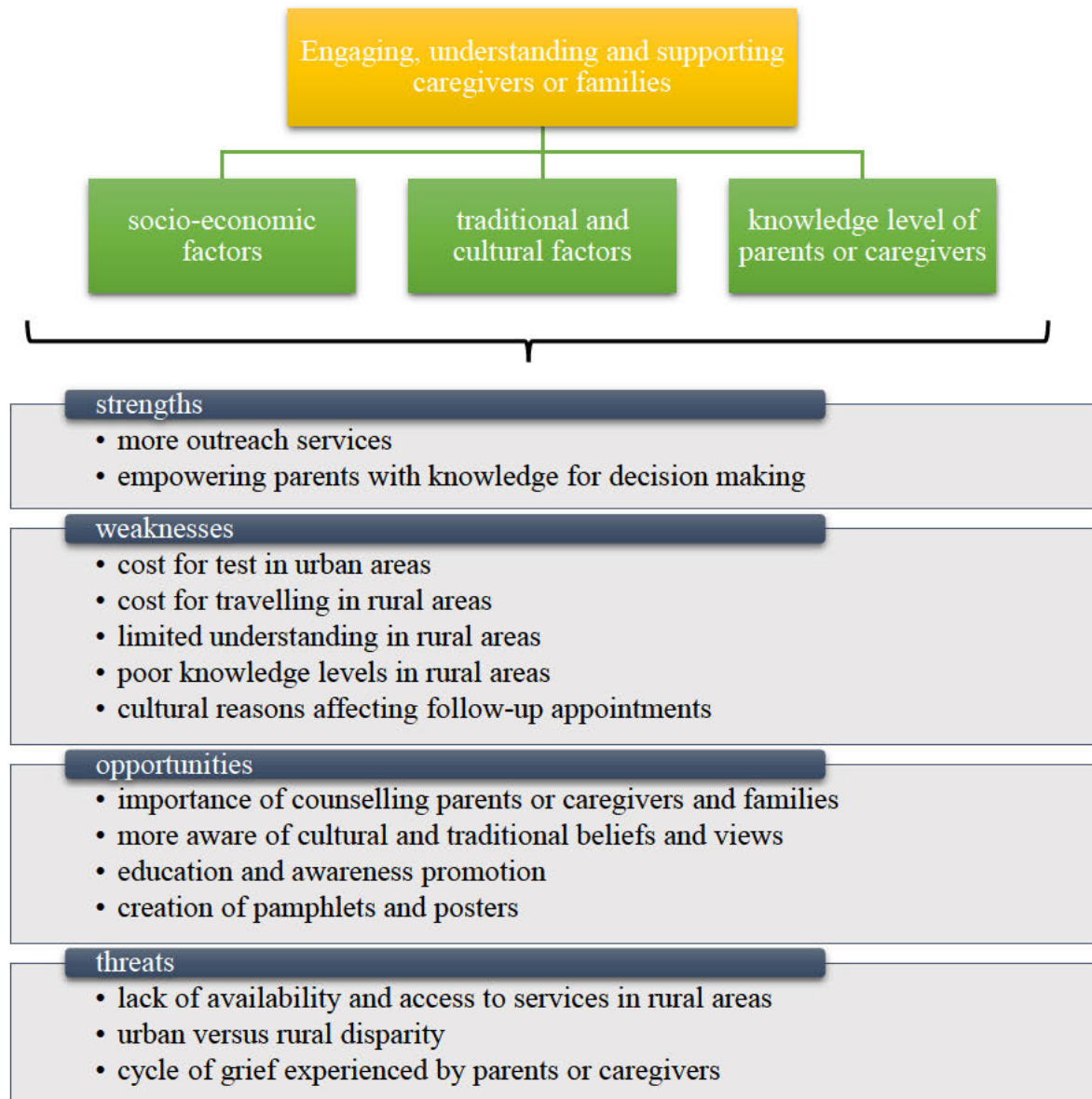
4.2.5. Engaging, understanding and supporting caregiver or families

The fifth main theme identified from the research study is related to socio-economic, cultural factors, beliefs and knowledge of parents or caregivers about EHDI. Analysis from the NVivo software allowed the researcher to review and form a mind map in relation to the fifth theme (Appendix N). The results were generated and discussed under three subthemes which are socio-economic factors, traditional and cultural factors and knowledge levels of parents or caregivers. The barriers relate to limited accessibility of services in rural areas and poor knowledge of hearing screening services by parents or caregivers. Some of the facilitators mentioned include education, awareness and promotion as well as the importance of counselling to parents to improve knowledge.

The abovementioned information has been further illustrated in Figure 9.

Figure 9

Engaging, understanding and supporting caregivers or families: strengths, weaknesses, opportunities and threats



4.2.5.1. Socio-economic factors. Participants reported that social-economic factors play a huge part in EHDI implementation. The cost of transport for parents or caregivers especially in the rural areas and for the cost of the test in private healthcare were identified as barriers. In rural areas, there is a lack of availability of services which results in patients having to travel far to get access to services that they require. The availability of services differs in rural areas compared to urban areas, as there are more services available in an urban compared to rural area. The socio-economic status of the people living in rural versus urban areas also differs which affects if they can come back for the services. It was mentioned that people in

rural areas are more likely to forget or not keep up with appointments compared to those in urban areas. The level of understanding and language barriers experienced in rural areas affects EHDI implementation.

4.2.5.2. Traditional and cultural beliefs. Some of the participants reported that different cultures have different views, beliefs and understanding of health and illness, which is where the importance of counselling comes into play. Participants mentioned that they see a lot of young teenage mothers, who leave their baby with the granny to look after and in certain instances they may believe or follow a more traditional route to medicine, rather than visiting a hospital. It was believed that the older generation, specifically in rural areas believe and use traditional methods as opposed to visiting a hospital (westernized medicine). Furthermore, some participants indicated that there are many cases which they see where parents only bring the child when they are not talking, which is between three to five years, for assessment and management. Results from the participants' responses revealed that in an urban area, traditional and cultural beliefs did not pose as a barrier to the poor follow-up rates. However, those working in rural areas reported it to be a barrier impacting follow-up rates.

One participant reported that sometimes it could be cultural instead of traditional reasons that can stop parents or caregivers from bringing their child back for the appointment.

Participant F *“So I gave her a follow-up date for four weeks and she told me I can't make it when the baby is four weeks because culturally, she's not allowed to leave her house once she's discharged from hospital. So I think culture can affect... definitely can affect...”* (TE#25)

4.2.5.3. Knowledge of audiology by parents or caregivers. Parents are not that knowledgeable about EHDI services and the role an audiologist plays, which may lead them to not see the importance of the service or to seek out the services. Participants also mentioned that at an educational level parents may be more knowledgeable in the private compared to public, as A/STAs may be more visible. Therefore, parents who are more aware are more receptive to the services and will ask about it if their baby did not have it done.

The cycle of grief which is experienced by parents or caregivers was reported to be a threat to EHDI. Participants indicated the importance of counselling to improve EHDI services especially as many parents are in denial about hearing loss, which can influence how soon the child will be provided with early intervention services. Parents go through the cycle of grief

and counselling plays a key role in building a relationship with parents and providing them with the necessary information, to enable them to be more likely to seek out the services.

Participant K “...counselling is extremely important.” (TE#26)

Participant A “*Counselling, counselling and more counselling. I think counseling plays such a big part in it, understanding what the parents.... it's about building that reputation with your parents, you know and making them understand what's going on with their kid, because denial is such a bit thing within the diagnosis of hearing...hearing loss. Parents are in such denial about it and I think it's targeting them and once they understand that they have the major role and what happens with this kid...then your aural rehab will flow so nicely because they are involved in it.*” (TE#27)

All of the participants indicated that even if the services cannot be offered, provision of information through talks or pamphlets to parents or the hospital staff, is very helpful in creating awareness about the importance of early intervention. Audiology departments should be proactive in creating awareness and in-servicing to other professionals, to create awareness about the importance of EHDI services. Outreach at clinics was also identified as a big facilitator which will improve awareness in clinic settings, thus people may be keener to come for the test if they are aware.

Logistical barriers to EHDI as reported by participants included the cost of transportation for those in rural areas and cost of services in the private sector, location and availability of services, which correlated with results from Khoza-Shangases's study (Khoza-Shangase, 2019). The cost of the services, specifically in the private sector, is not covered by medical aid or part of the birthing package has been shown to influence hearing screening and follow-up (Scheepers et al., 2014). Results from the study indicated that availability and access to services differ in the urban compared to rural areas and this is unfortunate as it impacts if parents or caregivers return for the test. A few studies have indicated that there are significantly greater barriers related to access, experienced by rural versus urban communities, which include time, distance and cost of receiving healthcare services (Stuckler et al., 2011; Jackson et al., 2006). There is a need for reliable and affordable transport, especially due to the large distances and limited healthcare facilities in rural communities (Gaede & Versteeg, 2011). Service delivery and access need to be driven depending on the needs of individuals being served (Khoza-Shangase, 2019).

Limited financial and human resources is not the only barrier influencing screening and intervention, but cultural awareness, including culturally appropriate tools and resources, is also a challenge (Pascoe & Norman, 2011). South Africa has a richly diverse population in culture and language, thus clinical interactions need to be conducted using a mode or language of communication which patients understand (HPCSA, 2019). However, English is a dominant language used for communication and imparting health knowledge orally or through handouts in public healthcare (Janse van Rensburg, 2020). This education is essential to prevention of disease and promotion of health, but many individuals may have poor ability to understand what they read or heard, as an average individual's English comprehension ability is five grades lower than the highest schooling level achieved (Griffen et al., 2006). There often may be a mismatch with patient's highest schooling level and literacy level (Harridas et al., 2014).

Health education materials more often than not, are written at a higher level compared to patient's comprehension abilities (Harridas et al., 2014), which is an overlooked factor when these materials are developed and designed (Katz et al., 2007). Moreover, healthcare professionals often are unaware of language and literacy levels of patients' and this needs to be determined in order to effectively provide culturally and linguistically appropriate services (Janse van Rensburg, 2020). Therefore, patients receiving health education that is at an appropriate level of understanding for them, may be more likely to control their medical conditions effectively and participate in decision-making regarding their health, leading to improved outcomes for their health and wellbeing (Bowers et al., 2011).

Cultural beliefs may influence an individual's knowledge about health-related conditions, such as causative factors, treatment and management plans (Govender & Khan, 2017). Results from the study revealed that some participants believe it could be due to a cultural reason which the parent or caregiver is unable to bring the baby back for the test. This can have an impact on appointment times as it may fall outside of the recommended HPCSA EHDI guidelines. Thus, professionals should be knowledgeable about various cultural practices that can influence care and reflect on personal discomforts, such as cultural biases which will aid in providing family-centred care (Grandpierre et al., 2019). Culturally and linguistically appropriate management should be provided by affording unbiased and fair opportunities to people from different cultural and language groups seeking services (HPCSA, 2019).

The diversity of beliefs, practices and cultures between health-seeking individuals and healthcare professionals needs to be considered (Pillay & Serooe, 2019). Traditional healing

plays an important role in South African's health-seeking behaviours, with traditional healers being synonymous in black African communities (Pillay & Serooe, 2019). Participants mentioned that especially in rural areas traditional medicine, such as traditional healers, may be the route followed by many caregivers, compared to westernised medicine. Eight out of ten black people from South Africa, are believed to use only traditional health practitioners or in conjunction with Western medicine (Ross, 2010), while other studies indicated approximately 70% of black South Africans use traditional health practitioners (Ramgoon et al., 2011; Latif, 2010; Bopape, 2016). In South Africa, traditional healing methods are highly debatable because of the controversies surrounding possible negative impacts from traditional healing (Pillay & Serooe, 2019). According to Pillay and Serooe's (2019) study, audiologists are possibly unequipped and reluctant to talk about traditional healers and spirituality, within healthcare practices.

Western methods of care are used by audiologists, which focus on biological processes compared to emotional, spiritual and social processes (Alderfer, 2010). Traditional healers use different methods and substances based on cultural, religious and social belief systems which are not scientifically established (Albertyn et al., 2015), regardless, traditional healers are still consulted by South African individuals (Pillay & Serooe, 2019). Furthermore, many young teenage mothers are seen by A/STAs, with the babies being looked after by grandparents, thus they may have different views and beliefs to accessing healthcare services. A barrier identified in the South African context, is that there are many children without parents, thus placing a large burden on caregivers and this should be addressed when developing EHDI programs to ensure family-centred services (HPCSA, 2018). Conventional approaches need to be adapted to suit the social context, with appropriate support structures in place (HPCSA, 2018). Screening and intervention programs should be standardized to establish a national NHS program, especially in low-and-middle income countries, while keeping in mind the local culture, resource strengths and limitations (Kamal, 2013).

