CLINICAL EVALUATION OF THERAPEUTICAL MANAGEMENT IN PEDIATRIC WARD OF USM HOSPITAL MALAYSIA

TESIS

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SUMMARY

Children health is an indicator for the health of a nation (Egerter, *et al.*, 2008). Health problem in children will affect their growth. WHO(Anonymous, 2004) described that almost 11 million children die before the age of 5 years old. World Vision Asian Pacific (Anonymous, 2009[a]) report the same case accurred in Camboja, India, and Laos. In United States, 200 from 1000 childern died before the age of 1 years old (Anonymous, 2006[a]). The cause of this problem is vary, such as acute respiratory disease, malaria, diarrhea, measles, malnutrition, dysentery, pneumonia, diphtheria, and cough (Anonymous, 2006[a]; Kliegman *et al.*, 2007; Anonymous, 2009[a]). In fact, death can be avoided through rapid handling (Anonymous, 2006[a]).

From the above data, the possibility of the children to be hospitalized is very hight. Hospital should give special notice for handling pediatric patients. Pediatric particulary neonates with a rudimentary organ metabolism can't accept the treatment as similar as those for adult. Drug treatment for pediatric need perfect management, start from enforcement of diagnosis, drug selection, dosage plan, until monitoring of drug use (Agalu & Mekonnen, 2012).

Special attention is needed from health professionals for pediatric patient in terms of drug interactions, because children have a different response to the drug as compaire to adult. Parts of the body which is responsible for the excretion has not fully developed until the age of 1 year, so that the half-life of the drug is longer, that lead to it's toxicity (Novaes & Gomes, 2006).

The use of drugs requires a clear understanding of the set targets to achieve the effect, and the relative risk appears to the drug of choice. The need for a safe and effective drug for use in the sick neonates, infants, children and teens need drug treatment strategy formation wise (Kliegman *et al*., 2007).

The aim of the study is to evaluate the patient drugs therapy management and its outcome in the pediatric ward HUSM Kelantan Malaysia. The research was carried out for two months from April 2012 to Mei 2012 on the Pediatric Ward Hospital University Sains Malaysia (HUSM). An amount of 59 pediatric patients consist of male (57.63%) and female (37.29%) were involved in this study. Data was collected from patient medical records in Pediatric Ward HUSM, includes age, sex, body weigh, diagnostic, physical examination, therapy, and laboratory investigation.

The research was conducted using a prospective longitudinal methode. Anova. The relationship between diagnosis and the patient age, diagnosis, body weight were analysed using one way anova, diagnosis and gender using Chy-Square. The relationship between diagnosis with therapy using Chy-Square methode. The relationship between diagnosis and data laboratory and diagnosis

with lenght of stay using one way anova methode. And the relationship between diagnosis with outcome using chy-Square methode.

The average weight and age of the patient were 14.65±11.44 kg and 4.94±4.05 year old, respectively. The average lenght of stay of the patient of about 3 days. Most of the patient during hospitalization were suffered from respiratory tract infection 52,5%, were 64,5% patient among them with bronchopneumonia. The most drug therapy of the patient was the combination of amoxicillin and clavulanic acid.

From the data of management of therapy at the pediatric ward of HUSM Malaysia conducted in April to June 2012, the several conductions can be generated as followers is most common disease suffered by pediatric patients is bronchopneumonia infection. The followed by most widely drugs used at the pediatric ward is amoxicillin and clavulanic acid for antibiotics, carbamazepine for anticonvulsants, nifedipine for antihypertensives, prednisone and combination of prednisone and hydrocortisone for steroids, ravin enema and combination of ravin enema with lactulose for laxatives, and ORS (Oral Rehydration Salt) for antidehydration. The average length of stay of the patients is 2-4 days, except for nephrotic syndrome which is about 5-6 days. The clinical outcome of the patients at the children's ward of HUSM shows that patients are generally discharged without complications, except for chronic hydrocephalus, cerebral pseudotumor and nephrotic syndrome, the patient discharged with complication.

