Evaluation of the Management of Severe Malnutrition in two Hospitals in Namibia

MWIMANENWA NJUNGU

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SUPERVISOR: PROFESSOR THANDI PUOANE

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Mwimanenwa Njungu

KEYWORDS:

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Abstract

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M Njungu

Master of Public Health mini-thesis, Department of School of Public Health, University of the Western Cape

As in most developing countries, Namibia has a prevalence of malnutrition that is still unacceptably high and the case fatality rates for severe malnutrition are expected to be correspondingly high. This is not documented as not many studies have been done in the country around the subject. This mini-thesis evaluates the management of severe malnutrition in one central hospital and one district hospital in Namibia. A cross sectional, quantitative study was undertaken in the two hospitals. A total of 154 records of all children below the age of five who were admitted for severe malnutrition over a period of thirteen months were reviewed to obtain information about recorded practices in the management of severe malnutrition. A doctor and sister in-charge from each paediatric ward were interviewed to obtain information about current practices in the management of severe malnutrition. Structured observation of available resources needed for the management of severe malnutrition was carried out. The data was analysed using Microsoft Excel computer program. The case fatality rates for severe malnutrition were calculated, and the available resources and reported practices of paediatric staff were compared with WHO guidelines for the management of severe malnutrition.

 The case fatality rates at Katutura hospital and St. Mary's hospitals were 14% and 8% respectively. In Katutura hospital and St. Mary's hospital, staff correctly recorded 58% and 40% of the recommended practices respectively. Both hospitals had close to 90% of the resources required for the treatment of severe malnutrition. The findings of this study indicate that the case fatality rates for severe malnutrition in the two hospitals are not very high but

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can be improved. The treatment practices were not in line with the WHO guidelines. The findings and recommendations will be communicated to the relevant stakeholders for consideration and action.

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Declaration

I declare that Evaluation of the Management of Severe Malnutrition in Two Hospitals in Namibia is my own work, that it has not been submitted for any degree or examination in any other university, and that all the sources I have used or quoted have been indicated and acknowledged by complete references.

Mwimanenwa Njungu   November 2008

Signed: M. Njungu

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Definitions

- *Malnutrition*: bad nutrition which includes under nutrition and over nutrition.

- *Acute malnutrition*: recent and severe weight loss as a result of acute food shortage or illness. It is measured by weight for height or mid upper arm circumference.

- *Chronic malnutrition*:   inadequate diet persistently over a longer period and presents as stunting and/or underweight.

- *Stunting*: A height for age below -2 standard deviations (SD) of National Centre for Health Statistics (NCHS) /World Health Organization (WHO) reference values (WHO, 1999; Collins *et al*, 2006a; Bern *et al*, 1997).

- *Underweight:* A weight for age below -2 SD of NCHS/WHO reference values (WHO, 1999).

- *Wasting*: A weight for height below -2 SD of NCHS/WHO reference values (WHO, 1999).

- *Moderate acute malnutrition*: A weight-for-height between 70 and 79% or less than -2SD of NCHS/WHO reference values and no oedema (WHO, 1999).

- *Severe acute malnutrition*: A weight-for-height below 70% or less than -3SD of NCHS/WHO reference values or MUAC of less than 110mm and/or bilateral pitting oedema (WHO, 1999; Collins, Dent, Binns, Bahwere, Sadler & Hallam, 2006; Weisstaub & Araya, 2008).

- *Wellcome Classification* (Reddy, 1991)

Weight (percentage of standard)	Oedema present	Oedema absent
80-60	Kwashiorkor	Underweight
<60	Marasmic-kwashiorkor	Marasmus

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WHO Classification of malnutrition (WHO, 1999)

	Classification	
	Moderate malnutrition	Severe malnutrition (Type) [a]
Symmetrical oedema	No	Yes (Oedematous malnutrition) [b]
Weight-for-height	$-3 \leq SD - score < -2$ [c] (70 – 79%)	$SD\ score < -3 (< 70\%)$ severe wasting [d]
Height- for-age	$-3 \leq SD - score < -2$ (85 – 89%)	$SD\ score < -3 (<85\%)$ severe stunting

[a] The diagnoses are not mutually exclusive.

[b] This includes kwashiorkor and marasmic kwashiorkor in older classifications. However, to avoid confusion with the clinical syndrome of kwashiorkor which includes other features, the term "oedematous malnutrition" is preferred.

[c] Below the median NCHS/WHO reference; the SD-score is defined as the deviation of the value for an individual from the median value of the reference population, divided by the standard deviation of the reference population.

SD-score = (observed value) – (median reference value)

      standard deviation of reference population

[d] Corresponds to marasmus (without oedema) in the Wellcome clinical classification. However to avoid confusion, the term "severe wasting" is preferred.

Abbreviations

WHO	World Health Organization
UNICEF	United Nations Children's Fund
MOHSS	Ministry of Health and Social Services
IVF	Intravenous Fluids
HIV	Human Immunodeficiency Virus
AIDS	Acquired Immune Deficiency Syndrome
CFR	Case Fatality Rate

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CHAPTER 1: Introduction

Malnutrition has been defined as poor nutrition from an insufficient or poorly balanced diet or faulty digestion or utilization of foods (Houghton, 2002). It refers to the medical condition in a person that result from either too little or too much food, or a diet deficient in one or more important nutrients (Summerton, Shetty, Sandle & Watt, 2002).Malnutrition is still widely prevalent in the world and poses a serious challenge as it is implicated in at least half of all the deaths occurring in children below the age of five years, especially in the developing world (World Health Organization, 2005). Children who are malnourished are susceptible to serious infections because their immune system is compromised. In addition, the combination of malnutrition with infection increases the risk of death in children who are affected by both conditions. In developing countries, moderate malnutrition is more prevalent, although the highest risk of death is found where severe malnutrition occurs, with case fatalities ranging between 20 – 30 % (Allen, 2001; UNICEF, 2005).

1.1 Background

Namibia, situated on the south-western part of the African Continent, is one of the better countries in Africa in terms of the economic indicators and is richly endowed with mineral deposits. (Safra, 2003) In spite of this, malnutrition and poverty are prevalent in some parts of the country. This may be because of a wide income disparity between the rich and the poor and an unemployment rate of 31% countywide (Ministry of Health and Social Services, 2003; Census 2001, 2003). The population size is estimated at 1, 8 million people, most of which is concentrated in the northern region (Census 2001, 2003). The capital city, Windhoek, in the central Khomas region, is home to 250 305 people while the population is more sparse in the southern regions, with Rehoboth housing a total population of approximately 20 000. The two towns, Windhoek and Rehoboth, are the sites of the current study. St. Mary's Hospital is the district hospital in Rehoboth with a bed capacity of 140 of which 30 are paediatric beds. It is serviced by 2 medical doctors. Katutura Hospital in Windhoek is a Tertiary hospital with a bed

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capacity of 740 and specialised services including a Paediatric Department. About 20% of paediatric admissions in both hospitals are due to malnutrition.

Although moderate malnutrition is more prevalent in communities, children with severe malnutrition are the ones most likely to be seen and admitted to hospital where the aim of treatment is to stabilise the child and replace the nutrients that the child has been deprived of. Not all children benefit from such admission with death resulting in a number of cases. There are a number of possible reasons why such children with severe malnutrition die during hospital admission and these include; overwhelming infection; metabolic complications that aren't corrected; bringing the child to hospital too late when there are already complications; lack of resources including manpower and the use of outdated treatment protocols (Schofield & Ashworth, 1996). Indeed, it has been claimed that this last factor plays a major role in the high mortality rate associated with severe malnutrition (Schofield & Ashworth, 1996). Discussions with a few stakeholders (clinicians and national administration) also re-emphasized some of these problems namely; children being brought to hospital only when critically ill; overwhelming infection, staff constraints at institutions.

1.2   Problem Statement

Currently, there is a lack of information on the percent of malnourished children dying during hospital treatment, possible causes of deaths and current practices of staff in the two hospitals in the two districts. There has been an introduction and implementation of WHO's integrated management of childhood illnesses (IMCI) which focuses on outpatients treatment and interventions at primary level. There are training materials on in-patient treatment of severe malnutrition developed by the WHO that have been used in other developing countries with positive results. For these materials to be utilised in Namibia there must be evidence of such need and that is why the current study is being undertaken. It is hoped that the information obtained from this study will lead to improvement in the management of severe malnutrition and reduction in the case fatality rates of severe malnutrition.

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1.3   Outline of thesis

This thesis is presented in the following order:

Chapter 1 introduces the thesis

Chapter 2 presents a review of relevant literature

Chapter 3 gives the research design and methodology

Chapter 4 presents the results of the study

Chapter 5 presents the discussion and

Chapter 6 presents the conclusions and recommendations of the study.

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CHAPTER 2: Literature Review

The review of literature presented in this chapter covers the following:

- Global problem of severe malnutrition

- Causes of under nutrition

- Causes of high case fatality due to malnutrition

- WHO treatment guidelines – " 10 steps"

- Staff knowledge, attitudes and practices

- Training in the WHO guidelines

- Management and support in the implementation of the guidelines

- Namibian studies

2.1 Global problem of severe malnutrition

Malnutrition is estimated to affect more than fifty million children worldwide under the age of five years and contributes to more than half of all deaths in children below five years of age (WHO, 2000; UNICEF, 2005). More than seventy percent of children with protein energy malnutrition live in South Asia and a further twenty six percent live in Sub-Saharan Africa (UNICEF, 2006). Although under nutrition is not a common problem in developed countries such as the United States of America, as many as 25% of hospitalized children are reported to have some form of acute protein energy malnutrition (Grigsby, 2006).