Traditional and cultural beliefs may also play a role in the follow-up rates, which was identified to be more pronounced in rural areas compared to urban areas. Therefore, continued awareness and education to parents about importance of NHS and early intervention, especially in clinic settings, may help to facilitate better return rates. Screening programs implemented in South Africa need to be sensitive to religious beliefs and cultural traditions which may influence perceptions about childhood hearing loss (Olusanya & Okolo, 2006; Swanepoel et al., 2006; Khoza-Shangase et al., 2010). Despite South Africa having laws which support diversity, many

users of audiology and speech-language therapy services, face obstacles in receiving culturally and linguistically appropriate services (HPCSA, 2019).

Disabilities in certain cultures are stigmatised which can add to challenges to service delivery (Grandpierre et al., 2019). Survey results from developing contexts, like South Africa and Nigeria, show a favourable attitude from mothers towards early detection and intervention regarding childhood hearing loss (HPCSA, 2018). Unfortunately, there is little data in South Africa about caregiver perceptions regarding “early identification of hearing loss” (HPCSA, 2018, p. 23). Healthcare institution-based services need to focus on parent and caregiver training and education to promote communication and child development (HPCSA, 2018). Results from the study indicated that participants believed that parents or caregivers were not aware of the role of an audiologist. Furthermore, it was mentioned in the private sector, parents or caregivers may be more aware of audiology services compared to in the public sector, as audiologists are more visible.

Caregivers and parents need to be part of the assessment process which will aid in their understanding of the assessment management process (Kovacs, 2012). Uniform conclusions have been reported from low-and-middle income countries, which indicate a negligible difference in parental anxiety between parents of infants who received the screening compared to those that did not (HPCSA, 2018). Participants indicated that providing information through talks and the use of pamphlets is a good way to create awareness about EHDI and audiology services. Outreach at clinics, especially those in the rural areas, was also reported to be a good opportunity to improve knowledge and awareness about EHDI services.

The lack of parental knowledge plays a huge role in delaying diagnosis and amplification as well as inadequate referrals from other professionals contributing to a delay in the intervention (Khoza-Shangase et al., 2010). Additional resources that focus on early intervention and the needs of families of children with hearing loss, need to be offered (Störbeck & Moodley, 2011). Counselling was reported by the participants to be of utmost importance to facilitate family-centred care, especially as parents or caregivers may go through the cycle of grief. There are various stages in the cycle of grief, one of which is denial, which affects how soon parents would bring their child for further assessment and management and can adversely affect meeting of the recommended timeframes. Data indicates that the resolution of grief with early identified children and their families may occur faster compared to later-identified children, but only if these children develop strong communication and language skills (Yoshinaga-Itano,

2003). Therefore, counselling plays an important role in allowing healthcare professionals to empower parents and caregivers with information to ensure they can make informed decisions, further facilitating building of relationships. Attention should be provided to create awareness and counselling should include the whole family, as an individual member's poor knowledge can lead to a delay in identification and management of the hearing loss (Rajagopalan et al., 2014). South Africa has very little data regarding caregiver perceptions of early identification of hearing loss (HPCSA, 2018) and further research should be conducted towards “culturally congruent screening programmes” (HPCSA, 2018, p. 23).

4.3. Conclusion

Research indicates that early intervention principles were not applicable for South Africa, due to language barriers, socio-economic factors, cultural diversity, lack of resources and awareness which affect audiology service delivery (Khoza-Shangase et al., 2010). The main barriers affecting EHDI implementation included; lack of resources, poor follow-up rates, limited knowledge and education, socio-economic status and practicality of the EHDI guideline. These findings emphasize the need for context-specific solutions and strategies to facilitate effective practice and implementation of EHDI services, due to the rich and diverse contexts.

“Children with hearing loss are as much part of the future of the country as those with normal hearing and it is through effective EHDI services that the active and equal participation of these children will be secured among their hearing peers to change, influence and direct the future of South Africa” (HPCSA, 2018, p. 47).

CHAPTER 5. CONCLUSION, LIMITATIONS, AND IMPLICATIONS

“The important thing is to never stop questioning”

Albert Einstein

5.1. Introduction

This chapter provides an integration of information from the previous chapters to provide a conclusion and recommendations based on the study's aim and objectives. Thereafter, the limitations and research and clinical implications for the study are presented.

5.2. Concluding summary

The study aimed to determine the barriers and facilitators to EHDI in KZN, as described by A/STAs from guideline generation to clinical application. It was found that there is limited research conducted regarding the EHDI guideline and feasibility of implementing it in the South African context, given the diverse population. Roll-out and implementation of services after the HPCSA EHDI (2007) position statement release, was reported to be slow (HPCSA, 2018). A review of the literature revealed that the majority of studies focused on initial screening, with limited studies on diagnostic and intervention services. EHDI is a holistic program and should contain all aspects, therefore the literature was used to inform the researcher about gaps in EHDI and challenges faced by A/STAs towards implementation.

The use of the SWOT conceptual framework allowed the researcher to critically analyse the research data and this was achieved through the use of a qualitative research design. The qualitative method enabled the research to gather in-depth information based on A/STAs views, beliefs and opinions. Results from the data revealed that one of the main barriers perceived by A/STAs, affecting EHDI was the lack of resources in healthcare facilities. This included a lack of funding from hospital management and the government, to provide healthcare facilities with the required staff and equipment to carry out the services, which is a major challenge correlating with other South African research studies (Theunissen & Swanepoel, 2008; Petrocchi-Bartal & Khoza-Shangase, 2014; Khoza-Shangase et al., 2017). Poor knowledge and awareness at a government level and with healthcare professionals regarding the importance of EHDI services, was also identified as barriers towards EHDI. Education and training about EHDI services are an essential part of promoting and creating awareness, amongst healthcare professionals and at a government level, which can facilitate mandating of the guidelines. The

follow-up and referral rates have been reported to be poor worldwide, thus improved healthcare professional awareness can assist in improving caregiver or parent awareness of the importance of these services, thereby improving follow-up return rates.

Contrasting positive and negative views were identified by participants regarding the involvement of nurses to facilitate improved implementation of hearing screening, therefore careful consideration needs to be taken into account before the inclusion of such strategies in KZN. There have been no studies conducted in South Africa that have analysed the practicality of the EHDI guidelines for the South African context. Results from the study indicated that although there are guidelines in place to guide practice, it may be more suited to an urban versus a rural area. In South Africa, even KZN itself, we have a culturally and linguistically diverse population, with individuals from various socio-economic backgrounds. Hence, these need to be considered when developing and releasing guidelines, that healthcare facilities should be implementing.

Although the results revealed many barriers and challenges to EHDI implementation, facilitators were also identified from the data. Information provided from A/STAs at ground level, in the various provinces, may benefit in developing more contextually-relevant and practical guidelines, that can aid in improved implementation and referral systems. Opportunities included the development of task teams specifically for EHDI programs, creation of WhatsApp groups for collaboration and communication, workshops, presentations, training to healthcare professionals and improving data management systems. The results of the study should be interpreted keeping in mind the limitations (listed below). Further areas of research regarding EHDI guideline and practice have also been indicated, which can guide and inform A/STAs in their clinical practice (discussed below). It can be concluded that many of the barriers and challenges as identified by this research study, is consistent with findings reported from other studies.

Research indicates that early intervention principles were not applicable for South Africa, due to language barriers, socio-economic factors, cultural diversity and lack of resources and awareness which affect audiology service delivery (Khoza-Shangase et al., 2010). This research study was the first step in identifying barriers and facilitators affecting EHDI implementation and understanding the practicality in the South African context. The results from the study can be used to build on research regarding EHDI services. Investigation into

EHDI programs, the barriers and facilitators in South Africa, especially in the various provinces are needed to develop effective implementation and practice.

5.3. Limitations

Limitations are known as weaknesses or flaws in a research study (Bui, 2014), which are important to be aware of during the study as this can guide future research (Creswell, 2012). The limitations identified from the current research study are as follows:

- The study sample and size are only representative of A/STAs employed in private and public healthcare facilities in the KwaZulu-Natal province only, during the study timeframe. Qualitative research may not be generalisable in a probabilistic sense which does pose as a limitation, the findings however, can be transferable to a similar context (Marshall & Rossman, 2010).
- The study participants were specifically chosen, in a non-random manner. to ensure a diverse range of individuals, thus selection bias occurred to an extent (Kobayashi, 2019)
- The time limit of 45-60 minutes scheduled for the telephonic interview may have affected the depth of information obtained from the participants, as many A/STAs working in healthcare facilities have very busy schedules.
- The interviews were conducted telephonically with participants thus, non-verbal cues and facial expressions expressed by participants could not be obtained (Edwards & Holland, 2013).
- A qualitative research design was used for the current study and this was a time-consuming and labor-intensive process, as the telephonic interviews had to be recorded, transcribed, inputted into NVivo for analysis and thereafter analysed through thematic analysis (Anderson, 2010).
- Audio-recordings of the telephonic interviews had certain limitations as the quality of recording with one or two of the interviews were affected due to the background noise, in the participant's workplace (Howitt, 2016) and therefore, certain words/phrases in the audio recordings were unable to be transcribed.

5.4. Research implications

The following research implications are noted:

- Future research should investigate the barriers and facilitators of EHDI implementation, in the various provinces, using a larger quantitative, online survey-based study in South Africa.
- Investigation of the knowledge and awareness of healthcare professionals, i.e. ENTs, paediatricians, nurses, early interventionists, speech therapists, regarding EHDI services should be conducted in KwaZulu-Natal and South Africa.
- Investigation of the knowledge and awareness at a government level, with the DoH and DoE about EHDI services and challenges, should be conducted in South Africa.
- Analysis of the practicality and feasibility of the EHDI guidelines in the various provinces as well as challenges faced by A/STAs, should be explored
- Investigation of the effectiveness of screening, diagnosis and intervention protocols as mentioned in the guidelines in the various contexts and provinces, through interviews or observation and analysis of EHDI statistical information for each context or province.
- Further strategies to improve and facilitate the implementation of EHDI in healthcare facilities and clinic-based contexts, need to be determined.
- Investigation of the status of EHDI programs in all the provinces and effectiveness of these programs.
- EHDI pilot studies to be conducted to investigate cost-effectiveness and implementation of guidelines in various provinces.

5.5. Clinical implications

The following clinical implications are noted:

- It may be necessary for de-specialization of hearing screening services to healthcare professionals such as nurses to facilitate UNHS and achieve goals and principles as set out by the HPCSA EHDI (2018) guidelines.
- Emphasis is greatly placed on NHS in the HPCSA EHDI (2018) guidelines however, one should be aware that in the absence of diagnostic assessments, implementation and intervention, EHDI programs cannot be successful. Therefore, when implementing

EHDI services or programs, A/STAs should be aware and provide all the components of EHDI, which includes screening, diagnosis, and intervention.

- A national database can assist in obtaining accurate prevalence rates for newborn and infant hearing loss, in the South African context and provide information regarding the age of hearing screening and diagnosis of hearing impairment (HPCSA, 2018).
- Assessment and evaluation of resources and protocols available in healthcare facilities in all the provinces of South Africa should be conducted, which can assist with developing proper EHDI programs and for implementation purposes.
- Practices and protocols for EHDI programs in healthcare facilities should be feasible, cost-effective, linguistically and culturally appropriate given the diverse South African context.