Based on the statistical analysis, there is a significant correlation between renal disease, with uses patient suffered nephrotic syndrom at the age of 11.7±0.494 years old, while with AGN (Acute Glomerulus Nepritis) were at the age of 7.6 ± 5.027. There is also a significant correlation between renal disease and other disease groups, with their body weigth most of the patient suffer from neprhotic syndrom were of 40.7 ± 16.546 kg , and AGN (Acute Glomerulus Nephritis) were of 28.5 ± 17.677 kg, While the averege of body weight of the patient suffer from chronic Hydrocephalus were of 20.5 kg, Alleged Insect of 14.0 ± 5.656 kg, AVSD of 10.5kg, Syncope 20.0kg, and Pseudotumor Cerebri of 62.0kg.

There is a significant relationship between the disease of RTI (Respiratory Tract Infection), most of antibiotic drug treatment for the patient with RTI were amoxicillin and clavulanic acid. The relationship between the infection diseases with antibiotic drugs there is significant, the most of antibiotic drug treatment is amoxicillin and clavulanic acid. Relationship between the neuronal diseases with anti convulsant drugs there is significant, the most of antibiotic drug treatment is carbamazepine. The relationship between renal disease with anti hypertension there is significant, the most of antibiotic drug treatment is nifedipine and HCT. The relationship between and gastrointestinal disease with anti dehydration and laxative drugs there is significant, the most of antibiotic drug treatment is ravin enema, lactulosa and ORS (Oral Rehydration Salt).

There is also a significant relationship between the diagnosis and patient laboratory data of the disease of RTI with urea, infectious diseases with potassium and urea, renal disease with creatinine and albumin, neurological disease with sodium, gastrointestinal disease with sodium, creatinine and urea for there more $P<0.05$. There is a significant relationship between the length of stay with patient diagnoses. The relationship between diagnosis and patients outcome was also significant.

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Thesis

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STATEMENT OF AUTHENTICITY

I hereby honorably declare that the presented thesis with the title : ***"CLINICAL EVALUATION OF TERAPEUTICAL MANAGEMENT IN PEDIATRIC WARD OF USM HOSPITAL MALAYSIA"*** is my own work; thoughts directly or indirectly taken from external sources have been highlighted as such. Furthermore, I confirm that no other sources have been used than those specified in the thesis itself.

The thesis, in same or similar form, has so far not been presented at any other examination board and also has not been published yet.

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CURRICULUM VITAE

The author was born in the village of Takengon Payatumpi on December 5, 1985, the first child of three children of the couple Mr. Miftahun, Spd and Mrs. Sumiem. Author completed elementary school Payatumpi State 1999, Junior High School I Takengon 2002, and Senior High School 2 Takengon State in 2004. In 2004 the author continued her education at the Department of Pharmacy at the University of Andalas Padang and completing studies in 2010. In 2010 the author continued her education and graduated pharmacist in 2011. In 2011 the author had the opportunity to continue their education Srata 2 (S2) at the Faculty of Pharmacy Graduate Study Program Community and Clinical Pharmacy at the Andalas University.

FOREWORD

Praise the author say the presence of God who has endowed he guidance until the author can sort a research en titled:, CLINICAL EVALUATION OF THERAPEUTICAL MANAGEMENT IN PEDIATRIC WARD OF USM HOSPITAL MALAYSIA as one of the requirements to obtain a Master Degree in Community and Clinical Pharmacy at the Postgraduate Program of Pharmacy, the University of Andalas Padang.

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Finally, the author expects criticism and suggestion on the flaws of this thesis. May thesis be useful in the future and may ALLAH Almighty always mercy and His grace to us all.

Padang, Juli 2013

Rita Astuti

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CHAPTER I

INTRODUCTION

1.1. Background

Children health is an indicator for the health of a nation (Egerter *et al.*, 2008). Health problem in children will affect their growth. Anonymous (2004) described that almost 11 million children die before the age of 5 years old. Anonymous (2009[a]) report the same case accurred in Camboja, India, and Laos. In United States, 200 from 1000 childern died before the age of 1 years old (Anonymous, 2006[a]). The cause of this problem is vary, such as acute respiratory disease, malaria, diarrhea, measles, malnutrition, dysentery, pneumonia, diphtheria, and cough (Anonymous, 2006[a]; Kliegman, *et al.*, 2007; Anonymous, 2009). In fact, death can be avoided through rapid handling (Anonymous, 2006[a])

None of parent want their children hospitalized, but from the above data, the possibility of the children to be hospitalized is very hight. From this reason, Hospital should give special notice for handling pediatric patients. Pediatric particulary neonates with a rudimentary organ metabolism can't accept the treatment as similar as those for adult. Drug treatment for pediatric need perfect management, start from enforcement of diagnosis, drug selection, dosage plan, until monitoring of drug use (Agalu & Mekonnen, 2012).