In Sub-Saharan Africa and South Asia, the prevalence rates for malnutrition have remained high despite advances in medical knowledge. According to UNICEF, 2007, the percentage of children under five years who are moderately and severely underweight in Sub-Saharan Africa and South Asia are 28% and 42% respectively, while the percentage of children who have moderate and severe stunting in the same regions are 38% and 46% respectively. Infectious diseases such as diarrhoea, acute respiratory infections and more recently the HIV/AIDS epidemic may be contributing considerably to the high prevalence in developing countries

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(Rice, Sacco, Hyder & Black, 2002; Collins *et al*, 2006a). Although moderate malnutrition carries a lower risk for death than severe malnutrition, its higher prevalence makes it a major public health concern because it considerably increases morbidity and mortality from other childhood illnesses (Allen, 2001; Allen & Lagunju, 2007; UNICEF, 2005; Rice *et al*, 2002; Pelletier, Frongillo, Schroeder & Habicht, 1995). This happens because malnutrition is known to impair the body's immune function. Other complications of malnutrition include growth retardation and poor mental development with negative economic consequences as those affected move into adulthood (Grigsby, 2006; Girma, Molgaard & Michaelson, 2006).

2.2 Causes of Under nutrition in Children

Under nutrition has multiple causes interacting at different levels. These causes are grouped into immediate, underlying and basic causes and are best understood using the UNICEF Conceptual Framework, a tool that shows not only the causes but also the multi-sectoral nature of the problem and consequently, the interventions necessary to deal with it (UNICEF, 1998). Figure 1 below shows the Conceptual Framework and demonstrates the links between the different levels of causes.

The basic causes of malnutrition include the political and economic environment that determines how available resources are utilised and shared in communities. Where poverty and social inequalities exist, unequal distribution of wealth leads to the underlying causes of malnutrition which are insufficient household food security, inadequate maternal and child care, and insufficient health services and unhealthy environment. The underlying causes directly contribute to the onset of disease and also affect the levels of nutritional intake through the diet. Strategies to tackle malnutrition therefore, must target the different levels of causes and must involve the different sectors of government. Improving the social and economic wellbeing of communities will go a long way in preventing the deaths of millions of children (Lang, 2003).

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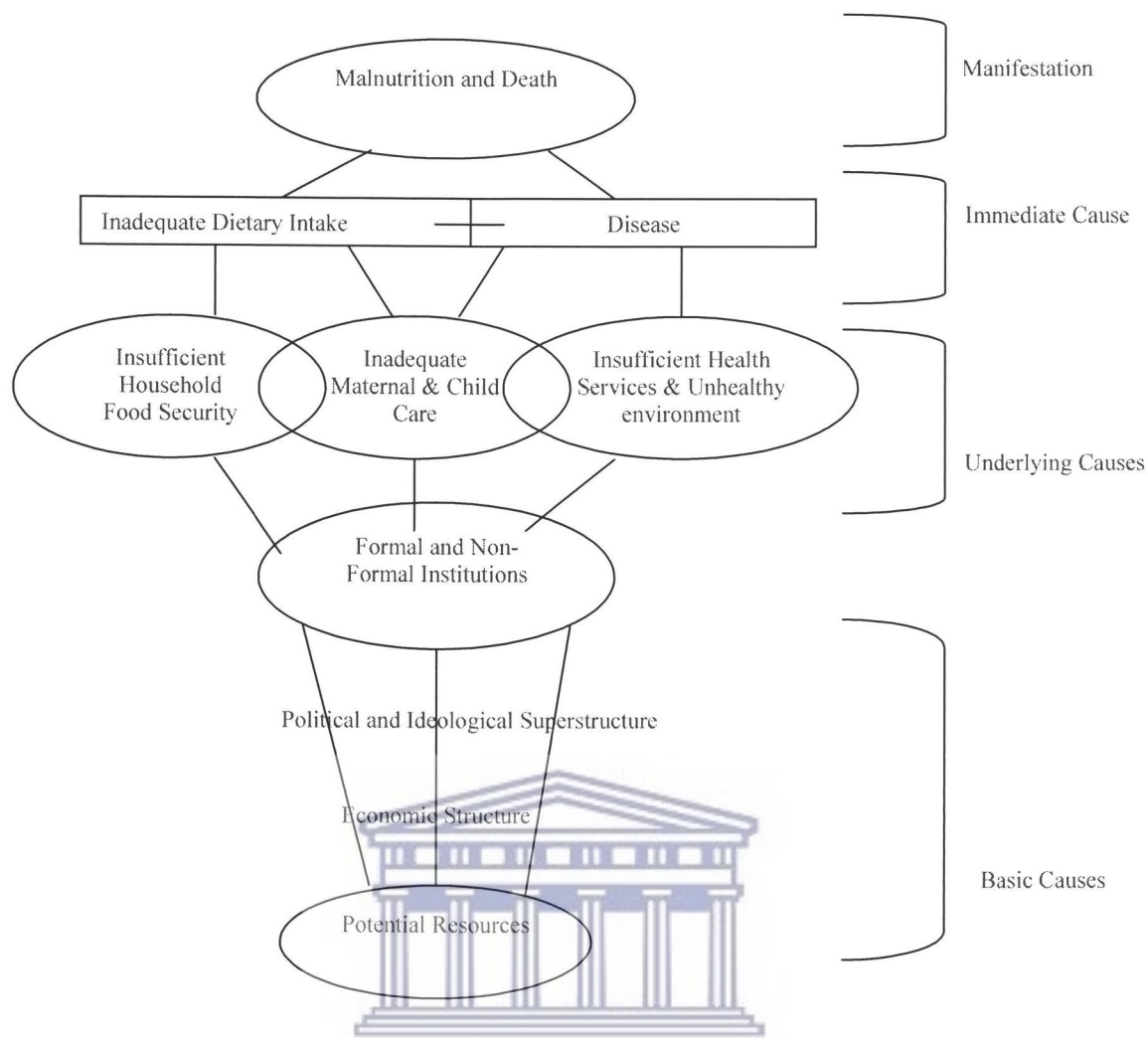
Figure 1: UNICEF Conceptual Framework for the Causes of Malnutrition

(Adopted from State of the world's children 1998)

Moderate malnutrition can be managed in the community with measures such as:

dissemination of nutritional educational messages, effective growth monitoring activities and

nutritional intervention programmes for both pre-school and school going children from under

privileged communities. Where moderate malnutrition has not been well managed, severe

malnutrition develops and manifests as severe wasting or oedematous malnutrition. A number

of physiological and biochemical changes take place in an attempt for the body to adapt to the

state of deprivation (Collins *et al,* 2006a). This leads to complications such as electrolyte

imbalances, micronutrient deficiencies and hypoglycaemia which necessitate treatment in an

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in-patient facility. Unfortunately, not all patients treated in hospitals have a positive outcome with case fatality rates being unacceptably high in some hospitals.

2.3   Causes of high Case Fatality Rate due to severe malnutrition

Worldwide, severe malnutrition has been associated with up to half the deaths in children below the age of five years with case fatality rates (CFR) for severe malnutrition being between 20 – 30% (Allen, 2001; UNICEF, 2005; Jackson, Ashworth, Khanum, 2006). High case fatalities have been associated with outdated treatment practices. A study which reviewed literature spanning a period of 50 years reported a median CFR of 23.5% in the 1990s (Schofield & Ashworth, 1996). The authors suggested that faulty practices such as inappropriate diets, use of diuretics to treat oedema and lack of replacement of electrolytes and micronutrients contributed to high case fatalities.

Similarly, Puoane and colleagues (Puoane, Sanders, Chopra, Ashworth, Strasser, McCoy, Zulu, Matinise & Mdingazwe, 2001), in a study of two rural district hospitals in South Africa, where the CFR were found to be as high as 50%, reported practices such as use of intravenous therapy to rehydrate children, feeds not being given at night with a gap of about 11 hours, inappropriate diets for children, no antibiotics in routine treatment, and a lack of stimulation and emotional support for children during admission.

A follow up study in the same hospitals demonstrated an overall drop in case fatality rates following the implementation of WHO guidelines (Ashworth *et al*, 2004). The authors attributed this to the improvement in staff knowledge following training in the WHO guidelines which changed the attitudes of staff towards malnourished children. Studies from several countries have reported high case fatality rates due to malnutrition. For example, Bachou examined the prevalence and mortality of malnutrition in children admitted to Mulago Hospital in Uganda and reported a case fatality rate of 24% (Bachou, 2004). Similarly, Weisstaub and colleagues in Latin America assessed treatment practices and case fatality for severe malnutrition at one hospital and found the case fatality rate to be 17.4% (Weisstaub,

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Soria & Araya, 2004). These case fatality rates were attributed to practices such as use of intravenous fluids, antibiotics not being given routinely, and the treatment of hypothermia, hypoglycaemia and feeding which did not follow the WHO guidelines. The findings of these studies support those reported by Schofield and Ashworth, 1996.

2.4 WHO treatment guidelines "10 steps"

Over the years, the principles of treatment of severe malnutrition have changed with earlier protocols emphasising relatively larger quantities of protein and iron supplementation from admission (Reddy, 1991). Based on basic principles noted to be consistently present at centres where case fatalities from severe malnutrition were low, the WHO has developed guidelines for treatment (Ashworth, Khanum, Jackson, & Schofield, 2005). The WHO treatment guidelines "10 steps" for improving the hospital management of severe malnutrition are divided into two phases:

1. The stabilisation phase, which includes the correction of imbalances in a child in order to restore the normal processes of the body and,

2. The rehabilitation phase which includes rebuilding lost tissues through adequate feeding (WHO, 1999; Ashworth *et al*, 2005).

The WHO ten steps are as follows:

1. prevent/treat hypoglycaemia

2. prevent/treat hypothermia

3. prevent/treat dehydration

4. correct electrolyte imbalances

5. prevent/treat infections

6. correct micronutrient deficiencies

7. cautious feeding

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8. rebuild wasted tissues (catch-up growth)

9. provide stimulation, play & loving care

10. prepare for follow up after discharge

Table 1 below, was adopted from the Guidelines for the inpatient treatment of severely malnourished children (Ashworth *et al*, 2005) and shows the approximate time frame during which the different steps are carried out.