REFERENCES

- Abulebda, A., Patel, V. J., Ahmed, S. S., Tori, A. J., Lutfi, R., & Abu-Sultaneh, S. (2017). Comparison between chloral hydrate and propofol-ketamine as sedation regimens for pediatric auditory brainstem response testing. *Brazilian Journal of Otorhinolaryngology*, 85(1), 32-36.
- Alam, S., Satterfield, A., Mason, C.A., & Deng, X. (2016). Progress in Standardization of Reporting and Analysis of Data from Early Hearing Detection and Intervention (EHDI) Programs. *Journal of Early Hearing Detection and Intervention*, 1(2) 2-7.
- Alanazi, A. A., & Nicholson, N. (2019). Audiology and Speech-Language Pathology Simulation Training on the 1-3-6 Early Hearing Detection and Intervention Timeline. *American Journal of Audiology*, 1-14.
- Albertyn, R., Berg, A., Numanoglu, A., & Rode, H. (2015). Traditional burn care in sub-Saharan Africa: A long history with wide acceptance. *Burns*, 41(2), 203–211. <https://doi.org/10.1016/j.burns.2014.06.005>
- Alderfer, C. (2010). *The practice of organizational diagnosis: Theory and methods*. Oxford University Press.
- Allen, M. (2017). *The SAGE Encyclopedia of Communication Research Methods* (Vol. 1). SAGE Publications.
- AAP. (1999). Newborn and Infant Hearing Loss: Detection and Intervention. *American Academy of Pediatrics*, 103, 527-530.
- Anderson, C. (2010). Presenting and Evaluating Qualitative Research. *American Journal of Pharmaceutical Education*, 74 (8), 1-7.

- ASHA. (2005). *Audiology Information series: ASHA's consumer newsletter*. American Speech-Language-Hearing Association. <https://www.asha.org/uploadedFiles/aud/InfoSeries/PrevalenceIncidence ofHearingLossChildren.pdf>.
- Baarda, B. (2019). *Research: This is it!* (1st ed.). Routledge.
- Benatar, S. (2013). The challenges of health disparities in South Africa. *SAMJ: South African Medical Journal*, 103(3), 154-155.
- Bezuidenhout, J. K., Khoza-Shangase, K., Maayer, T. d., & Strehlau, R. (2018). Universal newborn hearing screening in public healthcare in South Africa: Challenges to implementation. *South African Journal of Child Health*, 12(4), 159-163. <https://dx.doi.org/10.7196/SAJCH.2018.v12i4.1522>
- Bhattacharjee, A. (2012). *Social Science Research: Principles, Methods, and Practices* (2nd ed.). Scholar Commons, USF.
- Bloom, G., & McIntyre, D. (1998). Towards equity in health in an unequal society. *Social Science & Medicine*, 47(10), 1529-1538.
- Brace, I. (2013). *Questionnaire Design: How to Plan, Structure and Write Survey Material for Effective Market Research* (3rd ed.). Kogan Page Publishers.
- Breen, R. L. (2006). A Practical Guide to Focus-group Research. *Journal of Geography in Higher Education*, 30 (3), 463-475.
- Briney, K. (2015). *Data Management for Researchers: Organize, maintain and share your data for research success*. Pelagic Publishing.
- Birt, L., Scott, S., Cavers, D., Campbell, C., & Walter, F. (2016). Member Checking: A Tool to Enhance Trustworthiness or Merely a Nod to Validation? *Qualitative Health Research*, 1-10.

- Bopape, M. A. (2016). *Indigenous practices of mothers with children admitted at the Polokwane/Manweng Hospital Complex in the Limpopo Province*. [PhD Thesis, School of Health Sciences. University of Limpopo]. <http://hdl.handle.net/10386/1034>.
- Bowers, J., Howard, S. L., & Bywood, P. T.(2011). Health literacy and primary health care. *PHCRIS Research Roundup*. <http://www.phcris.org.au/publications/researchroundup/issues/19.php>
- Bui, Y. N. (2014). *How to Write a Master's Thesis*. (2nd ed.). SAGE Publications.
- Butler, I. R. T., Basson, S., Britz, E., Wet, R. D., Korsten, G. B., & Joubert, G. (2013). Age of diagnosis for congenital hearing loss at Universitas Hospital, Bloemfontein. *South African Medical Journal*, 103(7), 474-475.
- Butler, I. R. T., Ceronio, D., Swart, T., & Joubert, G. (2015). Age of diagnosis of congenital hearing loss: Private v. public healthcare sector. *South African Medical Journal*, 105(11), 927-929.
- Carey, M., & Asbury, J. (2016). *Focus group research*. Routledge.
- CDC. (2010). *Early hearing detection and intervention (EHDI) national goals*. <http://www.cdc.gov/ncbddd/hearingloss/ehdi-goals.html>.
- CDC (2018). *Hearing loss in children*. <https://www.cdc.gov/ncbddd/hearingloss/ehdi-data2015>.
- CDC (2019). *CDC's Work on Hearing Loss*. National center on birth defects and Developmental disabilities. <https://www.cdc.gov/ncbddd/hearingloss/about.html>.

- Cebulla, M., Hofmann, S., & Shehata-Dieler, W. (2014). Sensitivity of ABR based newborn screening with the MB11 BERAphone. *International Journal of Pediatric Otorhinolaryngology*, 78, 756–761.
- Cebulla, M., & Shehata-Dieler, W. (2012). ABR-based newborn hearing screening with MB11 BERAphone using an optimized chirp for acoustical stimulation. *International Journal of Pediatric Otorhinolaryngology*, 76, 536–543.
- Chapchap, M. J., Olusanya, B. O., Swanepoel, D. W., Castillo, S., Habib, H., Mukari, S. Z., Martinez, N. V., Lin H., & McPherson, B. (2007). Progress towards early detection services for infants with hearing loss in developing countries. *BMC Health Services Research*, 7(14), 1-15.
<https://dx.doi.org/10.1186/1472-6963-7-14>
- Chopra, M., Lawn, J. E., Sanders, D., Barron, P., Karim, S. S. A., Bradshaw, D., Jewkes, R., Karim, Q. A., Flisher, A. J., Mayosi, B. M., Tollman, S. M., Churchyard, G. J., & Coovadia, H. (2009). Achieving the health Millennium Development Goals for South Africa: Challenges and priorities. *The Lancet*, 374(9694), 1023-1031.
- Chung, W., Beauchaine, K. L., Grimes, A., O'Hollearn, T., Mason, C., & Ringwalt, S. (2017). Reporting Newborn Audiologic Results to State EHDI Programs. *Ear and hearing*, 38(5), 638–642.
- Colella-Santos, M. F., Hein, T. A. D., Souza, G. L. d., Amaral, M. I. R. d., & Casali, R. L. (2014). Newborn Hearing Screening and Early Diagnostic in the NICU. *Hindawi: BioMed Research International*, 1-11.
- Collins, H. (2017). *Creative Research: The Theory and Practice of Research for the Creative Industries*. Bloomsbury Publishing.

- Coolican, H. (2018). *Research Methods and Statistics in Psychology*. (7th ed.). Routledge.
- Creswell, J. W. (1998). *Qualitative inquiry and research design: Choosing among five traditions*. SAGE Publications.
- Creswell, J. W. (2012). *Educational Research: Planning, Conducting and Evaluating Quantitative and Qualitative Research* (4 ed.). Pearson Education, Inc.
- Creswell, J. W. (2014). *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches*. (4th ed.). SAGE Publications.
- Crowther, D., & Lauesen, L. (2017). *Handbook of Research Methods in Corporate Social Responsibility*. Edward Elgar Publishing.
- Cylus, J., Richardson, E., Findley, L., Longley, M., O'Neill, C., & Steel, D. (2015). United Kingdom: Health system review. *Health Systems in Transition*, 17(5), 1–125.
- Dambisya, Y. M., & Modipa, S. I. (2009). *Capital Flows in the Health Sector in South Africa: Implications for Equity and Access to Health Care*. [EQUINET Discussion Paper Series 76, Harare]. <https://www.equinet africa.org/sites/default/files/uploads/documents/DIS76pppDAMBISYA.pdf>
- Das, S., Seepana, R., & Bakshi, S. S. (2020). Perspectives of newborn hearing screening in resource constrained settings. *Journal of Otology*, 1-9.
- De Kock, T., Swanepoel, D., & Hall, J.W. (2016). Newborn hearing screening at a community-based obstetric unit: Screening and diagnostic outcomes. *International Journal of Pediatric Otorhinolaryngology*, 84, 124-131.
- DoH. (2011). *National Health Insurance: Policy paper*. <http://www.bowman.co.za/FileBrowser/ContentDocuments/NHI.pdf>

- Edwards, R., & Holland, J. (2013). *What is Qualitative Interviewing?* Bloomsbury Publishing.
- Emmel, N. (2013). *Sampling and Choosing Cases in Qualitative Research: A realistic approach*. SAGE Publications.
- Ezzy, D. (2013). *Qualitative Analysis: Practice and Innovation*. Routledge Publications.
- Flick, U. (2013). *The SAGE Handbook of Qualitative Data Analysis*. SAGE Publications.
- Flick, U. (2014). *An Introduction to Qualitative Research* (5th ed.). SAGE Publications.
- Friderichs, N., Swanepoel, D., & Hall, J. W. (2012). Efficacy of a community-based infant hearing screening program utilizing existing clinic personnel in Western Cape, South Africa. *International Journal of Pediatric Otorhinolaryngology*, 76(4), 552-559.
<https://dx.doi.org/10.1016/j.ijporl.2012.01.015>
- Galletta, A. (2013). *Mastering the Semi-Structured Interview and Beyond: From research design to analysis and publication*. NYU Press.
- Gallin, J. I., Ognibene, F. P., & Johnson, L. L. (2017). *Principles and Practice of Clinical Research*. (4th ed.). Academic Press.
- Grandpierre, V., Fitzpatrick, E. M., Thomas, R., Mendonca, O., Sikora, L., & Potter, B. K. (2019). Barriers and Facilitators to Cultural Competence in Early Hearing Loss Services: A Qualitative Analysis. *Canadian Journal of Speech-Language Pathology and Audiology*, 43(3), 189-200.
- Green, J., & Thorogood, N. (2004). *Qualitative methods for health research*. (2nd ed.). Sage Publications.
- Grbich, C. (2012). *Qualitative Data Analysis: An Introduction*. (2nd ed.). SAGE Publications.

- Griffen J., McKenna, K., & Tooth, L. (2006). Discrepancy between older clients' ability to read and comprehend and the reading level of written educational materials used by occupational therapists. *American Journal of Occupational Therapy*, 60(1), 70–80.
- Grosse, S. D., Mason, C. A., Gaffney, M., Thomson, V., & White, K. R. (2018). What Contribution Did Economic Evidence Make to the Adoption of Universal Newborn Hearing Screening Policies in the United States? *Int. J. Neonatal Screen*, 4, 25.
- Groundwater-Smith, S., Dockett, S., & Bottrell, D. (2014). *Participatory Research with Children and Young People*. SAGE Publications.
- Govender, S., & Khan, N.B. (2017). Knowledge and cultural beliefs of mothers regarding the risk of infant hearing loss and awareness of audiology services. *Journal of Public Health*, 8(557), 43-48.
- Gürel, E., & Tat, M. (2017). SWOT Analysis: A Theoretical Review. *The Journal of International Social Research*, 10(51), 994-1006.
<http://dx.doi.org/10.17719/jisr.2017.1832>
- Haines, A., Kuruvilla, S., & Borchert, M. (2004). Bridging the implementation gap between knowledge and action for health. *Bulletin of the World Health Organization*, 82(10), 724-732.
- Harbinson, S., & Khoza-Shangase, K. (2015). Evaluation of universal newborn hearing screening in South African primary care. *African Journal of Primary Health Care*, 7(1), 12.
- Harding, J. (2013). *Qualitative Data Analysis from Start to Finish*. SAGE Publications.

Harridas R., Supreeth, A., Ajagannavar, S. L., Tikare, S., Maliyil, M. J., & Kalappa, A. A.

(2014). Oral health literacy and oral health among adults attending dental college hospital in India. *J Int Oral Health*, 6(6), 61–66.

Howitt, D. (2016). *Introduction to Qualitative Research Methods in Psychology* (4th ed.). Pearson.

HPCSA. (2007). *Professional board for speech, language and hearing professions: Early hearing detection and intervention programmes in South Africa. Position statement* Pretoria: Health Professions Council of South Africa (HPCSA).

HPCSA. (2018). *Professional board for speech, language and hearing professions: Early hearing detection and intervention programmes in South Africa*. Pretoria: Health Professions Council of South Africa (HPCSA). [https://www.hpcsa.co.za/Uploads/SLH/Guidelines%20for%20Early_Hearing_Detection_and_Intervention_\(EHDI\)_2018.pdf](https://www.hpcsa.co.za/Uploads/SLH/Guidelines%20for%20Early_Hearing_Detection_and_Intervention_(EHDI)_2018.pdf)

HPCSA. (2019). *Professional board for speech, language and hearing professions: Guidelines for practice in a culturally and linguistically diverse South Africa*. Pretoria: Health Professions Council of South Africa (HPCSA).