Special attention as needed from health professionals for pediatric patient in terms of drug interactions, because children have a different response to the drug as compaire to adult. Parts of the body which is responsible for the excretion has not fully developed until the age of 1 year, so that the half-life of the drug is longer, that lead to it's toxicity (Novaes & Gomes, 2006).

Drug interactions may be desirable or undesirable. Beneficial effect of the interaction for the goal of therapy is to increase drug effectiveness, reduce the side effects and to allow pretition to reduce the dose. Undesirable effects may reduce the effectiveness of the drug, produce harmful effects, and even be toxic to the body and in addition well increasing the cost of the treatment. Undesirable interactions can lead to different outcomes in patients. Some have this interaction which give a risk to life or permanently organ damage. Severe interactions also make a risk to life or permanent damage, moderate interactions which require additional treatment, and light interactions which do not significantly affect the therapeutic effect (Lisboa & Gomes, 2000).

The use of drugs requires a clear understanding of the set targets to achieve the effect, and the relative risk appears to the drug of choice. The need for a safe and effective drug for use in the sick neonates, infants, children and teens need drug treatment strategy formation wise (Kliegman *et al.*, 2007).

1.2 Research Questions

Based on the background, the problem can be formulated in this study are:

1. What kind of diseases was found at pediatric ward HUSM Kelantan Malaysia?
2. How does the therapy management of the pediatric ward in HUSM Kelantan Malaysia in April to May 2012?
3. How does the therapy outcome in the pediatric ward HUSM Kelantan Malaysia in term of:
   a. Langht of Stay
   b. Condition of dischard

1.3. Research Objective

1.3.1. General Purpose

The purposes of the study is to evaluate the patient drugs therapy management and its outcome in the pediatric ward HUSM Kelantan Malaysia.

1.3.2. Specific Objectives

1. To determine the patient diagnoses at the pediatric ward HUSM Kelantan Malaysia.
2. To determine therapy of patient in pediatric ward
3. To determine the therapeutic outcome at the pediatric ward HUSM Kelantan Malaysia in term of:

c. Langht of Stay

d. Condition of dischard

4. To compare clinical outcomes among patients in pediatric ward HUSM Kelantan Malaysia.

1.4. Advantage of Research

1. The research is expected to increase knowledge and field experience on drugs therapy.
2. For other researchers, the results of this study are expected to be a reference and comparison as well as the basic material for further research to obtain better results.
3. For the management especially in Indonesian public hospitals, the results of this study is expected to provide information about drugs therapy evaluation in order to optimize life quality of padiatric patients and reduce the adverse reaction.
4. For educations, the results of this study are expected to contribute to the enhancement of lecture materials, especially in the field of clinical pharmacy.

CHAPTER II

THEORETICAL FRAMEWORK

2.1 Pediatric Definition

There is some literature that set the limits of pediatrics. Some references state that children younger than 18 years is called pediatrics. Babies born before 37 weeks of age in the womb is called premature. Ages of 1 day to 1 month is referred to neonates. Age of 1 month to 1 year is called a baby. Aged of 1 year to 11 years is called the child, and ages of 12 to 18 years referred to adolescents (Dipiro, 1999). Anonymous 2011[a], states that pediatric is patient under the age of ≤ 14 years or those whose the body weight of ≤ 36 kg as determined by a length-based resuscitation tape.

2.2. Development of Children

The term "growth" is used for defining a quantitative increase in the body or in some of its parts, whereas the "development" is used for functional changes including those which a rouse from emotional and social interactions (Beyazova, 1996; Kliegman *et al.*,2006). Development refers to change or growth that occurs in a child during the life span from birth to adolescence. This change occurs in an orderly sequence, involving physical, cognitive, and emotional development. These three main areas of child development involve developmental changes which take place in a predictable pattern (age related), orderly, but with

differences in the rate or timing of the changes from one person to another (Ruffin, 2009).

Growth is the product of various factors, thus, a complex situation. In this complex, the answers to genetic factors, nutrition, metabolism, endocrine system, and peripheral tissue are of great significance, and required for such a sensitive coordination (Arcasoy *et al,* 1994; Kandemir & Yordam, 1995). Starvation and inadequate nutrition cause resistance against the growth hormone (Kandemir & Yordam, 1995). In small children, malnutrition has a dampening effect for motivation and curiosity, limiting their desire to play games and make observations. Due to the decreased level of interactions with surroundings, mental and cognitive development of such children are adversely affected (Bellamy, 1998).