Table 1: Time Scale for the 10 Steps

	PHASE		
	STABILISATION ⟶		REHABILITATION
Step	**Days 1 - 2**	**Days 3 – 7**	**Weeks 2 - 6**
1. Hypoglycaemia			
2. Hypothermia			
3. Dehydration			
4. Electrolytes			
5. Infection			
6. Micronutrients		no iron	with iron
7. Cautious feeding			
8. Catch-up growth			
9. Sensory stimulation			
10. Prepare for follow-up			
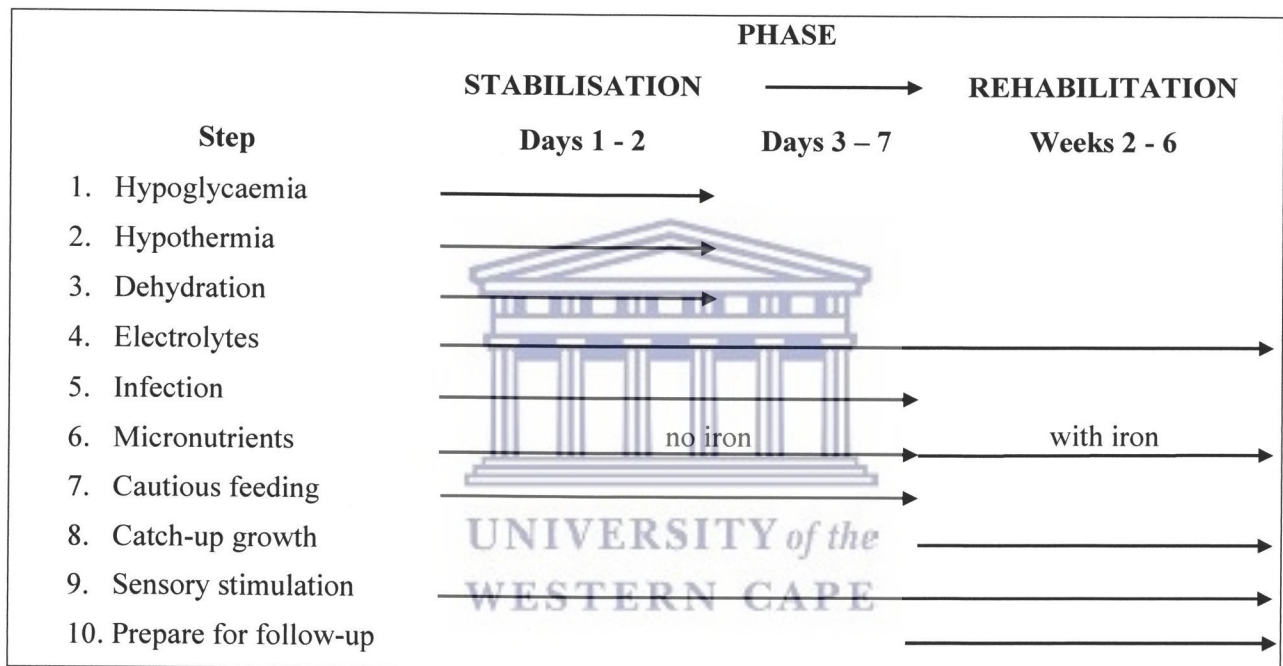
(Adopted from Ashworth et al, 2005)

There is evidence of reduction in case fatality rates in centres that have implemented the WHO guidelines. Studies that have been done in Africa, Asia and South America have all shown significant improvement in CFR following implementation of the guidelines (Ashworth *et al*, 2004; Deen *et al*, 2003; Bhan, Bhandari, Bahl, 2003; Bernal, Velasquez, Alcarez & Botero, 2008). Most of these studies have been carried out in resource constrained rural areas which may correctly represent the situation found in most developing countries. This strongly suggests that changing treatment protocols in other areas may yield similar improvements in

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CFR. The observation of similar trends in different settings lends credit to the argument for changing treatment protocols according to the recommendations of the WHO. However, because the case fatality rates in the studies that have been done in Africa have not fallen to the acceptable level of 5% as in other places, other factors may be contributing to the high CFR. The question of whether implementing WHO guidelines in resource constrained areas is feasible has been evaluated (Karaolis *et al*, 2007; Deen *et al*, 2003). Karaolis et al, 2007, in evaluating the feasibility of implementing the WHO guidelines in the two rural hospitals in the Eastern Cape in South Africa reported that not all components of the guidelines were implemented adequately. The authors suggested incorporation of management of severe malnutrition in the training of medical and nursing students. Other researchers have suggested that improving the methods and signs used in assessing patients for admission would further improve CFR (Maitland *et al*, 2006). It has been suggested that infection with HIV increases morbidity and mortality in severe malnutrition (Collins *et al*, 2006a; Kessler, Daley, Malenga & Graham, 2000; Bachou, Tylleskar, Downing & Tumwine, 2006; Heikens, 2007).

This is confirmed by Brewster and colleagues, (Brewster, Manary & Graham, 1997), who reported a high prevalence (21%) of HIV infection among children admitted for treatment of kwashiorkor and an equally high case fatality rate (24%) in spite of introducing treatment protocols in line with the WHO guidelines. Other factors which were found to contribute to high case fatality rates included staff shortages in the treatment facilities where children were admitted for treatment and the absence of doctors to attend to the sick children. Similar findings were reported from Uganda (Bachou, 2004).

2.5   Staff knowledge, attitudes and practices

An integral component of the treatment of severely malnourished children is the level of knowledge in the staff members which influences both the treatment practices and the attitudes of staff to the children. Researchers in Eastern Cape, South Africa, compared the attitudes of nursing staff before and after training on the WHO guidelines on the management of severe

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malnutrition (Puoane *et al*, 2006). The authors reported negative attitudes before training based on a lack of understanding of the causes and physiological changes taking place in malnutrition. After training, the nurses' attitudes were more positive as they were equipped with better understanding of malnutrition. Similarly, Navaratnarajah (Navaratnarajah, 2004) reported negative staff attitudes in nurses treating malnourished children in another rural hospital in South Africa. These negative attitudes resulted from a combination of lack of knowledge and frustration from difficult working conditions brought about by staff shortages.

2.6 Training in the WHO guidelines

With the recognition of the need to change treatment practices in the management of severe malnutrition, training of health workers in the use of the WHO guidelines has become necessary because many health workers were not trained in the guidelines in their respective training schools. Many centres have undertaken such training for their health workers with different results. Puoane *et al*, 2004, reported a drop of 25% in CFR after staffs were trained in the WHO guidelines, in the Eastern Cape in South Africa. In contrast, Deen *et al*, 2003, reported an unchanged CFR at Battor hospital in Ghana after a period of training and implementation of the guidelines. Other reports have generally shown that training of staff results in improved outcomes (Bernal *et al*, 2008; Weistaub & Araya, 2008; Maitland *et al*, 2006). Evidently, more research is needed to specifically evaluate the effectiveness of training in the WHO guidelines and their implementation (WHO, 2005).

2.7 Management and support in the implementation of the guidelines

Following training of health workers in treating severely malnourished children, it is important to offer continuing support in order for them to confidently practice the new skills they acquire during training. This support may be in the form of regular supervisory visits during which principles of treatment are revised while praise and encouragement are offered. Not many studies were found that show the effect of support on the effectiveness of implementation of the guidelines. However, the studies by Puoane *et al*, 2004, and Deen *et al*, 2003, report

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evidence of support through the visits that were made during the implementation phase of the WHO guidelines. Both studies reported overall improvements in outcomes of treatment.

The evidence is compelling that implementation of the WHO guidelines in the treatment of severe malnutrition has a positive effect on case fatality rates although it may be to varying extents. However, there has recently been much debate and advocacy for taking a more community-based approach to the treatment of moderate and severe malnutrition without complications (Collins *et al*, 2006a; Briend, Prudhon, Prinzo, Daelmans, Mason, 2006; Girma, Molgaard & Michaelsen, 2006). Reports indicate that case fatality rates in some parts of Africa have been reduced to below 5% through community-based interventions and that coverage of such programmes is more than that of facility based interventions (Collins *et al*, 2006b; Sadler, Myatt, Feleke & Collins, 2007). Although more widespread research needs to be carried out on the practical aspects of such an approach, its relative cost effectiveness in comparison to in-patient treatment would favour its use in resource constrained rural Africa.

2.8   Namibian Studies

Not many studies have been done in Namibia on the prevalence of malnutrition or the outcomes of treatment. One study reported that 12.4% of children in Namibia were malnourished in 1992 with a drop to 10.3% the following year (Cupido, 1995). More recent data from UNICEF (2002) indicated that the prevalence of wasting was 9%, stunting was 24% and the prevalence of underweight children was 24 %(UNICEF, 2002). Similar findings were reported from a national demographic survey undertaken in the year 2000 (MOHSS-Namibia, 2003). The same survey showed an increase in the under-five mortality rate from 57 per thousand live births ten years before the survey to 62 per thousand live births in the five years preceding the survey (MOHSS-Namibia, 2003).

In the light of the reported reductions in CFR in the studies described above, and because of the absence of studies on malnutrition in Namibia, this study is an attempt to establish and

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document current practices in St. Mary's district hospital and Katutura central hospital in Namibia, in order to inform the national authorities and other stakeholders on findings in the light of WHO recommendations.

CHAPTER 3: RESEARCH DESIGN AND METHODOLOGY

3.1 Introduction

This chapter presents the aim and the objectives of the study and explains the research designs, study sites, sampling, data collection and analysis. A discussion on the reliability, validity, limitations and ethical considerations follows.

3.2 Aim: To evaluate the management of severe malnutrition in two hospitals in Namibia.

3.3 Objectives:

1. To establish the case fatality rate for severe malnutrition at St. Mary's District Hospital and Katutura Central Hospital.

2. To assess the recorded and self reported practices of paediatric staff in the management of severe malnutrition in the two hospitals.

3. To compare the recorded and self reported practices of paediatric staff with the WHO guidelines.

4. To determine the availability of resources required for the management of severe malnutrition in the two hospitals.

3.4 Study Design

This is a cross-sectional, descriptive study utilising a positivist approach and quantitative methods of data collection.

3.5 Study setting

The study took place at two hospitals: Katutura Central Hospital in Windhoek, found in the central Khomas region with 700 paediatric admissions per year of which 20% are due to malnutrition; and St Mary's District Hospital in Rehoboth which is found about 90kilometers

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south of the Windhoek and has 300 paediatric admissions per year with 20% of them being due to malnutrition.

3.6   Sampling

Three sampling procedure was used as follows:

- To obtain case fatality rates a ward register was used to obtain information about children who were admitted in the two hospitals during a period of thirteen (13) months from 1st January 2006 to 30th January 2007.