Imam, S. S., El-Farrash, R. A., Taha, H. M., & Bishoy, H. E. (2013). Targeted versus Universal Neonatal Hearing Screening in a Single Egyptian Center. *Hindawi*, 1-7.

Jackson, D., Loveday, M., Doherty, T., Mbombo, N., Wigton, A., & Matizirofa, L. (2006). Community based situation analysis: Maternal and neonatal follow-up care. *Durban: Health Systems Trust*.

- Janse van Rensburg, Z. (2020). Levels of health literacy and English comprehension in patients presenting to South African primary healthcare facilities. *African Journal of Primary Health Care & Family Medicine*, 12(1), 1-6.
<https://dx.doi.org/10.4102/phcfm.v12i1.2047>
- Jatto, M. E., Ogunkeyede, S. A., Adeyemo, A. A., Adeagbo, K., & Saiki, O. (2018). Mothers' perspectives of newborn hearing screening programme. *Ghana Medical Journal*, 52(3), 158-162.
<http://dx.doi.org/10.4314/gmj.v52i3.9>
- JCIH. (2000). JCIH Year 2000 Position Statement: Principles and Guidelines for Early Hearing Detection and Intervention Programs. *ASHA*, 2, 27-51.
- JCIH. (2007). Year 2007 Position Statement: Principles and Guidelines for Early Hearing Detection and Intervention Program. *American Academy of Pediatrics*, 898-920.
<http://dx.doi.org/10.1542/peds.2007-2333>
- JCIH. (2019). Year 2019 Position Statement: Principles and Guidelines for Early Hearing Detection and Intervention Programs. *The Journal of Early Hearing Detection and Intervention*, 4(2), 1-44.
- Jobson, M (2015). *Structure of the Health System in South Africa: Facts and Figures*. Johannesburg: Khulumani Support Group. <http://www.khulumani.net/>
- Joubert, K., & Casoojee, A. (2013). Hearing-screening record-keeping practices at primary healthcare clinics in Gauteng. *South African Journal of Communication Disorders*, 60, 27-30.
- Kanji, A. (2016). Early hearing screening in South Africa – time to get real about context. *SAJCH*, 10(4), 192.

- Kanji, A. (2018). Early hearing detection and intervention: Reflections from the South African context. *South African Journal of Communication Disorders*, 65(1), 1-3.
<https://doi.org/10.4102/sajcd.v65i1.581>
- Kanji, A., Khoza-Shangase, K., & Monroe, N. (2018). Newborn hearing screening protocols and their outcomes: A systematic review. *International Journal of Pediatric Otorhinolaryngology*, 115, 104-109.
- Katz, M. G., Jacobson, T. A., Veledar, E., & Kriplani, S. (2007). Patient literacy and question-asking behavior during medical encounter: A mixed method analysis. *Soc Gen Intern Medicine*, 22(6), 782–786.
<https://doi.org/10.1007/s11606-007-0184-6>
- Kennedy, C., McCann, D., Campbell, M.J., Kimm, L., & Thornton, R. (2005). Universal newborn screening for permanent childhood hearing impairment: and 8 year follow-up of a controlled trial. *Lancet*, 355, 660-662.
- Khoza-Shangase, K. (2019). Current sedation practices in paediatric audiology clinics in gauteng, South Africa. *International Journal of Pediatric Otorhinolaryngology*, 122, 93-98.
- Khoza-Shangase, K. (2019). Early hearing detection and intervention in South Africa: Exploring factors compromising service delivery as expressed by caregivers. *International Journal of Pediatric Otorhinolaryngology*, 118, 73-78.
- Khoza-Shangase, K., Barrett, J., & Jonosky, J. (2010). Protocols for early audiology intervention services: Views from early intervention practitioners in a developing country. *South African Journal of Child Health*, 4(4), 100-105.

- Khoza-Shangase, K., Kanji, A., Petrocchi-Bartal, L., Farr, K. (2017). Infant hearing screening in a developing-country context: Status in two South African provinces. *South African Journal of Child Health*, 11(4), 159-163.
- Kiyimba, N., Lester, J. N., & O' Reilly, M. (2018). *Using Naturally Occuring Data in Qualitative Health Research: A Practical Guide*. Springer.
- Kobayashi, A. (2019). *International Encyclopedia of Human Geography* (2nd ed.). Elsevier.
- Korrapati, D. R. (2017). *Five Chapter Model for Research Thesis Writing: 108 Practical Lessons for MS/MBA/M.Tech/M.Phil/LLM/Ph.D Students*: Diamond Pocket Books Pvt Ltd.
- Kovacs, L. (2012). Partnering with Parents to Enhance Habilitation: A Parent's Perspective. *Seminars in Speech and Language*, 33(4), 259-263.
- Krishnan, L. A., & Donaldson, L. K. (2013). Newborn Hearing Screening in Developing Countries: Understanding the Challenges and Complexities of Implementation. *Research Gate*, 54-61.
<http://doi.org/10.1044/gics3.2.54>
- Krishnan, L. A., Van Hyfte, S., & Richard K. A. R. (2019). Newborn hearing screening: early education = more satisfied mothers. *American Journal of Audiology*, 28, 617-27. .
- Kumar, R. (2014). *Research Methodology: A Step-by-Step Guide for Beginners* (4th ed.). SAGE Publications.
- Lam, M. Y. Y., Wong, E. C. M., Law, C. W., Lee, H. H. L., & McPherson, B. (2018). Maternal knowledge and attitudes to universal newborn hearing screening: Reviewing an established program. *Indian Journal Pediatric Otorhinolaryngology*, 105, 146-153.
<http://doi.org/10.1016/j.ijporl.2017.12.021>

- Latif, S. S. (2010). *Integration of African traditional health practitioners and medicine into the health care management system in the province of Limpopo*. [Thesis MPA, University of Stellenbosch]. <https://scholar.sun.ac.za/handle/10019.1/5248>
- Leedy, P. D., & Ormrod, J. E. (2015). *Practical Research: Planning and Design* (11th ed.). Pearson Education, Inc.
- Louw, B., & Avenant, C. (2002). Culture as context for intervention: developing a culturally congruent early intervention program. *International Pediatrics*, 17(3), 145-150.
- Magnusson, E., & Marecek, J. (2015). *Doing Interview-based Qualitative Research: A learner's guide*. Cambridge University Press.
- Marshall, C., & Rossman, G. B. (2010). *Designing Qualitative Research*. (5th ed.). SAGE Publications.
- Mayosi, B. M., & Benatar, S. R. (2014). Health and health care in South Africa—20 years after Mandela. *New England Journal of Medicine*, 371(14), 1344–1353.
- Mazlan, R., & Min, W. S. (2018). Knowledge and attitude of Malaysian healthcare professionals towards newborn hearing screening program. *Malaysian Journal of Public Health Medicine*, 62-68.
- Merugumala, S.V., Pothula, V., & Cooper, M. (2017). Barriers to timely diagnosis and treatment for children with hearing impairment in a southern Indian city: a qualitative study of parents and clinic staff. *International Journal of Audiology*, 56, 733-739.
- Meyer, M. E., & Swanepoel, D. W. (2011). Newborn hearing screening in the private health care sector - a national survey. *South African Medical Journal*, 101(9), 665-667.

- Meyer, M.E., & Swanepoel, D. (2012). *National survey of early hearing detection and intervention in the private health care sector. In fulfilment of the requirements for Masters Degree in Communication Pathology 2012.* [Masters in Communication Pathology, University of Pretoria, South Africa].
- Meyer, M. E., Swanepoel, D. W., Le Roux, T., & Linde, M. v. d. (2012). Early detection of infant hearing loss in the private health care sector of South Africa. *International Journal of Pediatric Otorhinolaryngology*, 76(5), 698-703.
- Michal, G., & Khoza-Shangase, K. (2014). Early intervention in audiology: Exploring the current status from a developing country context. *British Journal of Medicine and Medical Research*, 120(4), 2238-2249.
- Moeller, M. P. (2000). Early intervention and language development in children who are deaf and hard of hearing. *Pediatrics*, 106(3), 1-9.
- Moodley, S., & Störbeck, C. (2012). The role of the neonatal nurse in early hearing detection and intervention in South Africa. *Prof Nurse Today*, 16(4), 28-31.
- Moodley, S., & Störbeck, C. (2015). Narrative review of EHDI in South Africa. *South African Journal of Communication Disorders*, 62(1), 1-10.
- Moodley, S., & Störbeck, C. (2017). Data management for early hearing detection and intervention in South Africa. *South African Journal of Information Management*, 19(1), 6.
- Mostert-Phipps, N., Pottas, D., & Korpela, M. (2012). Improving continuity of care through the use of electronic records: A South African perspective. *South African Family Practice* 54(4), 326–331.
<https://doi.org/10.1080/20786204.2012.10874244>.

- Moyakhe, N. P. (2014). Quality healthcare: An attainable goal for all South Africans? *The South African Journal of Bioethics and Law*, 7(2), 1–7.
<https://doi.org/10.7196/sajbl.355>
- Naidoo, S. (2012). The South African National Health Insurance: A revolution in health-care delivery! *Journal of Public Health*, 34(1), 149–150. NCHAM (2019). *EHDI Legislation overview*. National Center for Hearing Assessment and Management.
<https://www.infanthearing.org/legislation/>
- Nelson, H. D., Bougatsos, C., & Nygren, P. (2008). Universal newborn hearing screening: systematic review to update US Preventive Services Task Force recommendation. *Pediatrics*, 122, e266–e276.
- Ngulube, P. (2018). *Handbook of Research on Heritage Management and Preservation*. IGI Global.
- Nikolopoulos, T. P. (2015). Neonatal hearing screening: what we have achieved and what needs to be improved. *International Journal of Pediatric Otorhinolaryngology*, 79, 635–7.
- Olson, K. (2016). *Essentials of Qualitative Interviewing*. Routledge.
- Olusanya, B. O. (2001). Early detection of hearing impairment in a developing country: what options? *Audiology*, 40, 141-147.
- Olusanya, B. O. (2005). State of the world's children: life beyond survival. *Archives of Disease in Childhood*, 90, 317-318.
- Olusanya, B.O. (2007). Addressing the global neglect of childhood hearing impairment in developing countries. *PLoS medical*, 4(4), 0626-0630.

- Olusanya, B. O. (2008). Priorities for early hearing detection and intervention in sub-Saharan Africa. *International Journal of Audiology*, 47(S1), 3-13.
- Olusanya, B. O. (2010). Ambient noise levels and infant screening programs in developing countries. *International Journal of Audiology*, 49, 535-541.
- Olusanya, B.O. (2011). Making targeted screening for infant hearing loss an effective option in less developed countries. *International Journal of Pediatric Otorhinolaryngology*, 75, 316-321.
- Olusanya, B. O. (2015). Screening for neonatal deafness in resource-poor countries: Challenges and solutions. *Research and Reports in Neonatology*, (5), 51-64.
- Olusanya, B. O., & Newton, V. E. (2007). Global burden of childhood hearing impairment and disease control priority project for developing countries. *Lancet*, 369, 1314-1317.
- Olusanya, B.O. & Okolo, A.A. (2006). Early hearing detection at immunization clinics in developing countries. *International Journal of Pediatric Otorhinolaryngology*, 70, 1495-1498.
- Olusanya, B. O., Ruben, R. J., & Parving, A. (2006). Reducing the burden of communication disorders in the developing world. *Journal of the American Medical Association*, 4, 441-444.
- Olusanya, B., Swanepoel, D., Castillo, H., Chap-chap, M. J., Habib, H., Mukari, S. Z., Martinez, N.V., Lin, H. C., McPherson, B. (2007). Early Detection of Infant Hearing Loss: An Epidemiological Trend in Developing Countries. *BMC Health Services Research*, 7, 14.