2.3. Imunization in Childrens

Immunization is one of the most beneficial and cost effective disease prevention measures (Maciosek *et al*., 2006). Immunisation protects people against harmful infections before they come into contact with them in the community. Immunisation uses the body's natural defence mechanism - the immune response - to build resistance to specific infections. Immunisation helps people stay healthy by preventing serious infections (Anonymous . 2010[a]). Successes of immunization include worldwide eradication of small-pox, control of poliomyelitis with hopes of eradication, and elimination of indigenous measles and rubella in the United States (Orenstein *et al*., 2004; Anonymous, 2005[b]).

The benefits of the various partial vaccination for protection against the consequences of infection, ranging from asymptomatic infection or mild till severe, such as paralysis or death. The risk of vaccination coverage in general, mild and severe side effects, and life-threatening conditions. Thus, the recommendation for immunization practices balance scientific evidence of the benefits, costs, and risks to achieve the optimum level of protection against infectious diseases. This Recommendation describes the balance and attempt to minimize risk by providing information on the dose, route, and distance immunobiolog and described the situation required precautions or contraindications to the use of these immunobiologi (Anonymous, 1994).

Tabel. 1. Immunization Schedule and Type Of Immunization in Children (Anonymous, 2013)

Vaccine	Number of doses	Recommended ages	Other information
DTaP (diphtheria, tetanus, pertussis)	5	2 months, 4 months, 6 months, 15–18 months, 4–6 years	Some children should not get pertussis vaccine. These children can get a vaccine called DT.
Hepatitis B	3	Birth, 1–2 months, 6–18 months	Children may get an additional dose at 4 months with some "combination" vaccines.
Polio	4	2 months, 4 months, 6–18 months, 4–6 years	
Hib (*Haemophilus influenzae* type b)	3 or 4	2 months, 4 months, (6 months), 12–15 months	There are 2 types of Hib vaccine. With one type the 6-month dose is not needed.
PCV13 (pneumococcal)	4	2 months, 4 months, 6 months, 12–15 months	Older children with certain chronic diseases may also need this vaccine.
Rotavirus	2 or 3	2 months, 4 months, (6 months)	Not a shot, but drops that are swallowed. There are 2 types of rotavirus vaccine. With one type the 6-month dose is not needed.

2.4. Nutrition for Children

Good nutrition is necessary for the development of the brain and the body before a child is born and in the early state of life. Eating the right nutrients at the right time during growth increases a child's potential (Anonymous, 2006[b]). Diet influences all facets of a child's growth: physical, mental, cognitive, and psychosocial. Brain development can be restricted by even mild malnutrition but chronic under-nutrition can lead to life-long cognitive limitations and behavioral impairments (Anonymous, 2005[c]). Undernutrition, particularly in children, is a vice locked around humanity, preventing individuals and even whole societies from achieving their full potential. Children who are undernourished have lowered resistance to infection and are more likely to die from such common childhood ailments as diarrhoeal diseases and respiratory infections. Those who survive may be locked into a vicious cycle of recurring sickness and faltering growth, often with irreversible damage to their cognitive and social development (Anonymous, 2006[a]; Owens, 2008).

1.5. Medicine for Children

Monitoring the safety of medicine use in children is of paramount importance since, during the clinical development of medicines, only limited data on this aspect are generated through clinical trials. Use of medicines outside the specifications described in the licence (e.g. in terms of formulation, indications, contraindications, understanding, personal circumstances, or age) constitutes off-label and off-licence use and these are a major area of concern (Anonymous, 2009[d]; Anonymous, 2007[a]).

The use of medicines in infants and children presents a unique set of challenges to the prescriber. Physiological variances between children and adults, including the organ maturity and body composition, significantly influence the actions, effectiveness and safety of medicines. However, most pharmacokinetic and pharmacodynamic studies provide little, if any, information on drug action in infants and children, because they are usually conducted in adults (Anonymous, 2010[b]).