- Records of all paediatric admissions from1[st] January 2006 to 30th January 2007 in the two hospitals for children below the age of five years with a diagnosis of severe malnutrition, kwashiorkor, marasmus, marasmic-kwashiorkor and wasting were obtained from the admission register. A total of 36 records were obtained from St. Mary's hospital and all of them were reviewed as they were few. In Katutura hospital, 236 records were obtained and systematic random sampling was used to select 118 records for review with every second case record being selected. This was done to obtain a fairly representative sample (Katzenellenbogen, 1997). Systematic sampling is known to be more practical where patient records are to be selected as in the current study (Katzenellenbogen, 1997).This is why the sample was selected in this manner in preference to other methods. However, the resulting sample size was smaller than would have been obtained by using a sample size calculation. Using on-line calculators a sample size of 146 records would have been ideal. The formula used to calculate the sample size is: ss = $[z^2*(p)*(1-p)]/c^2$; where z = z value (1.96 for 95% confidence level); p = percentage points expressed as a decimal (0.5); c = confidence interval expressed as a decimal(Creative Research Systems, 2007).Therefore, the precision of the results was compromised. The whole population was not taken as the sample in Katutura hospital because of time constraints.

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- Lastly, a purposive sample of a doctor and a sister in charge of the paediatric ward of each hospital was selected for interviews. The paediatric wards of both St. Mary's hospital and Katutura hospital are managed by one medical officer and one sister in charge who have been working in the wards for longer periods of time than the other staff members and they supervise the work of their colleagues. They were therefore thought to be the richest sources of information on treatment practices on the wards and were selected for that reason as suggested by Nieuwenhuis (Nieuwenhuis, 2007).

3.7   Data Collection Instruments

The WHO guidelines for the routine management of severe malnutrition were used to develop the data collection tools. These tools included:

- A questionnaire that identified the self reported practices of health workers and whether or not those practices are in line with WHO recommendations. The questionnaire used open ended questions to obtain information relating to the WHO Ten Steps for the management of severe malnutrition. The content of the responses was analysed for comparison with the WHO guidelines (see Appendix 1, page 46).

- A checklist was used for structured observation of available resources on the ward. This checklist was adapted from the validated checklist used by Puoane and colleagues in South Africa (Puoane *et al*, 2001). The resources included on the checklist were those thought to be necessary for effectively carrying out the Ten Steps (see Appendix 2, page 49).

- A data collection sheet was used to obtain information from patient records about recorded practices of doctors and nurses in the management of severe malnutrition. Information collected on this data sheet included recorded clinical findings during assessment of malnourished children and recorded management (see Appendix 3, page 50).

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The data collection tools were developed in English which is the language used in practice at the two hospitals. Pre-testing of all the tools was done at St. Mary's hospital two months before the formal period of data collection. A member of staff on the paediatric ward who was not the sister in charge and a doctor who was not in charge of the paediatric ward were interviewed using the questionnaire. Structured observation of resources on the paediatric ward was carried out using the checklist. No adjustments were made to the questionnaire and checklist. The record review data collection sheet was also pre-tested on 5 patient records that were not part of the study population. The initial data sheet could not obtain information specifically related to the Ten Steps. It was therefore adjusted to include specific elements for each of the Ten Steps as shown in Appendix 3

3.8 Data Collection
Data collection took place between 09 /07 /07 and 10 /08 /07.

- *Objective 1:* To establish the case fatality rates in the two hospitals.

  Record Review: The researcher went through the paediatric register of each hospital to obtain the number of all children who were admitted to the ward from 1 January 2006 to 30 January 2007, who had a diagnosis of malnutrition, severe malnutrition kwashiorkor, marasmus and marasmic-kwashiokor. Outcome of treatment (discharged, died, absconded) was determined, and a percent of all deaths was calculated.

- *Objective 2:* To assess recorded and self reported practices of paediatric staff in the management of severe malnutrition at the two hospitals.

  i.   The researcher reviewed case records of 36 patients in St. Mary's hospital and 118 patients in Katutura hospital to identify practices including frequency of feeding, types of feeds, frequency of weighing of children, method used to rehydrate children, types of antibiotics prescribed.

  ii. A sister in charge of the paediatric ward and a paediatric doctor were interviewed using a structured questionnaire about the management of

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malnourished children. The information obtained was used to validate the information obtained from the patient records.

- *Objective 3:* To compare the recorded and self reported practices of paediatric staff with WHO guidelines.

Data obtained from patient's records were compared with the WHO treatment guidelines so as to identify shortcomings in the management of severely malnourished children. This was done during data analysis.

- *Objective 4:* To determine if resources required for the management of severe malnutrition are available in the two hospitals.

Using a checklist of recommended resources, the researcher made observations of the resources available in each paediatric ward.

3.9 Data processing and analysis

The data were analysed using Microsoft excel computer program. Descriptive statistics (frequencies and percentages) of the following were calculated:

1. Children admitted with principal diagnosis of severe malnutrition
2. Children admitted with a principal diagnosis of severe malnutrition that died during admission.
3. Children admitted with a principal diagnosis of severe malnutrition that were discharged alive.
4. Case fatality rate :

$$= \frac{\text{Number of children dying of severe malnutrition from 01/01/06 to 30/01/07}}{\text{Number of children admitted with severe malnutrition from 01/01/06 to 30/01/07}} \times 100$$

5. Percentages were calculated to determine the percent of activities recorded and reportedly performed according to WHO guidelines and those that are not in line with WHO guidelines. Specific elements contained in the Ten Steps were given points and the total calculated. The number of activities recorded and reported that were in line with the guidelines were then calculated and percentages derived.

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6. Percentages of available resources were also calculated. Each resource in the checklist was given a point and the total number of points was calculated. Each resource that was found in the hospitals during observation was also given a point. The percentage of observed resources out of the recommended resources was then calculated.

7. Data collected from the interviews were summarized in relation to the WHO ten steps.

3.10 Reliability and Validity

The instruments used for data collection are based on the WHO guidelines. Use of instruments that have been tested and used in other studies ensured validity of data. The checklist used for observation of available resources was adapted from a similar checklist that was validated and used in a South African study on the management of severe malnutrition (Puoane *et al*, 2001). In addition, selection bias was reduced by using the whole study population from St. Mary's hospital and randomly selecting half the population from Katutura hospital for review. Reliability was ensured by the use of one researcher to collect data. Triangulation (use of different methods to collect data), that is, record review, interviews and audit of resources ensured validity and reliability of the data collected.

3.11 Limitations

This study was limited by the fact that it did not use any qualitative data collection methods. Because of this, a deeper understanding of why the current state of affairs prevails was not possible. In addition, the time available for the study and the manpower available did not allow for a study of more hospitals in the country to give a more comprehensive picture of the situation. One of the shortcomings of the record review method of data collection is that activities that are done but are not recorded are missed while interviews are likely to yield biased information as hospital personnel are reporting activities undertaken by themselves, hence the need for triangulation to validate findings. Complementary methods of data collection such as observation of activities would cover this deficit but was not used in this study. Comparison of the results from the two hospitals is problematic because of the differences in both the sample size and the selection of the samples.

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3.12 Ethical considerations

Permission to carry out the study and ethical clearance were obtained from the administrative heads of both institutions. The protocol was also submitted to the University of the Western Cape ethics committee for ethical approval. Information sheets about the study were made available to the members of staff who participated in the study. In addition the purpose of the study and its nature was explained and informed consent was obtained. Assurance of confidentiality was given as well as their right to withdraw from participation at any time during the study without any consequence. The information sheet, consent form and authorisation to conduct the study are attached as Appendix 4, 5 and 6 respectively (pages 52, 53 and 54).

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CHAPTER 4: RESULTS PRESENTATION

The results presented in this chapter include:

- Characteristics of the study sample

- The case fatality rates from record reviews

- Practices of paediatric staff from interviews and record reviews

- Structured observation of available resources.

4.1   Characteristics of the study sample

A total of 154 records, 118 from Katutura Hospital and 36 records from St. Mary's Hospital were reviewed.

The ages of children in the records ranged from 3 weeks to 5yrs with the average age being 16 months. In Katutura hospital, 52% of patients were males and 48% were females, while in St. Mary's hospital, 42% were males and 58% were females. The highest numbers of admissions at Katutura hospital were in the month of April followed by May, March and November as shown in Figure 2.
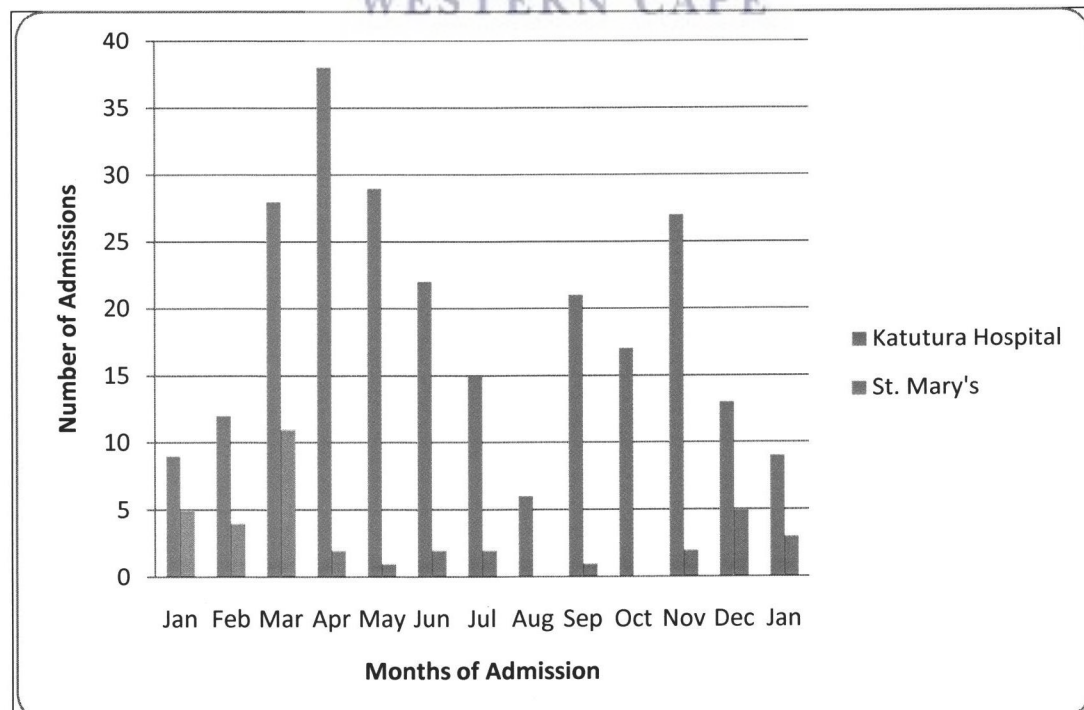
Figure 2: Distribution of study participants by month of admission

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St. Mary's hospital had much fewer admissions but recorded a peak in March followed by January 2006 and December. In Katutura hospital, 53% of patients had oedematous malnutrition on admission while St. Mary's Hospital had 47% of patients with oedematous malnutrition on admission. Average duration of admission for both hospitals was 14 days.