- Olusanya, B. O., Wirz, S. L. & Luzon, L. M. (2008). Community-based infant hearing screening for early detection of permanent hearing loss in Lagos, Nigeria: a cross-sectional study. *In Bulletin of the World Health Organisation*, 86 (12), 956-963. <http://doi.org/doi:10.2471/BLT.07.050005>
- Opperman, J., & Kanji, A. (2015). Audiological practices and findings post HPCSA position statement: Assessment of children aged 0 - 35 months. *SAJCH*, 9(2), 38-40.
- Park, S. K., Chang, J., Im, G. J., Ahn, J. H., Lee, J. H., Han, K., Chung, J. W., Kim, J. S., Jang, H., & Lee, S. (2020). Status of early hearing detection and intervention in South Korea: a nationwide population-based study of national infant health checkup. *Sci Rep*, 10, 16838.
- Pascoe, M. & Norman, V. (2011). Contextually relevant resources in speech-language therapy and audiology in South Africa – are there any? *South African Journal Communication Disorders*, 58, 2-5.
- Petersen, L., & Ramma, L. (2015). Screening for childhood hearing impairment in resource constrained settings: Opportunities and possibilities. *South African Medical Journal*, 105(11), 901-902.
- Petrocchi-Bartal, L. (2011). Clinic based hearing screening protocols: The feasibility of implementing the Health Professions Council of South Africa Year 2007 guidelines. (Masters dissertation). <http://wiredspace.wits.ac.za/bitstream/handle/10539/10134/Petrocchi-Bartal>.
- Petrocchi-Bartal, L., & Khoza-Shangase, K. (2014). Hearing screening procedures and protocols in use at immunisation clinics in South Africa. *South African Journal of Communication Disorders*, 61(1), 1-9.

- Petrocchi-Bartal, L., & Khoza-Shangase, K. (2016). Infant hearing screening at primary healthcare immunisation clinics in South Africa: The current status *South African Journal of Child Health*, 10(2), 139-143.
- Pillay, D., & Serooe, T. (2019). Shifting and transforming the practice of audiology: The inclusion of traditional healing. *South African Journal of Communication Disorders*, 66(1), 635.
- Pillay, M., Tiwari, R., Kathard, H., & Chikte, U. (2020). Sustainable workforce: South African Audiologists and Speech Therapists. *Human Resources for Health*. 18(47). 1-13. <https://doi.org/10.1186/s12960-020-00488-6>
- Pynnonen, M. A., Handelsman, J. A., King, E. F., Singer, D. C., Davis, M. M., & Lesperance, M. M. (2016). Parent perception of newborn hearing screening: Results of a US National Survey. *JAMA Otolaryngology—Head & Neck Surgery*, 142(6), 538–543.
- Rai, R., & Thakur, N. (2013). Universal screening of newborns to detect hearing impairment – is it necessary? *International Journal of Pediatric Otorhinolaryngology*, 77, 1036-1041.
- Rajagopalan, R., Selvarajan, H., Rajendran, A., & Ninan, B. (2014). Grandmothers' perspectives on hearing loss in children and newborn hearing screening. *Indian Journal of Otology*, 20(1), 20-23.
- Ramgoon, S., Dalasile, N. Q., Paruk, Z., & Patel, C. J. (2011). An exploratory study of trainee and registered psychologists' perceptions about indigenous healing systems. *South African Journal of Psychology*, 41(1), 90–100.

- Ravi, R., Gunjawate, R. D., Yerraguntla, K., & Lewis, E. L. (2017). A national survey of knowledge, attitude and practices among pediatricians towards newborn hearing screening in India. *International Journal of Pediatric Otorhinolaryngology*, 95, 9-14.
- Ravi, R., Gunjawate, D. R., Yerraguntla, K., Lewis, L. E., Driscoll, C., & Rajashekhar, B. (2016). Follow-up in Newborn Hearing Screening- A Systematic Review. *International Journal of Pediatric Otorhinolaryngology*. 16. 1-32.
<http://doi.org/10.1016/j.ijporl.2016.08.016>.
- Ravi, R., Gunjawate, D. R., Yerraguntla, K., Noronha, J. A., Lewis, L. E., & Bellur, R. (2017). Knowledge, Attitude and Practices Among Nurses Towards Newborn Hearing Screening in India. *International Journal of Pediatric Otorhinolaryngology*, 95, 9-14.
- Ravi, R., Gunjawate, R. D., Yerraguntla, K., & Rajashekhar, B. (2018). Systematic review of knowledge of, attitudes towards, and practices for newborn hearing screening among healthcare professionals. *International Journal of Pediatric Otorhinolaryngology*, 104, 138-144.
- Ravitch, S. M., & Riggan, R. (2012). *Reason & Rigor: How Conceptual Frameworks Guide Research*. SAGE Publications.
- Ravitch, S. M., & Carl, N. M. (2015). *Qualitative Research: Bridging the Conceptual, Theoretical, and Methodological*. SAGE Publications.
- Ravitch, S. M., & Riggan, M. (2016). *Reason & Rigor: How Conceptual Frameworks Guide Research* (2nd ed.). SAGE Publications.
- Ritchie, J., Lewis, J., Nicholls, C. M., & Ormston, R. (2013). *Qualitative Research Practice: A guide for Social Science Students and Researchers* (2nd ed.). SAGE Publications.

- Ross, E. (2010). Inaugural lecture: African spirituality, ethics and traditional healing—implications for indigenous South African social work education and practice. *South African Journal of Bioethics Law*, 3(1), 44–51.
- Russ, S. A., Hanna, D., DesGeorges, J., & Forsman, I. (2010). Improving Follow-up to Newborn Hearing Screening: A Learning-Collaborative Experience. *Pediatrics*, 126(1), S59-S69.
<https://doi.org/10.1542/peds.2010-0354K>
- Russo, I.C.P. (2000). Overview of audiology in Brazil: state of the art. *Audiology*, 39, 202-206.
- Sahli, A. S., (2018). Significance of early diagnosis and early intervention in early childhood hearing loss. *Journal of Early Childhood Studies*, 2(3), 592-603.
- Sahu, P. K. (2013). *Research Methodology: A Guide for Researchers In Agricultural Science, Social Science and Other Related Fields*. Springer Science & Business Media.
- Saldana, J. (2012). *The Coding Manual for Qualitative Researchers* (2nd ed.). SAGE Publications.
- Samuels, A., Slemming, W., & Balton, S. (2012). Early Childhood Intervention in South Africa in Relation to the Developmental Systems Model. *Infants and Young Children*, 25 (4), 334-345.
- Sarsby, A. (2016). *SWOT Analysis: A guide to SWOT for business studies students*. Lulu.com.
- Seidman, I. (2019). *Interviewing as Qualitative Research: A guide for Researchers in Education and the Social Studies* (5th ed.). Teachers College Press.
- Scheepers, L. J., Swanepoel, D. W., & Le Roux, T. (2014). Why parents refuse newborn hearing screening and default on follow-up rescreening - A South African perspective. *Journal of Pediatric Otorhinolaryngology*, 78(4), 652-658.

- Sharma, Y., Mishra, G., Bhatt., S., & Nimbalkar, S. (2015). Neonatal Hearing Screening Programme (NHSP): At A Rural Based Tertiary Care Centre. *Indian Journal Otolaryngology Head Neck Surgery*, 67(4), 388-393.
- Shearer, A. E., Shen, J., Amr, S., Morton, C. C., & Smith, R. J. (2019). A proposal for comprehensive newborn hearing screening to improve identification of deaf and hard-of-hearing children. *Genet Med*, 21, 2614–2630.
- Sibinga, C. T. S. (2018). *Ensuring Research Integrity and the Ethical Management of Data*. IGI Global.
- Silva, E. A., Healey, P., Harris, N., & Broeck, P. V. d. (2014). *The Routledge Handbook of Planning Research Methods*. Routledge Handbook.
- South African National Treasury. (2010). Estimates of National Health Expenditure. Pretoria: South African National Treasury. <http://www.treasury.gov.za/publications/guidelines/2010%20EI>
- Sreejesh, S., Mohapatra, S., & Anushree, M. A. (2013). *Business Research Methods: An Applied Orientation*. Springer Science & Business Media.
- Störbeck, C., & Moodley, S. (2011). ECD policies in South Africa: What about children with disabilities? *Journal of African Studies and Development*, 3, 1–8.
- Störbeck, C., & Young, A. (2016). The HI HOPES data set of deaf children under the age of 6 in South Africa: maternal suspicion, age of identification and newborn hearing screening. *BioMed Central Pediatrics*, 16(45), 10.
- Stuckler, D., Basu, S., & McKee, M. (2011). Health care capacity and allocations among South Africa's provinces: Infrastructure inequality traps after the end of apartheid. *American Journal of Public Health*, 101(1), 165-172.

- Swanepoel, D.W. (2006). Audiology in South Africa. *International Journal of Audiology*, 45, 262–266.
- Swanepoel, D. W., & Almec, N. (2008). Maternal views on infant hearing loss and early intervention in a South African community. *International Journal of Audiology*, 47(1), S44-S48.
<https://doi.org/10.1080/14992020802252279>
- Swanepoel, D. W., Delpont, S. D., & Swart, J. G. (2004). Universal newborn hearing screening in South Africa – A first-world dream? *South African Medical Journal/ Suid-Afrikaanse Tydskrif Vir Geneeskunde*, 94, 634–635.
- Swanepoel, D., Ebrahim, S., Joseph, A., & Friedland, P. L., (2007). Newborn hearing screening in a South African private healthcare hospital. *International Journal of Pediatric Otorhinolaryngology*, 71, 881—887.
- Swanepoel, D. W., & Hall, J. (2010). A systematic Review of Telehealth Applications in Audiology. *Telemedicine and e-Health*, 16 (2), 181-200.
- Swanepoel, D.W., Hugo, R., & Louw, B. (2005). Infant hearing screening in the developing world. *Audiology Today*, 17(4), 16–19.
- Swanepoel, D., Johl, L., & Pienaar, D. (2013). Childhood hearing loss and risk profile in a South African population. *International Journal of Pediatric Otorhinolaryngology*, 77, 394-398.
- Swanepoel, D.W., Störbeck, C., & Friedland, P. (2009). Early hearing detection and intervention services in South Africa. *International Journal of Pediatric Otorhinolaryngology*, 73(6), 783-786.

- Taylor, S. J., Bogdan, R., & DeVault, M. (2015). *Introduction to Qualitative Research Methods: A Guidebook and Resource* (4th ed.). John Wiley & Sons.
- Teixeira, L., & Joubert, K. (2014). Availability of audiological equipment and protocols for paediatric assessment and hearing aid fitting in Gauteng, South Africa. *South African Journal of Communication Disorders*, 61(1), 8.
- Tharpe, A. M., & Seewald, R. (2016). *Comprehensive Handbook of Pediatric Audiology*. (2nd ed.). Plural Publishing, Incorporated.
- Theunissen, M., & Swanepoel, D. W. (2008). Early hearing detection and intervention services in the public health sector in South Africa. *International Journal of Audiology*, 47(1), 23-29.
- Thomson, V., & Yoshinaga-Itano, C. (2018). The Role of Audiologists in Assuring Follow-Up to Outpatient Screening in Early Hearing Detection and Intervention Systems. *American Journal of Audiology*, 27(3), 283-293.
http://doi.org/10.1044/2018_AJA-17-0113.
- Van der Spuy, T., & Pottas, L. (2008). Infant hearing loss in South Africa: age of intervention and parental needs for support. *International Journal of Audiology*, 47(1), 30-35.
- van Rensburg, H. C. J. (2014). South Africa's protracted struggle for equal distribution and equitable access – Still not there. *Human Resources for Health*, 12, 1–16.
<https://doi.org/10.1186/1478-4491-12-26>
- Venter, C., & Viljoen, J. (2008). Children with Hearing Loss: Parental Needs regarding Diagnosis. Unpublished B. Communication Pathology research report, University of Pretoria.