One of the most important aspects of pharmacotherapy in paediatrics is the fact that children are not 'small adults. The evaluation of pharmacokinetic, and also pharmacodynamic, data in children is essential. It's analyses is elemental importance for a valid, effective and safe pharmacotherapy in this age group. In addition, dose finding in children is complicated by the physiological development of the enzyme and receptor systems, which should be taken into account in clinical trials (Brochhausen, 2001).

Good management therapy in the hospital, can reduce an incident of medication error. Medication error is preventable event that may cause or lead to an inappropriate medication use or patient harm. These can be controled by the care professional on the patient. Such events may be related to professional practice, health care products, procedures and systems including: prescribing, order communication, product labelling, packaging and nomenclature, compounding, dispensing, distribution, administration, education, monitoring and use (Anonymous, 2010[c]).

The following problems occur with the use of medicines in the treatment of children and adolescents (Anonymous, 2007);

1. Often, medicines used are off-label and unlicenced.
2. Over-the-counter, traditional and herbal medicines are readily available, but their use is generally not evidence-based and is often inappropriate.
3. Counterfeit and substandard medicines are widespread.
4. Abuse by teenagers occurs with non-medical prescription of legalmedicines and illegal drugs.
5. New and innovative medicines are available with a paediatric indication, but with no evidence of long-term benefit and risk, e.g. the biological agents used as disease modifying antirheumatic medicines, such as etanercept.

WHO recognized the need for research and development into medicines for children, including better dosage forms, better evidence and better information about how to ensure that medicines for treating the common childhood diseases are given at the right dose for children of all ages. The World Health Organization has therefore developed a program of work on medicines for children (Anonymous, 2010[b]).

2.6. Pharmacokinetic and Pharmacodynamic in Children

Many physiological differences between children and adults may result in age-related changes in pharmacokinetics and pharmacodynamics. Factors such as gastric pH and emptying time, intestinal transit time, immaturity of secretion and activity of bile and pancreatic fluid among other factors determine the oral bioavailability of pediatric and adult populations. Anatomical, physiological and biochemical characteristics in children also affect the bioavailability of other routes of administration. Key factors explaining differences in drug distribution between the pediatric population and adults are membrane permeability, plasma protein binding and total body water. As far as drug metabolism is concerned, important differences have been found in the pediatric population compared with adults both for phase I and phase II metabolic enzymes. Immaturity of glomerular filtration, renal tubular secretion and tubular reabsorption at birth and their maturation determine the different excretion of drugs in the pediatric population compared to adults (Fernandez *et al.*, 2011).

Drug delivery can occur via several routes, namely oral, sublingual, rectal, intravenous, intramuscular, subcutaneous, inhalation, topical, transdermal, intraocular, and intranasal. The success of each route depends on adherence and problems that may arise with each route. Because children may refuse delivery of drugs that have bad taste or that causes pain, burning, or other discomfort, strategies to reduce this problem must be addressed. Not all drugs are given through certain routes given in the same way. Because the technique can affect the proper administration of therapeutic efficacy (Kliegman *et al.*, 2007).

A. Absorbtion

Absorption of orally administered drugs may be affected by extrinsic factors (food and formulation) and intrinsic factors of a physiological nature. The latter includes volume of gastrointestinal fluids, the pH and buffer capacity of these fluids, contraction patterns, gastrointestinal transit, digestive enzymes, intestinal cellular transporters, drug metabolism enzymes, and intestinal bacterial flora (Atkinson *et al.*, 2007).

At birth normal gastric pH is about 1-3 on the first day of life. Furthermore, the pH of the stomach back toward neutral as low gastric acid secretion in the first few weeks. gastric pH would be the same as adults, usually achieved after the age of 2 years. Drugs that require stomach acid for absorption has low bioavailability. This situation is not very effective or require much higher doses than usual to achieve therapeutic such concentrations of drugs in this group are phenytoin, ketoconazole, and itraconazole (Anderson *et al.*, 2002).

B. Distribution

After absorption, the drug is distributed to the body compartments. Some of the processes involved in drug distribution is clearly different in neonates and infants compared with adults. Factors including plasma protein binding and partitioning of water continue to fluctuate throughout the first year of life, affecting the distribution of drugs (Fernandez *et al*, 2011).