4.2   Case Fatality

The case fatality rate at Katutura Hospital was 14% and 8% at St. Mary's hospital as shown in Table 2 and 3 respectively.

Table 2: Case fatality rate due to severe Malnutrition at Katutura Hospital (n=236)

Variable	No: of children	Percent
Total admissions for severe malnutrition	236	100%
Discharged	184	77.97%
Died(CFR)	34	14.41%
Absconded	18	7.63%

Table 3: Case fatality Rate due to severe malnutrition at St Mary's Hospital (n=36)

Variable	No: of children	Percent
Total admissions for severe malnutrition	36	100%
Discharged	30	83.33%
Died(CFR)	3	8.33%
Absconded	3	8.33%

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4.3   Practices of Paediatric Staff

The following tables (Table 4 & 5) summarize the findings on the practices of staff in the two

hospitals and compare them with the recommended WHO practices. Table 4 summarizes

information from the staff members (a doctor and sister in charge in the paediatric ward) and

review of 118 patient records at Katutura hospital while Table 5 presents similar information

from St. Mary's hospital. In the tables, each specific element of the guidelines was given a

single point and the total number of points for each step was doubled to account for

information from both the interview and the record review. Step 1 had two items with a

possible total of four points each - one point each for step 1(a) and step 1(b) from the

interviews and one point each for step 1(a) and step 1(b) from the records. Similar allocation

was made for step 2. Step 3 had one item and a total of two points allocated - one point from

the interviews and one point from the records. Each electrolyte in step 4 was allocated a point

as well as the use of diuretics to give a total of eight points – four points from the interviews

and four points from the records. Step 5 had one item corresponding to two points – a point

each from the interviews and from the records. Although step 6 had two items, each

supplement mentioned (folic acid, zinc, copper, multivitamins, vitamin A & iron) was given a

single point to yield a total of twelve points – six points from the interviews and six points

from the records. Four points were allocated to step 7 – 7(a) and 7(b) from the interviews was

given one point each while 7(a) and 7(b) from the records were also given one point each to

make a possible total of four points. Allocation of points for step 8 was similar to step 7 with

8(a) and 8(b) from the interviews each having one point and 8(a) and 8(b) from the records also

having one point each. The single item listed for step 9 was split into two; the presence of a

mother was allocated a single point each from the interviews and the records while playful

stimulation was allocated another two points – one each from the interviews and records

yielding a total of four points. Step 10 had two items and four points in total. Step 10(a) from

the interviews was allocated one point as was 10(b); 10(a) and 10(b) from the records were

also allocated one point each. Each element of practice that was reportedly done according to

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the WHO guidelines in the interview was given a point. Similarly, each recorded practice in the patient records that was in accordance with the WHO guidelines was given a single point. In steps 3, 4, 5, 6, 9 and 10, a percentage of more than 10 was taken to indicate that the activity was either performed or not performed in accordance with the WHO guidelines.

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Table 4: Comparison of reported and recorded practices in the management of severe malnutrition at Katutura Central Hospital with the WHO guidelines

RECOMMENDED PRACTICE	POINTS	REPORTED PRACTICE (INTERVIEW)	RECORDED PRACTICE (REVIEW OF 118 RECORDS)	POINTS
Step 1:Treat/prevent hypoglycemia a) Early and frequent feeds. b) feed every 2 hours ,day and night	4	a) Patients are fed as soon as they are admitted b) Patients were fed every 3 hours day and night	a) All patients fed soon after admission b) Patients were fed every 3 hours day and night	4
Step 2: Treat/prevent hypothermia a) Feed every 2 hours day and night. b) keep warm, avoid exposure	4	a) Patients fed every 3 hours day and night. b) blankets used to warm patients	a) all children fed every 3 hours day and night b) patients kept warm	4
Step 3: Treat/prevent dehydration a) Rehydrate orally (use modified rehydration solution) except in shock	2	a) Oral rehydration solution (ORS) used to rehydrate. if severely dehydrated, intravenous fluids (IVF) are used	a) IVF given to 42 out of 118 (36%) patients who were not shocked. Fluid balance records were available	1
Step 4: Correct electrolyte imbalance a) give extra potassium and magnesium b) limit sodium c) do not treat oedema with diuretics	8	a) potassium is given when serum levels are low, b) sodium not mentioned c) diuretics are not used to treat oedema	a) 1 (1%) child was given magnesium; potassium was given to 58 (49%) children. b) no sodium restriction in diet c) 2 (2%) children received diuretics	4
Step 5: Treat infection a) Give broad spectrum antibiotics routinely	2	a) Broad spectrum antibiotics are given routinely	a) Broad spectrum antibiotics were given to 105 (89%) children	2
Step 6: Treat micronutrient deficiencies a) Give folic acid, zinc, and copper, multivitamins. High dose vitamin A on day 1 b) do not give iron in initial phase	12	a) Vitamin A and copper not mentioned by both respondents, multivitamins, folic acid, iron and zinc are given b) Iron given on admission	a) Copper was not given to any children, 68 (58%) children received folic acid, 5 (4%) received zinc, 69 (58%) received multivitamins and 58 (49%) were given vitamin A b) iron given to 43 (36%) children on admission	6
Step 7: Initial stabilization a) small frequent feeds b) special starter formula	4	a) formula milk feeds given every 3 hours b) Nan, Infasoy, Ensure and Pediasure used	a) small feeds given initially every 3 hours b) Nan, Infasoy, Ensure and Pediasure used	2
Step 8: Catch- up growth a) change gradually to catch up formula when appetite returns b) frequent, unlimited amounts after transition	4	a) Same formula used in initial stabilization was given every 3 hours	a) Amounts of formula milk given gradually increased. Feeds given every 3 hours	1
Step 9: Loving care and stimulation a) Give tender loving care, playful stimulation and maternal involvement	4	a) No play area, no structured play therapy, no toys. b) Mothers allowed on the ward	a) No toys no play therapy. b) 8 (7%) children recorded to have mothers on the ward	1
Step 10: Prepare for follow up and discharge a) involve care takers in care and feeding b) arrange follow up	4	a) Nutritional advice given on how to feed children b) Referred to nearest clinic for growth monitoring. Some children are reviewed on the ward a few days after discharge.	a) 14 (12%) patients had specific instructions in the records for follow up and dates given	3
Total points (%)	48(100)			28(58)

Table 5: Comparison of reported and recorded practices in the management of severe malnutrition at St. Mary's District hospital with the WHO guidelines

RECOMMENDED PRACTICE	POINTS	REPORTED PRACTICE (INTERVIEW)	RECORDED PRACTICE (REVIEW OF 36 RECORDS)	POINTS
Step 1: Treat/prevent hypoglycaemia a) early and frequent feeds b) feed every 2 hours, day and night	4	a) Patients are fed immediately after admission b) Patients are fed every 2-3 hours day and night	a) No records of feeds were available for all children	2
Step 2: Treat/prevent hypothermia a) feed every 2 hours day and night b) keep warm, avoid exposure	4	a) patients are fed every 2-3 hours b) heater and blankets used to warm patients	a) no records of feeds b) patients kept warmed	2
Step 3: Treat/prevent dehydration a) Rehydrate orally (use modified rehydration solution) except in shock	2	a) ORS used and intravenous fluids are used when patient is severely dehydrated	a) IVF were given to 12 (33%) patients who were not shocked	1
Step 4: Correct electrolyte imbalance a) give extra potassium and magnesium b) limit sodium c) do not treat oedema with diuretics	8	a) potassium given when serum levels are low b) sodium not mentioned c) diuretics not used to treat oedema	a) potassium was given to 4 patients (11%), magnesium was not given to any children b) no sodium restriction in diet c) diuretics were given to 2 of the children (5%)	3
Step 5: Treat infection a) Give routine broad spectrum antibiotics	2	a) Broad spectrum antibiotics are routinely given	a) All children received broad spectrum antibiotics	2
Step 6: Treat micronutrient deficiencies a) Give folic acid, zinc, copper and multivitamins. High dose vitamin A on day 1 b) Do not give iron in initial phase	12	a) Vitamin A, multivitamins and iron are given b) Iron given after treating acute infection	a) Zinc and copper were not given to all children. Folic acid was given to 15 (42%), multivitamins were given to 25 (69%), vitamin A was given to 19 (53%) children b) Iron was given to 12 (33%) children on admission	6
Step 7: Initial stabilization a) small frequent feeds b) special starter formula	4	a) Feeds are given every 2-3 hours b) feeds comprise of eggs, milk, meat and fish	a) No records of feeds available. Generally a high protein diet was prescribed	1
Step 8: Catch-up growth a) Change gradually to catch up formula when appetite returns b) Frequent, unlimited amounts after transition	4	a) High protein diet every 2-3 hours	a) No change in the feed types throughout admission	0
Step 9: Loving care and stimulation a) Give tender loving care, playful stimulation and maternal involvement	4	a) No play area. No structured play therapy, no toys. Mothers are only allowed on the ward if they are breast feeding or if the child is seriously ill.	a) No play therapy, no toys. No record of any mothers on the ward	0
Step 10: Prepare for follow up after discharge a) involve care takers in care and feeding b) arrange follow up	4	a) Nutritional advice given on how to prepare food , frequency of feeding and importance of clinic visits for growth monitoring b) Followed up at nearest clinic. If they are referred to the social worker, home visits are arranged	a) No specific instructions given in the patient records about preparation for discharge and follow up.	2
Total (%)	48(100)			19(40)

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Table 4 and Table 5 show that the information obtained from the interviews is more in line with the guidelines from the WHO, but this is not translated into actual practice as revealed from the records. This is amplified in Table 5 showing data from St. Mary's hospital where the theoretical knowledge of early and frequent feeding is not practically carried out as there were no records of feeds in the patient files. Similarly, the interviews from both hospitals indicate that IVFs are only used to treat severe dehydration (shock) while the records show that IVFs were given to patients who were not shocked. This was noted in the records since the severity of dehydration was recorded as part of the clinical assessment of the patients as well as the treatment given. In addition, fluid balance sheets showing the fluids that were administered and the routes of administration were available in the records from Katutura hospital. In relation to preparing for follow up, the interviews show the plans for follow up at local clinics and nutritional education given on the ward but the records do not show specific instructions concerning follow up. The findings in relation to step 5 (treating infection) and step 9 (loving care and stimulation) are similar for the interviews and record reviews in both hospitals. Broad spectrum antibiotics were given to all the children whose records were reviewed as stated in the interviews. Play therapy was not practiced in both hospitals and this was reflected in both the interviews and patient records. The findings in both hospitals concerning the correction of electrolyte imbalances from the interviews correspond to the findings in the records.