- Watkin, P., McCann, D., Law, C., Mullee M., Petrou, S., Stevenson, J., Worsfold, S., Yuen, H. M., & Kennedy C. (2007). Language ability in children with permanent childhood hearing impairment: the influence of early management and family participation. *Pediatrics*, 120, e694–e701.
- White, K. R. (2014). Newborn hearing screening. In Katz, J., Medwetsky, I., Burkard, R., & Hood, L. *Handbook of clinical audiology* (7th ed.). Lippincott, Williams, & Wilkins.
- White, K. P., & Blaiser, K. M. (2011). Strategic Planning to Improve EHDI Programs: *The Volta Review*, 111(2), 83-108
- WHO. (2010). *Newborn and infant hearing screening: Current issues and guiding principles for action*. Retrieved from Geneva, Switzerland: https://www.who.int/blindness/publications/Newborn_and_Infant_Hearing_Screening_Report.pdf?ua=1
- WHO. (2019). *Deafness and hearing loss*. World Health Organisation. <https://www.who.int/news-room/fact-sheets/detail/deafness-and-hearing-loss>
- Willing, C. & Rogers, W. S. (2017). *SAGE Handbook of Qualitative Research in Psychology* (2nd ed.). SAGE.
- Wood, S. A., Sutton, G. J., & Davis, A. (2015). Performance and characteristics of the Newborn Hearing Screening Programme in England: The first seven years. *International Journal of Audiology*, 54 (353-358).
- Yoshinaga-Itano, C. (2003). Universal newborn hearing screening programs and developmental outcomes. *Audiological Medicine*, 1, 199-206.
- Yoshinaga-Itano, C. (2004). Levels of evidence: universal newborn hearing screening (UNIHS) and early hearing detection and intervention systems (EHDI). *Journal of Communication Disorders*, 37, 451-465.

Young, M. (2016). Private vs. Public Healthcare in South Africa. Honors Theses. 2741.

https://scholarworks.wmich.edu/honors_theses/2741

Yun, C., Wang, Z., Gao, J., He, P., Guo, C., Chen, G., & Zheng, X. (2017). Prevalence and Social Risk Factors for Hearing Impairment in Chinese Children—A National Survey. *Int. J. Environ. Res. Public Health*, 14(1), 88-99.

<http://doi.org/10.3390/ijerph14010088>

Zaitoun, M., Cumming, S., & Purcell, A. (2019). Evaluating Factors Affecting Audiologists' Diagnostic Performance in Auditory Brainstem Response Reading: Training and Experience. *International Journal of Medical and Health Sciences*, 13(5), 246-251.

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Greetings

1. My name is Naedene Naidoo and I have recently qualified as an Audiologist, who has taken an interest in implementation of the early hearing detection and intervention guideline, specifically newborn hearing screening, thus the purpose of the interview today.

You have been identified as a participant due to your knowledge, experience and expertise in this area and I believe you will be able to assist me in obtaining information, regarding the strengths, weaknesses, opportunities and threats towards EHDI in South Africa, specifically KwaZulu-Natal.

This guideline can be used to aid in answering the telephonic interview questions.

Strengths	<ul style="list-style-type: none">• What resources in South Africa do you have access to?• What are the contributing factors towards EHDI success in South Africa?
Weaknesses	<ul style="list-style-type: none">• What improvements can be made towards practice and implementation of EHDI services?• What are the challenges towards EHDI success?
Opportunities	<ul style="list-style-type: none">• What are some strategies that can be used in South Africa to improve EHDI service delivery?• What national trends can positively impact EHDI, if adopted/implemented in South Africa?
Threats	<ul style="list-style-type: none">• What are the obstacles faced in South Africa, affecting EHDI implementation and practice?

2. Demographical information <i>(tick the option that fits best)</i>	
Participant no.	
Age	<ul style="list-style-type: none"> - 21 to 30 years - 31 to 40 years - 41 to 50 years - 51 to 60 years - 61 years +
Gender	<ul style="list-style-type: none"> - Male - female
Race	<ul style="list-style-type: none"> - White - African - Indian
Level of education	<ul style="list-style-type: none"> - bachelors - masters - doctoral
Years in practice	<ul style="list-style-type: none"> - 1-5 years - 6-10 years - 11-15 years - 16-20 years - >20 years
Healthcare sector employed	<ul style="list-style-type: none"> - Public - Private
Setting of practice	<ul style="list-style-type: none"> - Rural - Urban
Level of healthcare facility	<ul style="list-style-type: none"> - Community based clinic - District hospital (level 1) - Regional hospital (level 2) - Provincial tertiary hospital (level 3) - Central hospital (level 4) - Specialised hospital (level 4)

3. Begin voice recording.

Guidelines

Question 1

The EHDI guidelines have been published by the HPCSA first in 2007 and a revised version in 2018. This is a professional guideline which should be implemented by all audiologists, however according to studies and literature universal newborn hearing screening is not conducted in many settings. Based on these guidelines what are the facilitators (strengths & opportunities) and barriers (weaknesses & threats) that impact implementation and practice?

<p>Newborn hearing screening</p> <p><i>Question 2</i></p> <p>According to the HPCSA EHDI guidelines UNHS should be conducted in all healthcare facilities in South Africa, however certain institutions conduct targeted or risk-based screening and others screen on referral based systems. What are your thoughts based on guidelines and current practice is best suited for our South African context?</p>
<p>Initial age of screening</p> <p><i>Question 3</i></p> <p>EHDI benchmarks state that all infants should have their initial screening by no later than one-month and six-weeks for infants at clinic based programmes. What are your thoughts regarding the practicality of screening at one-month and at six-weeks for infants at clinic based programmes?</p> <p><i>Question 4 (follow-up question)</i></p> <p>How can these guidelines be adapted/modified to translate into practice to ensure implementation of newborn hearing screening?</p>
<p>Screening protocols & platforms</p> <p><i>Question 5</i></p> <p>There are many protocols and programmes for NHS at different levels of healthcare such as the netcare newborn hearing screening programme, risk based screening, referral based screening etc. Can you tell me about the protocol you follow when conducting screening and does it vary from hospital to hospital?</p>
<p>Loss to follow-up</p> <p><i>Question 6</i></p> <p>What in your opinion are the barriers (threats and weaknesses) at the different levels (political, professional etc.) affecting follow up rates?</p>
<p>Age of diagnosis & Intervention</p> <p><i>Question 7</i></p> <p>According to the EHDI guidelines infants should be diagnosed with a hearing loss by three-months, no later than four-months. Intervention should be provided by no later than six-months and eight-months for those in clinic-based settings. What are your thoughts regarding the practicality of diagnosing an infant at three-months/ four-months and at eight-months for infants at clinic based programmes?</p>

Data management*Question 8*

Data management is an essential part in screening to track patients, monitor and evaluate the effectiveness of a programme. How effective is the data management system in place given the context?

3. Thank you for your participation in the study.
4. Conclude interview
5. You will receive a summary of the research findings once the study is completed should you wish to.
6. Stop voice recording.

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Probe questions/ follow-up questions for participants
Guidelines Note: Different levels which include political, professional, educational, institutional, practice and social)
Newborn hearing screening <ul style="list-style-type: none">• What recommendations can you recommend to facilitate and ensure progress of EHDI implementation?
Initial age of screening <ul style="list-style-type: none">• How can these guidelines be adapted/modified to translate into practice to ensure implementation of newborn hearing screening?
Screening protocols & platforms <ul style="list-style-type: none">• What are the facilitators that affect implementation of the proposed EHDI screening procedures and are they contextually relevant?• What are the barriers that affect implementation of the proposed EHDI screening procedures and are they contextually relevant?
Loss to follow-up <ul style="list-style-type: none">• What recommendations do you have to facilitate improved follow-up rates given the South African context?• What are the facilitators at the different levels (political, professional etc.) which affect implementation according to the EHDI guidelines?• What are the barriers (threats and weaknesses) at the different levels (political, professional etc.) which affect implementation according to the EHDI guidelines?
Age of diagnosis & Intervention <ul style="list-style-type: none">• How can these guidelines be adapted/modified to translate into practice?



18 February 2020

Miss Naedene Naidoo (214562170)
School Of Health Sciences
Westville Campus

Dear Miss Naidoo,

Protocol reference number: HSSREC/00001003/2020

Project title: Early hearing detection and intervention in KwaZulu-Natal: Analysis of barriers and facilitators from guideline generation to clinical application.

Degree: Masters

Approval Notification – Expedited Application

This letter serves to notify you that your application received on 03 February 2020 in connection with the above, was reviewed by the Humanities and Social Sciences Research Ethics Committee (HSSREC) and the protocol has been granted **FULL APPROVAL**

Any alteration/s to the approved research protocol i.e. Questionnaire/Interview Schedule, Informed Consent Form, Title of the Project, Location of the Study, Research Approach and Methods must be reviewed and approved through the amendment/modification prior to its implementation. In case you have further queries, please quote the above reference number. PLEASE NOTE: Research data should be securely stored in the discipline/department for a period of 5 years.

This approval is valid until 18 February 2021.

To ensure uninterrupted approval of this study beyond the approval expiry date, a progress report must be submitted to the Research Office on the appropriate form 2 - 3 months before the expiry date. A close-out report to be submitted when study is finished.

HSSREC is registered with the South African National Research Ethics Council (REC-040414-040).

Yours sincerely,

Dr Shamila Naidoo (Deputy Chair)

/dd

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Founding Campuses: Edgewood Howard College Medical School Pietermaritzburg Westville

INSPIRING GREATNESS



09 April 2020

Miss Naedene Naidoo (214562170)
School Of Health Sciences
Westville Campus

Dear Miss Naedene Naidoo,

Protocol reference number: HSSREC/00001003/2020

Project title: Early hearing detection and intervention in KwaZulu-Natal: Analysis of barriers and facilitators from guideline generation to clinical application.

Degree: Masters

Approval Notification – Amendment Application

This letter serves to notify you that your application and request for an amendment received on 31 March 2020 has now been approved as follows:

- Change in data collection method

Any alterations to the approved research protocol i.e. Questionnaire/Interview Schedule, Informed Consent Form; Title of the Project, Location of the Study must be reviewed and approved through an amendment /modification prior to its implementation. In case you have further queries, please quote the above reference number.

PLEASE NOTE: Research data should be securely stored in the discipline/department for a period of 5 years.

All research conducted during the COVID-19 period must adhere to the national and UKZN guidelines.

Best wishes for the successful completion of your research protocol.

Yours faithfully



Professor Dipane Hlalele (Chair)

/dd

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Date:

Greetings Sir/Madam

Re: Request to participate in proposed research study

My name is Naedene Naidoo and I am a postgraduate audiology research student, from the University of KwaZulu-Natal, College of Health Sciences: Discipline of Audiology.

You have been invited to consider participating in a qualitative research study looking at early hearing detection and intervention, in order to promote effective implementation of newborn screening services in KwaZulu-Natal. The aim and purpose of the study is to determine barriers and facilitators to EHDI in KZN, as reported by audiologists/speech therapists and audiologists': from guideline generation to clinical application. The study is expected to enroll 5-25 participants from various public and private healthcare facilities within KwaZulu-Natal. It will involve your participation in a telephonic interview. Should you decide to participate in the research study, you will be required to share your experiences and expertise with the researcher to allow for an in-depth understanding of context relevant guidelines and practice. Your responses will be audio-recorded for accuracy during data analysis. The duration of your participation if you choose to enrol and remain in the study is expected to be approximately 45-60 minutes. The study is funded by the researcher.

The study does not involve any risks and/or discomforts. We hope that the study will create awareness on the importance of early hearing and detection services, specifically newborn hearing screening.

The study has been ethically reviewed and approved by the UKZN Humanities and Social Sciences Research Ethics Committee (approval number: HSSREC/00001003/2020).

In the event of any problems or concerns/questions you may contact the researcher, N. Naidoo (cell number: 0763757312 or naidna01@gmail.com) or the Humanities & Social Sciences Research Ethics Administration, contact details as follows:

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Your participation in this study is voluntary and you may withdraw participation at any point. In the event of refusal/withdrawal of participation, you will not incur penalty or loss of treatment or other benefit to which they are normally entitled. The duration of the telephonic interview is expected to be 45-60 minutes, should you decide to participate. Arrangements will be made to conduct the telephonic interview after your consent to participate.

There is no cost incurred by the participant as a result of participation in the study.

Anonymity and confidentiality is of utmost importance and all responses will be kept confidential. No names shall be required and confidentiality will be maintained at all times as participants will be given a participant code, thus ensuring that anonymity and confidentiality is maintained. Any personal identification exchanged between you and the researcher will remain confidential throughout and after completion of the study. Findings will be analysed and interpreted and given to the UKZN Audiology department. Information provided by you may be present in the final dissertation in the form of extracts. The data will only be accessible to the supervisor and researchers and kept under lock and key for the duration of the study. Once completed, the data obtained will be kept safely for a period of five years and will be disposed of by means of shredding.