Understanding the characteristics of drug distribution in the body is very important when choosing the dose of the drug (Kliegman *et al.*, 2006). Distribution of the drug in infants and children are different from adults, due to differences valume ektraselular fluid, total body water, fat tissue composition. Extracellular fluid volume is relatively higher than adults, this volume will continue to decline with age, 50% of neonates, infants aged 4-6 months 35%, at the age of one year 25% of the total weight. Another thing that is more important is the total fluid in the body is higher in babies born prematurely (80-85% of total body weight) than in normal infants (75% of total body weight) and in infants aged 3 months 60% and in adults (55% of total body weight) (Kliegman *et al.*, 2007).

In very young infants, total body water is high (80-90% of body weight (BW)) while fat content is low (10-15% BW). The amount of total body water decreased by 55-60% in adulthood (Mcleod, 1992; Rane & Wilson, 1976). The amount of extracellular water is about 45% in neonates, and especially large in neonates with low birth weight, compared to 20% in adulthood (Mcleod *et al.*, 1992).

Albumin, α1-acid glycoprotein, and lipoproteins are the most important circulating protein responsible for binding the drug in plasma. Absolute concentration of this protein is affected by age, nutrition, and disease. Drug is bound mainly to albumin, α1-acid glycoprotein, and lipoproteins, whereas acidic and neutral compounds bind mainly to albumin. Serum albumin and total protein concentrations decreased during infancy, approaching adult values by age 10-12 months. The same pattern was

observed with the maturation of α1-acid glycoprotein, the concentration seems to be about 3 times lower in neonatal plasma compared with maternal plasma, reaching a value which can be compared with adults by 12 months of age (Kliegman *et al.*, 2007).

C. Metabolism

Liver drug metabolism in neonates is still lower blood flow to the heart, the intake of drugs by the liver cells, the capacity of liver enzymes and bile excretion. Enzyme system in the neonates and infants livers have not completely development, especially in the process of oxidation and glucoronidase, while the sulfuric acid conjugation pathway is already complete (Yaffe, 1980).

The liver is most important organ for drug metabolism. It is 5% of BW at birth but only 2% in adults (Benedetti *et al.*, 2007). The biological purpose of drug metabolism is to convert lipophilic (fat soluble) compounds into more polar and thus more water soluble substances which readily excreted into bile or urine. The major site of drug metabolism is the liver. The gastrointestinal tract, blood cells and other organs are also involved in drug metabolism. The enzymes involved in drug metabolism are not only involved in the breakdown of medicines but also numerous other chemicals that humans ingest or inhaled either deliberately or unwittingly (Choonara, 2005).

The main purpose of drug metabolism is to convert the drug into substances more water soluble to facilitate their excretion. The process of drug metabolism in the liver occurs mainly hepatocytes to produce metabolites that are not active and relatively nontoxic. Sometimes metabolites can be the source of the toxic matrials. Drug metabolism mechanisms can be classified two phase. Phase 1 which involves changes in the structure of the drug molecule, phase 2 where the drug then conjugated with others soluble in water section. Phase I reactions can be oxidation, reduction and hydrolysis. Oxidative reactions are the most important and frequently, though not necessarily, cytochrome P450 (CYP)-dependent. At birth, both phase I and II metabolic enzymes may be immature. Different capacities to metabolize drugs in children can cause drug levels higher or lower than those achieved in adult plasma (Mcleod *et al.*, 1992).

In fact, there are examples of therapeutic agents that produce metabolites in children who are not normally present in adults. These metabolites may be responsible for some of the efficacy and / or toxicity observed with the administration of drugs to children, an example is the production of caffeine in neonates receiving theophylline (Benedetti *et al.*,2007).

D. Excretion

Drug excretion by the kidney depends on three processes, glomerular filtration rate (GFR), tubular secretion and reabsorption. These are dependent on renal blood flow, which increases with age as a result of increased cardiac output and decreased peripheral vascular resistance (Fernandez *et al*, 2011).

The number of drugs are filtered by the glomerulus per unit of time depends on the functional ability of the glomerulus, the integrity of the renal blood flow and the extent of drug-protein binding. The number of filtered is drugs screened inversely related with the level of protein binding. Only free drug is filtered by the glomerulus and excreted. Although highly variable, the average renal blood flow 12 mL / min at birth, approaching adult values by 5-12 mo of age. Glomerular filtration rate was 2-4 ml / min at full-term infants, improved to 8-20 mL / min with 2-3 days of life, and approaching adult values by 3-5 months of age (Kliegman *et al*., 2007).