4.4   Availability of Resources

In both hospitals, close to 90% of resources required for the treatment of severe malnutrition were available as shown in table 6 and 7. The tables list the recommended resources for the treatment of severe malnutrition and each element was given a single point. A single point was allotted to each available element at each hospital and the percentages were calculated as shown. Katutura hospital had 86% of the recommended resources while St. Mary's hospital had 89%. The checklist used to undertake the observation of available resources was adapted from the validated checklist used by researchers in South Africa (Puoane *et al*, 2001) and

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adjusted for local use. Some elements that were not available locally such as the Eastern Cape protocol, Eastern Cape mineral mix and Eastern Cape potassium chloride solution for malnutrition were not included in the list. The thermometers used on both paediatric wards were under-arm thermometers. The feeds referred to on the list were the feeds given to malnourished children on the wards. At Katutura hospital, children were given formula milk feeds using Nan, Infasoy, Ensure and Pediasure which were all available on the ward. At St. Mary's hospital eggs, meat and fish from the kitchen were used to give a high protein diet in addition to milk (Lactogen and Nan) which was available on the ward. On the list washing facilities refers to both bathing and hand washing facilities and these were available on both wards.

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Table 6: Available Resources on Ward for the treatment of severe malnutrition (Katutura)

Resources on Ward	Number of Points	Yes	No
Dextrostix/glucostix or glucometer	1	1	
10% Glucose (Oral)	1	1	
Paediatric Nasogastric Tubes	1	1	
Feeds/Formulae	1	1	
Co-trimoxazole (Bactrim)	1	1	
Metronidazole	1	1	
Ampicillin	1	1	
Gentamicin	1	1	
Chloramphenicol	1	1	
Mebendazole	1	1	
Thermometers – Types	1	1	
Heaters	1		1
Blankets	1	1	
Potassium supplements	1	1	
Magnesium supplements	1	1	
Multivitamin	1	1	
Vitamin A	1	1	
Folic acid	1	1	
Zinc	1	1	
Copper	1		1
Iron	1	1	
Scale	1	1	
Toys	1		1
IV Cannulae (Paediatric)	1	1	
Oxygen	1	1	
Weight charts	1	1	
Fluid intake/output charts	1	1	
Paediatric giving sets	1	1	
Oral rehydration solution	1	1	
Ringers lactate	1		1
½ strength Darrows with 5% dextrose	1	1	
Ringers lactate with 5 % dextrose	1		1
Sterile Glucose/Dextrose (10% or 50%)	1	1	
Working fridge	1	1	
Washing facilities	1	1	
Electricity supply	1	1	
TOTAL:	36	31(86%)	5(14%)

Table 7: Available Resources on Ward for the treatment of severe malnutrition (St. Mary's)

Resources on Ward	Number of Points	Yes	No
Dextrostix/glucostix or glucometer	1	1	
10% Glucose (Oral)	1	1	
Paediatric Nasogastric Tubes	1	1	
Feeds/Formulae	1	1	
Co-trimoxazole (Bactrim)	1	1	
Metronidazole	1	1	
Ampicillin	1	1	
Gentamicin	1	1	
Chloramphenicol	1	1	
Mebendazole	1	1	
Thermometers – Types	1	1	
Heaters	1	1	
Blankets	1	1	
Potassium supplements	1	1	
Magnesium supplements	1	1	
Multivitamin	1	1	
Vitamin A	1	1	
Folic acid	1	1	
Zinc	1		1
Copper	1		1
Iron	1	1	
Scale	1	1	
Toys	1	1	
IV Cannulae (Paediatric)	1	1	
Oxygen	1	1	
Weight charts	1	1	
Fluid intake/output charts	1	1	
Paediatric giving sets	1	1	
Oral rehydration solution	1	1	
Ringers lactate	1		1
½ strength Darrows with 5% dextrose	1	1	
Ringers lactate with 5 % dextrose	1		1
Sterile Glucose/Dextrose (10% or 50%)	1	1	
Working fridge	1	1	
Washing facilities	1	1	
Electricity supply	1	1	
TOTAL:	36	32(89%)	4(11%)

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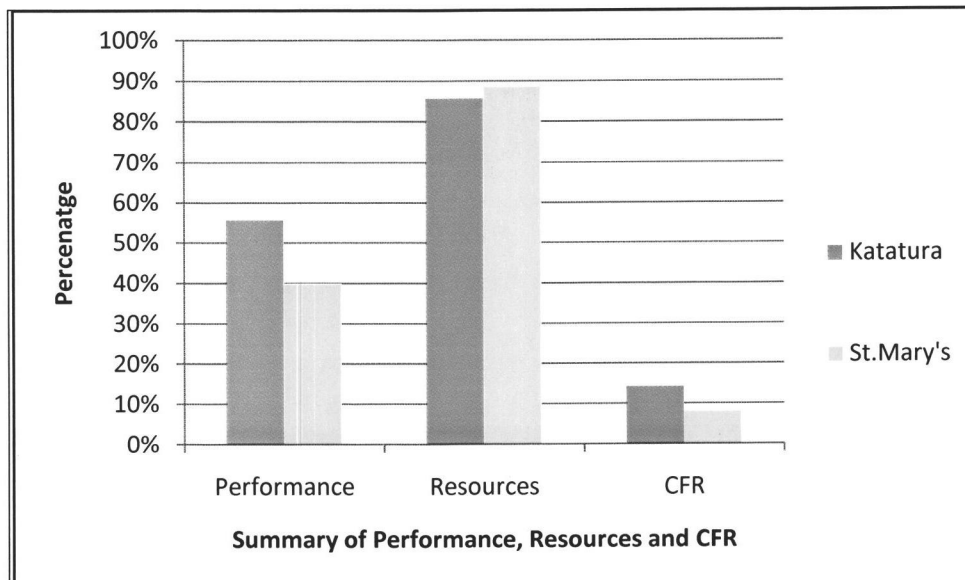
Figure 3: Comparison of staff performance, available resources and CFR in the 2 hospitals

Figure 3 summarizes all the results in a bar chart. Performance represents the practices of paediatric staff as a percentage of the recommended practices in the WHO guidelines from both interviews and record reviews (58% for Katutura and 40% for St. Mary's). Resources represent the percentage of available resources at each hospital (86% for Katutura and 89% for St. Mary's) and CFR represents the case fatality rates at each hospital (14% for Katutura and 8% for St. Mary's)

CHAPTER 5: DISCUSSION

The aim of this study was to evaluate the management of severe malnutrition in two hospitals (one central hospital and one district hospital) in Namibia.

The CFR of 8% at St Mary's Hospital and 14% at Katutura Hospital are much lower than those found in other settings in Africa (Puoane *et al*, 2001; Deen *et al*, 2003), but are still higher than the WHO target of 5% or below (Ashworth *et al*, 2005). This may be a reflection of the availability of most resources required for the management of severe malnutrition. The higher CFR at the central hospital may be attributed to the fact that it serves as the national referral hospital-receiving patients from the whole country. Most of the patients admitted at the central hospital are more ill than those at district and regional hospitals. Similarly, Brewster et al (1997) found that patients admitted to central hospitals tended to be more ill than those from smaller hospitals.

While WHO treatment guidelines recommend that malnourished children should be fed soon after admission and 2 hourly thereafter, the absence of feeding records at St. Mary's Hospital makes it impossible to assess the feeding practices. In Katutura Hospital, children were fed every three hours day and night. Early and frequent feeds are necessary to prevent and treat both hypoglycaemia and hypothermia (step 1 and 2). Malnourished children are at greater risk of developing hypoglycaemia because their glucose stores are depleted as a result of muscle wasting and deranged liver function and glucose consumption is increased in fighting infections and providing warmth for the body (Ashworth & Burgess, 2003). In addition, during the process of travelling to hospital and long admission procedures, many children are not fed for several hours resulting in a drop of blood glucose levels. Malnourished children are also at greater risk of hypothermia because of reduced insulation from lost fat, reduced activity and less glucose stores to provide heat (Ashworth & Burgess, 2003). Early and frequent feeds reduce the risk of death due to hypoglycaemia and hypothermia. The adaptation of feeding three hourly as opposed to two hourly is practical, considering staff constraints and has been

used in South Africa (Ashworth *et al*, 2004).Puoane and colleagues (Puoane *et al*, 2001), reported that children were fed regularly during the day but not at night with a consequently high risk of hypoglycaemia. Similarly, early and frequent feeding of children was reportedly not practiced in Mapulaneng Hospital, South Africa, prior to implementation of WHO guidelines (Deen *et al*, 2003).