N. Naidoo (researcher)

N. Khan

N. Khan (supervisor)

Consent

I (participant), _____ have been informed about the study: **Early hearing detection and intervention in KZN: Analysis of barriers and facilitators from guideline generation to clinical application** by the researcher: N. Naidoo.

I understand the purpose and procedures of the study.

I have been given an opportunity to answer questions about the study and have had answers to my satisfaction.

I declare that my participation in this study is entirely voluntary and that I may withdraw at any time without affecting any of the benefits that I usually am entitled to.

If I have any further questions/concerns or queries related to the study I understand that I may contact the researcher at (naidna01@gmail.com or 076 375 7312).

If I have any questions or concerns about my rights as a study participant, or if I am concerned about an aspect of the study or the researchers then I may contact:

HUMANITIES & SOCIAL SCIENCES RESEARCH ETHICS ADMINISTRATION

Research Office, Westville Campus
Govan Mbeki Building
Private Bag X 54001
Durban
4000
KwaZulu-Natal, SOUTH AFRICA
Tel: 27 31 2604557 - Fax: 27 31 2604609
Email: HSSREC@ukzn.ac.za

Additional consent, where applicable

I hereby provide consent to:

Audio-record my interview YES / NO

Signature of Participant

Date

DISCIPLINE OF AUDIOLOGY
SCHOOL OF HEALTH SCIENCES
Tel: 031 260 7438/8986
Fax: 031 260 7622
E-mail: sitholep2@ukzn.ac.za
E-mail: naidoor1@ukzn.ac.za



Greetings

The purpose of the study is to identify barriers and facilitators to EHDI from guideline generation to clinical application. You have been identified as a participant due to your knowledge, experience and expertise in this area and I believe you will be able to assist me in obtaining information, regarding the strengths, weaknesses, opportunities and threats towards EHDI in South Africa, specifically KwaZulu-Natal. A telephonic interview will be conducted for approximately 45-60 minutes during which your responses will be audio-recorded.

This guideline can be used to aid in answering the telephonic interview questions.

- | | |
|---------------|--|
| Strengths | <ul style="list-style-type: none">• What resources in South Africa do you have access to?• What are the contributing factors towards EHDI success in South Africa? |
| Weaknesses | <ul style="list-style-type: none">• What improvements can be made towards practice and implementation of EHDI services?• What are the challenges towards EHDI success? |
| Opportunities | <ul style="list-style-type: none">• What are some strategies that can be used in South Africa to improve EHDI service delivery?• What national trends can positively impact EHDI, if adopted/implemented in South Africa? |
| Threats | <ul style="list-style-type: none">• What are the obstacles faced in South Africa, affecting EHDI implementation and practice? |
-

Please fill out the following information below:

Demographical information <i>(highlight the option that fits best)</i>	
Participant no.	
Age	<ul style="list-style-type: none"> - 21 to 30 years - 31 to 40 years - 41 to 50 years - 51 to 60 years - 61 years +
Gender	<ul style="list-style-type: none"> - Male - Female
Race	<ul style="list-style-type: none"> - White - African - Indian
Level of education	<ul style="list-style-type: none"> - bachelors - masters - doctoral
Years in practice	<ul style="list-style-type: none"> - 1-5 years - 6-10 years - 11-15 years - 16-20 years - >20 years
Healthcare sector employed	<ul style="list-style-type: none"> - Public - Private - N/A
Setting of practice	<ul style="list-style-type: none"> - Rural - Urban - N/A
Level of healthcare facility	<ul style="list-style-type: none"> - Community based clinic - District hospital (level 1) - Regional hospital (level 2) - Provincial tertiary hospital (level 3) - Central hospital (level 4) - Specialised hospital (level 4) - N/A

This is a guideline based on the questions that will be targeted during the interview:

1. Based on the EHDI guidelines describe the facilitators (strengths & opportunities) and barriers (weaknesses & threats) impacting implementation and practice?
2. EHDI benchmarks state that all infants should have their initial screening by no later than one-month and six-weeks for infants at clinic based programmes. What are your thoughts regarding the practicality of screening at one-month and at six-weeks for infants at clinic based programmes?
3. According to the EHDI guidelines infants should be diagnosed with a hearing loss by three-months, no later than four-months. Intervention should be provided by no later than six-months and eight-months for those in clinic based settings. What are your thoughts regarding the practicality of this timeframe and contextualization's for South Africa?
4. Data management is an essential part in screening to track patients, monitor and evaluate the effectiveness of a programme. What do you think are the barriers and facilitators affecting a development of a proper data management system?

Once the telephonic interview has been completed please send this completed form to naidna01@gmail.com. Your participation in this research study is greatly appreciated.

DISCIPLINE OF AUDIOLOGY
SCHOOL OF HEALTH SCIENCES
Tel: 031 260 7438/8986
Fax: 031 260 7622
E-mail: sitholep2@ukzn.ac.za
E-mail: naidoor1@ukzn.ac.za



Date: _____

Pilot Study Feedback Form	
1.	Were the questions easy to understand?
2.	Did the questions follow a logical sequence
3.	Was the time scheduled for the interview appropriate to obtain the necessary information?
4.	Were there any ambiguous questions? Should there be any closed ended questions?
5.	Did the interviewer guide and probe appropriately? Did the interviewer provide unbiased involvement in the session?
6.	Other comments...

Thank you for your time and valuable feedback.



Zertifikat Certificat

Certificado Certificate

Promouvoir les plus hauts standards éthiques dans la protection des participants à la recherche biomédicale
Promoting the highest ethical standards in the protection of biomedical research participants



Certificat de formation - Training Certificate

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Naedene Naidoo

a complété avec succès - has successfully completed

Introduction to Research Ethics

du programme de formation TRREE en évaluation éthique de la recherche
of the TRREE training programme in research ethics evaluation

Release Date: 2019/11/27
CID: a5e76204e

Professeur Dominique Sprumont
Coordinateur TRREE Coordinator



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[REV : 20170310]



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South Africa

du programme de formation TRREE en évaluation éthique de la recherche
of the TRREE training programme in research ethics evaluation

Release Date: 2019/11/27
CID: c59e1f662

Professeur Dominique Sprumont
Coordinateur TRREE Coordinator



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Swiss Academy of Medical Science (SAMS/ASSM/SAMW) (www.sams.ch) - Commission for Research Partnerships with Developing Countries (www.kfpe.ch)

[REV : 20170310]

Table 4

Analysis and description of strengths, weaknesses, opportunities and threats identified from the study

SWOT category	Description
Strengths	<ul style="list-style-type: none"> • guideline exists • research and evidence-based • contextual adjustments for SA • supportive of early identification • private has staff and equipment • private better at adhering to guidelines • private able to follow-up and phone patients • awareness of paediatricians and ENTs towards EHDI • wider application of an AABR as it is not dependent on middle ear state • initial contact to build and foster relationships with parents • ABR in private conducted in theatre • more outreach services • empowering parents with knowledge for decision making
Weaknesses	<ul style="list-style-type: none"> • lack of consultation from people at ground level • no national database • lack of information • limited recording and reporting • variability in data capturing or management • community service audiologists unaware of protocols for equipment procurement • lack of confidence in testing • large caseload in public • prioritize babies with risk factors • some audiology departments do not have senior audio to advise or mentor • long waiting lists in public • lack of knowledge at a political level • poor level knowledge amongst healthcare professionals • lack of collaboration between DoH & DoE • poor communication between audiologists in private and public • new mothers often overwhelmed and may forget about test • reliability and validity of OAE testing in hospitals • invasive and time-consuming AABR testing • state of the child • sedation prescribed for electrophysiological testing • cost for test in urban areas • cost for travelling in rural areas • limited understanding in rural areas • poor knowledge levels in rural areas • cultural reasons affecting follow-up appointments

Opportunities	<ul style="list-style-type: none"> • development of protocols per district or area • creation of a database • employment of A/STAs • inclusion training programs for community service audiologists • more advocacy and workshops • inclusion of tele-audiology • provision of equipment • creation of a dedicated task teams • mandate guidelines • creation of WhatsApp groups between professionals to improve collaboration • improve communication between healthcare professionals • involvement of nurses is a good way to catch babies at the clinics • inclusion of AABR if baby fails an OAE • ensuring mothers aware that pass on an OAE does not mean the child will not have a hearing problem in the future • collaboration between doctors and audiologists to develop a good sedation protocol • inclusion of open days at hospitals • importance of counselling parents or caregivers and families • more aware of cultural and traditional beliefs and views • education and awareness promotion • creation of pamphlets and posters
Threats	<ul style="list-style-type: none"> • diverse context • too much emphasis on initial screening • guidelines not reviewed enough • insufficient funding/capital • shortage of A/STAs thus difficult to run NHS programs • A/STAs not prioritized for equipment or human resources • lack of equipment • inability to maintain, repair and calibrate equipment • audiology services are viewed as non-essential • nurses have a lack of understanding and huge workloads • high rate of loss-to-refer or poor follow-up • medical aids are not paying for hearing screening in private • OAE highly dependent on middle ear state • lack of availability and access to services in rural areas • urban versus rural disparity • cycle of grief experienced by parents or caregivers

Figure 10

Mind map developed: Improving EHDI guidelines

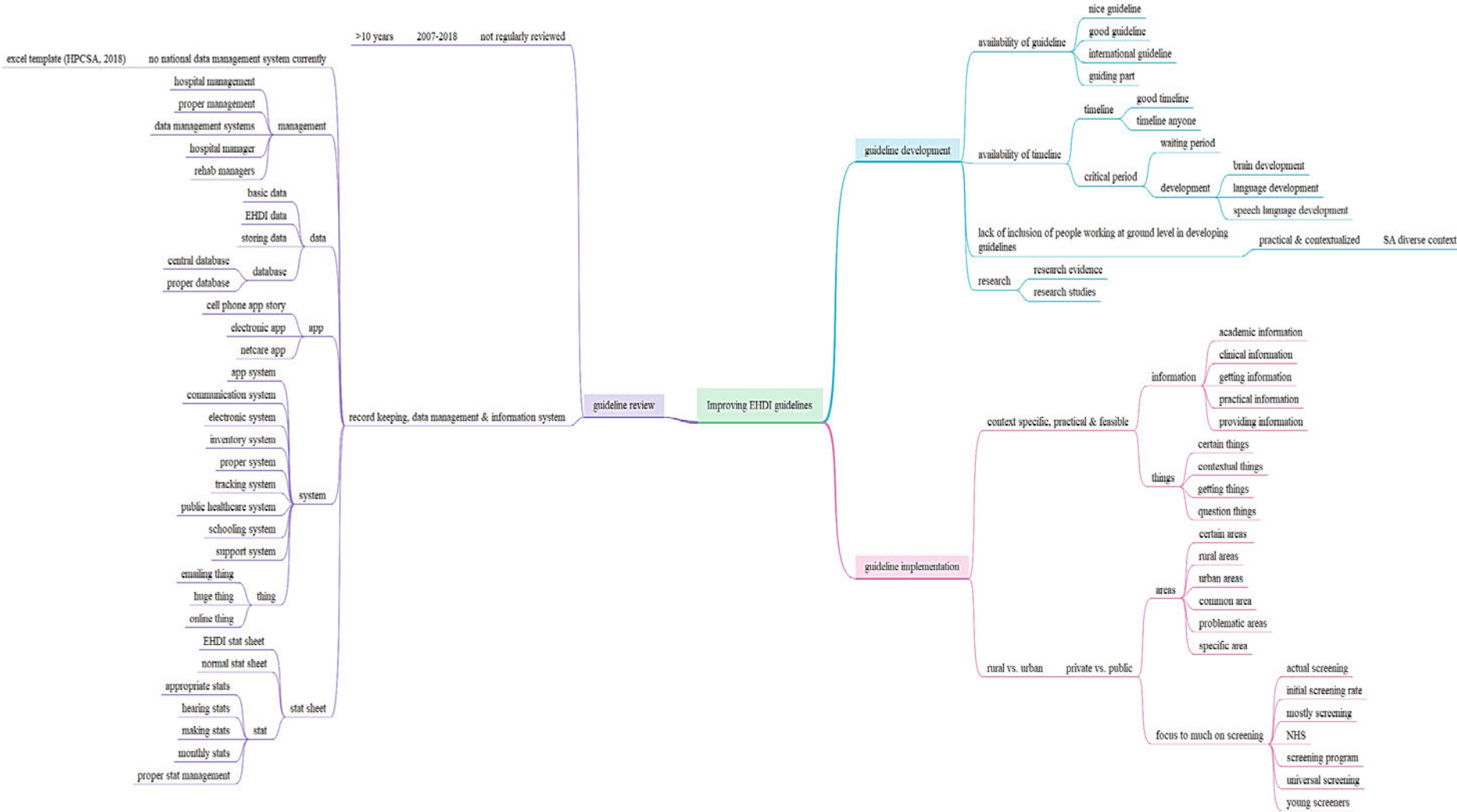


Figure 11

Mind map developed: Investing in resources and infrastructure for EHDI service delivery