Diagnosis of dehydration (step 3) in malnourished children presents a dilemma for many health workers because the usual signs of dehydration are already present in severe malnutrition even if the child is not dehydrated. This leads to over diagnosis of severe dehydration and consequently over use of intravenous fluids for rehydration (WHO, 1999). Intravenous therapy in malnutrition is only recommended for patients in shock which may occur in severe dehydration or sepsis. The use of IVF to rehydrate malnourished children has the danger of fluid overload and heart failure due to small and weak heart muscle (Ashworth & Burgess, 2003). In this study, both hospitals showed unnecessarily high use of IVF to rehydrate patients that were not shocked. These findings are similar to those from the Eastern Cape of South Africa where it was reported that all the children who died during admission in two district hospitals, had been rehydrated with IVF which were not monitored. They attributed the large number of deaths to over-hydration which is associated with cardiac failure and early death (Puoane *et al*, 2001). Researchers in Uganda also found the use of IVF to be associated with increased risk of death in children being treated for severe malnutrition (Bachou, Tumwine, Mwadime & Tylleskar, 2006)

In both hospitals, electrolyte imbalances were not correctly addressed as potassium and magnesium were not routinely given and sodium restriction was not mentioned as recommended in step 4 of the WHO protocol. Schofield and Ashworth, in their review of treatment practices from 79 institutions, found that less than half the centres studied gave potassium supplements and 26% gave magnesium (Schofield & Ashworth, 1996). Similar findings were also reported by Deen *et al*, (Deen *et al*, 2003).In malnutrition, the activity of the sodium pump in the cell walls is reduced and the permeability of the cell membrane is

increased leading to leakage of potassium and magnesium out of the cell and sodium enters the cells (WHO, 1999).In addition, sodium excretion is reduced from the kidneys leading to sodium and water retention (oedema) and increasing the risk of heart failure. Loss of potassium further increases the risk of heart failure through weakening of the heart muscle (Ashworth & Burgess, 2003). Therefore, potassium and magnesium must be given and sodium intake must be restricted. Diuretics must not be given as they worsen the electrolyte imbalance through potassium loss. Both hospitals in this study did not generally use diuretics to treat oedema. Of the two patients treated with diuretics at Katutura, one had a differential diagnosis of nephrotic syndrome. Equivocal results were reported by other researchers (Deen *et al*, 2003; Puoane *et al*, 2001; Schofield & Ashworth, 1996). Administration of electrolytes described above has been associated with reduction in CFR in some settings where interventions using the WHO guidelines have been introduced (Ashworth *et al*, 2004; Brewster *et al*, 1997). The regular use of intravenous fluids for rehydration and the non – administration of necessary micronutrients and electrolytes were problems encountered here and in studies elsewhere (Puoane *et al*, 2001; Deen *et al*, 2003; Weisstaub *et al,* 2004).

In severely malnourished children, the usual signs of infection such as fever and increased white cell count may be absent because of an impaired immune system (WHO, 1999). The WHO guidelines therefore recommend treatment of infection with broad spectrum antibiotics. Both hospitals conformed to the guidelines to a large extent with all patients at St. Mary's hospital and almost 90% of those at Katutura hospital receiving antibiotics. This is in contrast to the findings of other investigators who reported that routine administration of broad spectrum antibiotics was not practiced (Puoane *et al*, 2001; Schofield & Ashworth, 1996; Deen *et al*, 2003). Routine administration of antibiotics was found to contribute significantly to reduction in CFR in Hlabisa, South Africa (Wilkinson, Scrace & Boyd, 1996).

All severely malnourished children have micronutrient deficiencies which have to be corrected (Ashworth *et al,* 2005) (step 6). Even in the absence of visible changes in the eyes, the risk of blindness from vitamin A deficiency is very high hence the need to give high doses of vit A on

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admission (Ashworth & Burgess, 2003). Although anaemia is common, iron should not be given in the initial phase because the synthesis of the iron binding protein transferring in the liver is impaired (WHO, 1999). Unbound iron damages cell walls and stimulates the multiplication of harmful bacteria (Ashworth & Burgess, 2003). In the current study, vit A was not given routinely and some children were given iron in the initial phase of treatment in both hospitals. Zinc and copper were also not given in both hospitals. These findings are similar to those reported by researchers elsewhere (Puoane *et al*, 2001; Deen *et al*, 2003).

In the stabilisation phase, small feeds of a special starter formula should be given frequently. Giving small frequent feeds is important because absorption of nutrients is reduced and less enzymes are available to digest the food ingested. The weak heart cannot handle large volumes of fluid therefore amounts of meals must be measured (Ashworth & Burgess, 2003). A special starter formula which is low in protein and sodium but high in sugar is recommended because the liver makes less glucose and cannot metabolise large quantities of protein (WHO, 1999). Although records were missing at St. Mary's hospital, a high protein diet was prescribed from admission and amounts were not known. In Katutura hospital, measured amounts of full strength formula were given. This may have been responsible for some of the deaths. Similarly, Puoane and colleagues reported the use of full strength milk for younger children and normal ward diet for older children (Puoane *et al*, 2001). These findings also concur with those of Schofield and Ashworth who reported that the use of inappropriate diets using amounts of protein higher than those recommended by scientific evidence contributed to high case fatality rates (Schofield & Ashworth, 1996).

In the rehabilitation phase, to achieve rapid weight gain and rebuild new fat and muscle, a change to catch-up formula which is high in energy, protein and some micronutrients is necessary (Ashworth & Burgess, 2003).The transition to catch-up diet must be gradual, however, to avoid the development of heart failure from sudden consumption of huge amounts. In this study, the types of feeds were not changed throughout the hospital admission

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but the amounts of feeds were increased at Katutura hospital. Similar findings have been reported from other parts of Africa (Puoane *et al*, 2001; Deen *et al*, 2003).

In both hospitals, the most obviously absent aspect of treatment was playful stimulation, step 9, as there was neither a designated play area nor time scheduled for structured play therapy. This important step was found to be absent and a problem to implement in centres that have implemented the WHO guidelines (Puoane *et al*, 2001; Deen *et al*,2003; Ashworth *et al*, 2004). Severely malnourished children have delayed mental and behavioural development (Ashworth & Burgess, 2003). Play therapy provides the physical and emotional stimulation necessary to prevent the possible permanent mental and emotional impairment (WHO, 1999).

Finally, clear follow–up instructions were not always recorded in the patient notes and this was also the case in the Eastern Cape, South Africa (Puoane *et al*, 2001). Step 10 – preparation for discharge and follow-up is important to prevent a recurrence of severe malnutrition after the child goes back to the same circumstances that produced the problem initially. Therefore, an exploration of the prevailing circumstances and possible solutions together with instruction of care takers on how to feed and care for the child at home and when to take the child to the clinic is necessary (Ashworth & Burgess, 2003). In addition, although some weight gain will have taken place by the time children are being discharged, they are still at risk of infection, relapse and death when they go home because the immune system takes much longer to be repaired (Ashworth & Burgess, 2003).

On comparison of actual treatment practices done at both hospitals with the WHO (ten steps) recommendations, interpretation of the results must allow for the limitations of the data collection methods. In this study, record reviews and staff interviews were not further confirmed by observation of ward practices as other studies have done (Puoane *et al* , 2001; Deen *et al*, 2003). From the record reviews and interviews, 58% of recommended practices were performed at Katutura with local adaptations such as feeding three hourly as opposed to two hourly. At St. Mary's hospital, the absence of feed charts in the records leaves only 40% of recommended practices that were performed correctly. However, the interviews show that

much more information on the correct practices is known than is practiced in reality. The lack of adherence to all the ten steps may be one of the reasons for the higher CFR at the central hospital (Katutura). Another reason could be the fact that children who are sicker are referred to the central referral hospital. Possible reasons for non-adherence may include staff shortages, limited resources especially toys, heaters and non-availability of the special starter and catch up formulae and micronutrient supplements. Some of these constraints are similar to the experiences of other investigators working in developing countries (Brewster, Manary & Graham, 1996; Ashworth *et al*, 2004; Puoane *et al*, 2001).

It seems reasonable to suggest that the noted deviations from the recommended guidelines are contributing factors to the case fatalities noted. Other factors undoubtedly, may also be contributing. Since there was no formal training on the implementation of the WHO guidelines in the two hospitals, whatever is implemented in the form of WHO guidelines may have been obtained from the medical training of the doctors and shared information during medical practice. Implementation of WHO guidelines in other centres has been associated with considerable improvement in the outcomes of treatment of severe malnutrition as indicated by a drop in CFR (Deen *et al*, 2003; Puoane *et al*, 2004; Ashworth *et al* 2004). In all these cases, implementation was preceded by training of health care providers (nurses and doctors) in the use of the guidelines. The results of this study indicate that training in the use of the WHO guidelines may be beneficial towards improving the management of severe malnutrition not only in the two hospitals where the study was carried out, but in the whole country of Namibia.

5.1   What can be done to improve the situation in the two hospitals?

Since there was no formal training in the implementation of the WHO guidelines in the two hospitals, a training of the paediatric staff on the implementation of the guidelines seems to be the best way to improve the situation. The training should be accompanied by support and monitoring activities of the implementation process. A study on improving the hospital management of malnourished children by participatory research (Puoane *et al*, 2004) showed

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that support and follow up of staff is important during the implementation of the WHO guidelines. Monitoring refers to the regular observation and recording of activities in a programme or project to assess the progress thereof (UNDP, 2002). Monitoring the effects of training and implementation of the WHO guidelines will allow stakeholders to assess whether the desired results are being achieved. Therefore, monitoring has to be scheduled and planned for, including the tools needed to carry out monitoring activities.

The tool that was used for data collection by review of records will therefore be adapted to develop a simple tool for undertaking monitoring activities. This tool will be used by the ward sister who will review patient records weekly and record her findings. The information obtained will be validated by interviews with the caretakers of the children whose records were reviewed. In addition, a checklist similar to the one used for data collection will be used to monitor availability of resources monthly.

CHAPTER 6: CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

A number of reasons make definitive conclusions difficult in this study. The absence of records such as feed charts at St. Mary's hospital does not allow for correct interpretation of results. In addition, confirmation of practices by direct observation of activities is desirable to give a clearer view of the reality. Nevertheless, the following conclusions have been drawn:

In both hospitals, case fatality rates are not as high as reported in other countries, but are still unacceptably high, as with proper care malnourished children are not supposed to die during hospital admission. The practices of paediatric staff in the management of severe malnutrition were not all found to be in line with the WHO guidelines. Although the interviews show that some staff have some theoretical knowledge about the WHO guidelines, it seems that the implementation is a problem. This may be due to a lack of support and follow up. Practices that often put children at risk of death such as regular use of intravenous fluids for rehydration, giving iron in the initial phase and lack of replacement of micronutrients and electrolytes were found in both hospitals.

In Katutura hospital, 86% of recommended resources were available while 89% were available in St. Mary's hospital. Heaters and toys in the paediatric wards at Katutura hospital are necessary. Toys must be made available in St. Mary's hospital and both hospitals need supplies of micronutrients such as copper and zinc.

6.2   Recommendations

Based on the findings of this study, the following recommendations are proposed:

- A situation analysis of more hospitals nationwide will give a more comprehensive picture especially in the northern parts of the country where the population is more dense.

- Studies on the attitudes of health workers and observation of practices as health workers attend to malnourished children are necessary.

- Introduce the WHO guidelines for management of severe malnutrition through training of health workers. These trainings should be accompanied by support and training activities of the implementation of the guidelines.

- Introduce standard recording of feeds at all institutions treating severe malnutrition.

- Introduce play therapy in institutions treating children with severe malnutrition for physical and emotional stimulation.

- A regular supply of essential minerals and electrolytes (potassium, magnesium, zinc and copper) is necessary to effectively treat severe malnutrition.

- Functional heaters in wards where children with severe malnutrition are nursed are a necessity.

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APPENDIX 1:

QUESTIONNAIRE

Profession:_____ **Current Post:** _____

Qualification: _____ **Where obtained:** _____

How long have you been working in a paediatric ward?

_____

_____

What are your main challenges in treating children with severe malnutrition?

_____

_____

_____

Step 1:

1. How do you prevent hypoglycaemia in malnourished children?

_____

_____

2. How do you diagnose hypoglycaemia?

_____

_____

3. How soon after admission do you feed malnourished children?

_____

_____

4. What feeds are given soon after admission to malnourished children?

_____

_____

5. How often are feeds given?

_____

_____

Step 2:

1. How do you prevent hypothermia in malnourished children?

_____

_____

2. How do you treat hypothermia in malnourished children?

_____

_____

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Step 3:

1. How do you prevent dehydration in malnourished children?

   _____

   _____

2. How do you correct dehydration in malnourished children?

   _____

   _____

3. What fluids are used to rehydrate malnourished children?

   _____

   _____

Step 4:

1. How do you prevent electrolyte imbalances in malnourished children?

   _____

   _____

2. How do you diagnose electrolyte imbalances in malnourished children?

   _____

   _____

3. How do you correct electrolyte imbalances in malnourished children?

   _____

   _____

4. Are diuretics used to treat oedema?

   _____

   _____

5. What electrolytes are given to malnourished children?

   _____

   _____

Step 5:

1. Are antibiotics given routinely to all malnourished children?

   _____

   _____

2. How do you treat infections in malnourished children?

   _____

   _____

3. What antibiotics are used to treat infections in malnourished children?

   _____

   _____

Step 6:

1. What micro-nutrient supplements are given to malnourished children?

_____

_____

2. Is Iron given to malnourished children? When?

Step 7 & 8

1. What feeds are given to malnourished children?

_____

_____

Step 9:

1. Is there a play area for malnourished children?

_____

_____

2. Are there any toys for children to play with?

_____

_____

3. Are mothers/care takers allowed on ward?

_____

_____

4. Is there any structured play time?

_____

_____
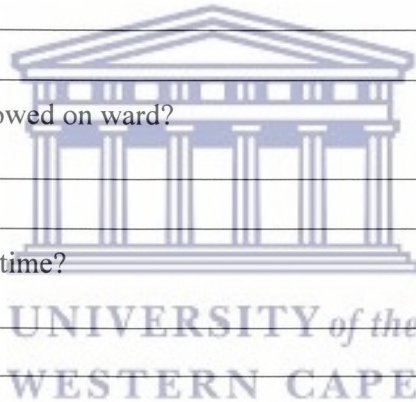
Step 10:

1. What instructions are given to care takers prior to discharge?

_____

_____

2. What arrangements are made for follow-up?

_____

_____

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Appendix 2

Checklist for Resources available on ward

	Yes	No
Dextrostix/ glucostix or glucometer		
10% glucose (oral)		
Nasogastric tubes Paediatric		
What feeds/formula		
Co-trimoxazole (Bactrim)		
Metronidazole		
Ampicillin		
Gentamicin		
Chloramphenicol		
Mebendazole		
Thermometers – types/? Many		
Heaters		
Blankets		
Potassium supplements		
Magnesium supplements		
Multivitamin		
Vitamin A		
Folic acid		
Zinc		
Copper		
Iron		
Scale		
Toys		
IV cannulae		
Oxygen		
Child weighing scales		
Weight charts		
Fluid intake/output charts		
Paediatric giving sets		
Oral rehydration solution		
Ringers lactate		
½ strength Darrows with 5% dextrose		
Ringers lactate with 5 % dextrose		
Glucose/Dextrose (10% oral)		
Sterile Glucose/Dextrose (10% or 50%)		
Working fridge		
Washing facilities		
Electricity supply		

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Appendix 3

Record Review Data Collection Sheet

Age _____Gender_____Diagnosis _____

Weight on_____Lowest weight_____last_____

Admission   during admission   weight recorded

Oedema _____Severe wasting _____Other clinical_____

Present   Features

Hypoglycaemia checked (Y/N)	Treated (Y/N)	How
Hypothermia checked (Y/N)	Treated (Y/N)	How
Dehydration checked (Y/N)	Treated (Y/N)	How
Electrolytes checked (Y/N)	Treated (Y/N)	How
Infection	Treated (Y/N)	How
Micronutrients supplements given	Which	When
Iron given on admission (Y/N)		

How soon after admission was the child fed?

What feed was given _____how often were feeds given_____?

Any change in feeds _____to what_____? (during admission)

Amounts consumed at each meal

Any record of structured play (nursing notes)

Or presence of mother on the ward.

Outcome _____ duration of admission _____

Discharge and follow-up instructions _____

Lab investigations   drugs give   Fluid Therapy/Balance records

Appendix 4

Information Sheet

Hello;

I am Mwimanenwa Njungu, a student with the University of Western Cape's School of Public Health. I am conducting a research on the management of children with severe malnutrition admitted to hospitals.

Why am I doing this?
In many African countries, many children suffer from severe malnutrition and even when they are admitted to hospitals, many of them do not recover as hoped. We do not know whether this is the case here in Namibia. This research will hopefully shed more light on the problems that are encountered in the management of such patients. It will also be used to obtain a masters degree in Public health.

Procedure:
A trained researcher will review hospital records (registers and case notes) and make observations of resources available on the wards for the treatment of patients .The researcher will not perform any procedures on the children. In addition, a questionnaire with questions to do with managing children with severe malnutrition will be given to health care workers who can then fill it in at their convenience. The information supplied will be treated with strict confidentiality. You are free to leave unanswered any questions that you do not wish to answer.

There is no benefit to you from participation.

Can you withdraw from study?
Certainly, you may withdraw from the study at any time, and without giving any reason. Your participation is completely voluntary and your refusal to participate has absolutely no adverse consequence.

If you have any further questions, more information may be obtained from Doctor Mwimanenwa Njungu at Cell number: 081 2014825.

If you are willing to participate in the study, please read and sign the attached consent form.

Thank you,
Dr. Mwimanenwa Njungu

Appendix 5

Consent Form

I ……………have been informed about the research project being carried out in this hospital. It has been explained to me that the purpose of the research is to obtain a post graduate degree and, eventually, maybe useful in improving the way children with malnutrition are treated in the hospital. The inconvenience that the study procedure will cause has also been explained.

I understand that all the information I supply will be kept strictly confidential and that I am free to withdraw my participation at any time without any penalty.
I have had the opportunity to ask questions.

I consent to take part in this research project.

Name of Participant: _____ Signature: _____ Date: _____

Name of Researcher: _____ Signature: _____ Date:_____

UNIVERSITY *of the*
WESTERN CAPE

Appendix 6

Permission to carry out Research

27. JUN. 2007 16:30   TELECOM   NO.114   P.1/1
                                                                   Att: Dr. John Musongo

REPUBLIC OF NAMIBIA

Ministry of Health and Social Services

Private Bag 13198	Ministerial Building	Tel: (061) 2032507
Windhoek	Harvey Street	Fax: (061) 227607
Namibia	Windhoek	E-mail: hnangombe@mhss.gov.na
Enquiries: Ms. H. Nangombe	Ref.: 17/3/3/AP	Date: 21 June 2007

OFFICE OF THE PERMANENT SECRETARY

Dr. Mwimanenwa Njungu
Erf No. 790
Block A
Rehoboth

Dear Dr. Njungu,

EVALUATION OF THE MANAGEMENT OF SEVERE MALNUTRITION IN TWO HOSPITALS IN NAMIBIA (KATUTURA AND ST. MARY'S HOSPITAL IN REHOBOTH).

1.   Reference is made to your application to conduct the above-mentioned study.

2.   The proposal has been evaluated and found to have merit.

3.   Kindly be informed that approval has been granted under the following conditions:
3.1.1. The data collected is only to be used for operational purpose;
3.2.   A quarterly progress report is to be submitted to the Ministry's Research Unit;
3.3.   Preliminary findings are to be submitted to the Ministry before the final report;
3.4.   Final report to be submitted upon completion of the study;
3.5.   Separate permission to be sought from the Ministry for the publication of the findings.

We hereby would like to inform you that your study is relevant but you should please pay attention to the following comments:

Wishing you success with your project.

Yours sincerely,

Approved

DR. K. SHANGULA
PERMANENT SECRETARY

Dr. RC GARISEB

Directorate: Policy, Planning and HRD
Subdivision: Management Information and Research

AND SOCIAL SERVICES

KATUTURA STATE HOSPITAL

Forward with Health for all Namibians by the Year 2000 and B...

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