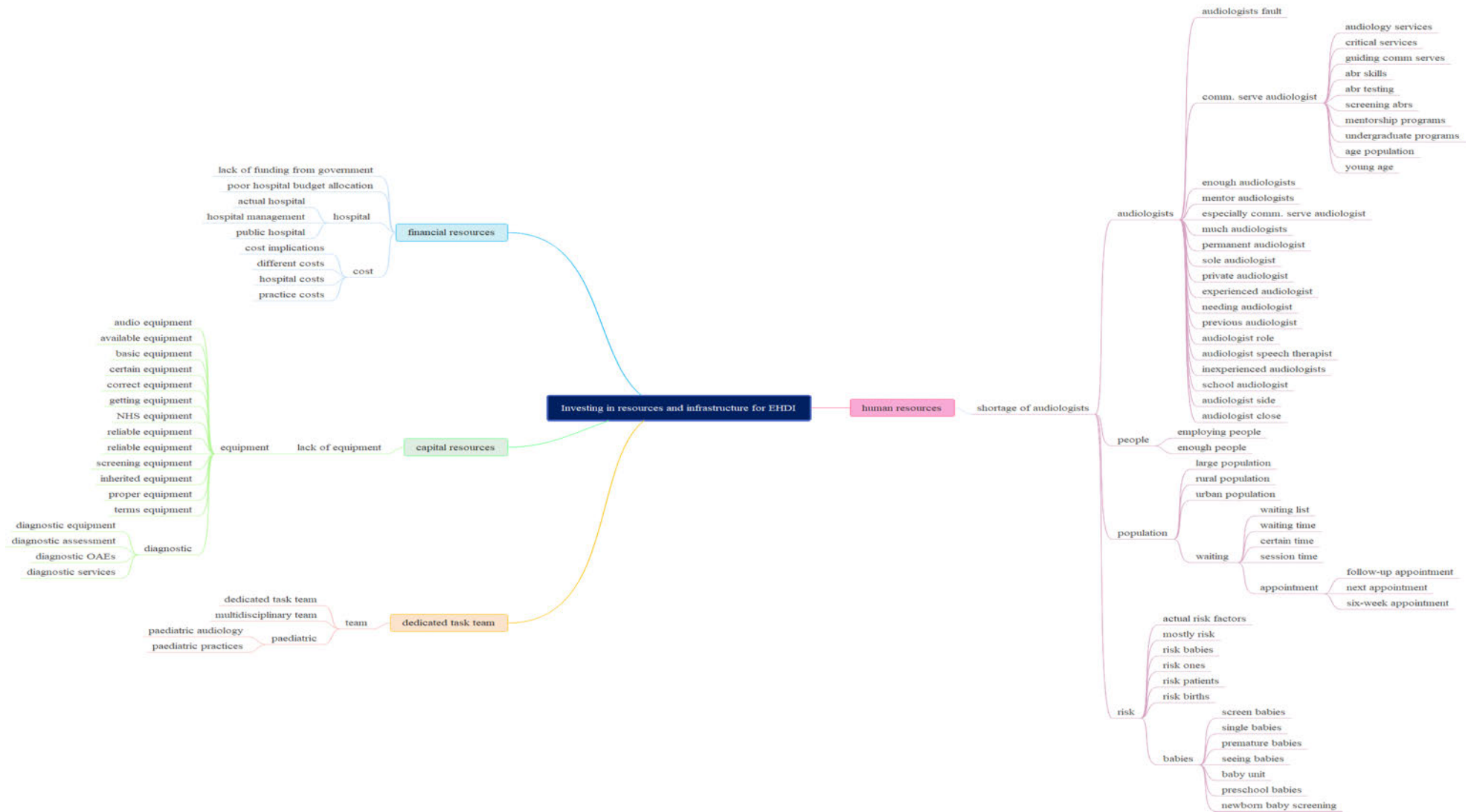


Figure 12

Mind map developed: Facilitating professional development, training and education and strengthening inter-sectoral collaboration for EHDI

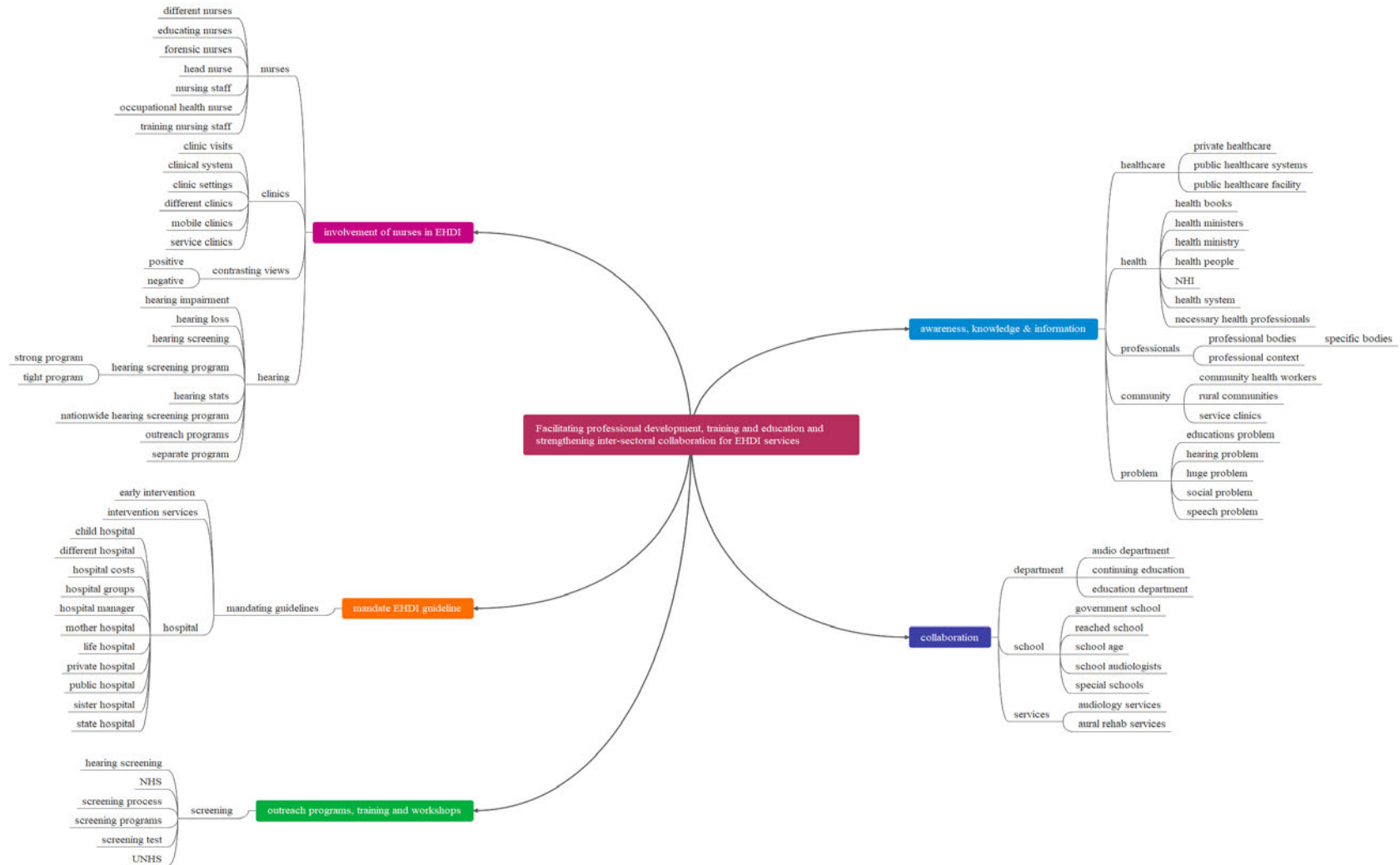


Figure 13

Mind map developed: Managing follow-up and evaluating protocols and procedures for screening

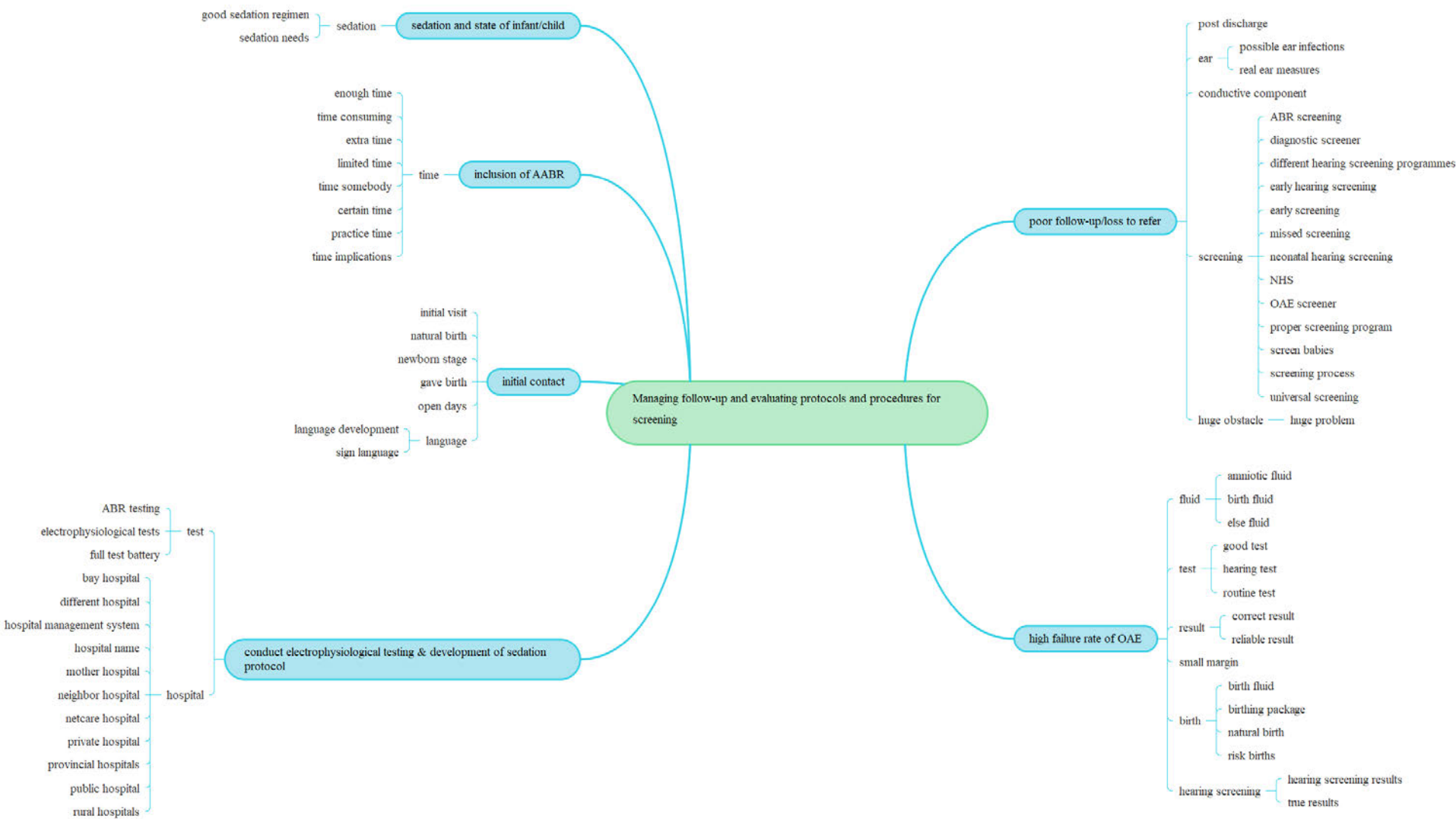


Figure 14

Mind map developed: Engaging, understanding and supporting caregivers or families