The mechanism of the renal tubules is essential in drug elimination, proportional development of glomerular filtration rate and tubular function may have variable and complex effects on the renal clearance of drugs. For example, the value of infant renal clearance for a given drug may exceed adult values, as low GFR can be offset by a greater reduction in tubular reabsorption capacity. It has been observed in children from 3-12 years old receiving imipenem-cilastatin (Jacob, 1984). In the case of digoxin, renal tubular secretion also plays a more important role in the excretion of the drug in children and adolescents than it does in adults (Linday, 1981),

inhibition of renal tubular secretion by compounds such as amiodarone can cause a sharp increase in serum digoxin concentrations children (Koren *et al.*, 1984).

2.7. Vital Signs in children

One of the most important and commonly performed tasks of a medical assistant is obtaining and recording patient vital signs and body measurements. Vital signs, also sometimes referred to as cardinal signs, include temperature, pulse, respiration, and blood pressure, abbreviated TPR B/P. They are indicative of the general health and well-being of a patient and, with regular monitoring, may measure patient response to treatment. Vital signs, in total or in part, are an important component of each patient visit. Height and weight measurements, although not considered vital signs, are often a routine part of a patient visit. The medical assistant may be required to take vital signs more than once during an offi ce visit to ascertain a baseline and obtain an impression of overall well-being of the patient. Accuracy in taking vital signs is necessary because treatment plans are developed according to the measurement of the vital signs. Variations can indicate a new disease process or the patient's response to treatment. Concentration and attention to proper procedure will help ensure accurate measurements and quality care of the patient.

A. Blood Preasure

Blood pressure is the force of blood against the artery walls as it circulates through the body. Blood pressure normally rises and falls throughout the day, but it can cause health problems if it stays high for a long time. High blood pressure can lead to heart disease and stroke—leading causes of death in the United States (Anonymous, 2009[b]).

Blood pressure in children works in the opposite way as compared to the other parameters in that it tends to increase as children age. Blood pressures can be quite low in newborns, and remain on the low side until children reach toddlerhood. Blood pressures can be obtained on the leg or the arm (for children who are toddlers or older) and should be taken with the child quiet and not moving. Blood pressures can be taken with a manual cuff and stethoscope, an automatic cuff, or even an adult wrist cuff placed over the arm or leg of a child. Listed below are normal ranges for blood pressure in children. The top number (systolic) and bottom number (diastolic) are listed separately (Agrawal, 2008).

B. Heart Rate

Heart rate (HR) is a non stationary signal; its variation may contain indicators of current disease, or warnings of impending cardiac diseases. Heart rate variability (HRV), the variation over time of the period between consecutive heartbeats, is predominantly dependent on the extrinsic regulation of the heart rate (HR) (Akhter *et a.l*, 2012). Heart rate and respiratory rate are key vital signs used to assess the physiological status of children in many clinical settings. They are used as initial measurements in acutely ill children, and in those undergoing intensive monitoring in high-dependency or intensive-care settings (Fleming *et al*, 2011).

C. Respiratory Rate

The number of breaths per minute is called the respiratory rate, although technically it is the ventilation rate (Kennedy, 2007) . Respiration involves three processes is ventilation, who movement of air between the atmosphere and the lungs, diffusion, which is the exchange of oxygen and carbon dioxide between the red blood cells and the lungs and perfusion, which is the delivery of red blood cells to and from the lungs (Hunter & Rawlings-Anderson, 2008).

D. Body Temperature

Normal body temperature does not vary as much by age, though children do tend to have a wider range of normal. Expect temperatures also vary by the time of the day, especially in older children. It is also very normal for some children to always read on the low or high side of the range. 98.6F, which has long been exalted as "the normal temperature," really is not any more normal than 97.7F or 99.2F for some children. The best way to take a temperature is rectally. Most parents obviously wish to avoid this method when possible. It is fine to take the temperature another way and then only do rectal temperatures when you suspect your child may be seriously ill. For older children, oral temperatures are reasonably reliable, and many newer thermometers allow us to take a temporal temperature (on the forehead), which is roughly equivalent to a rectal temperature (Agrawal, 2008).

Tabel. 2. Normal Pediatric Vital Signs

	HR beats/min	RR breaths/min	BP (sys) mm/Hg	BP (dias) mm/Hg
Newborn 0-1 month	100-180	30-60	73-92	52-65
Infant 1-12 months	80-150	30-60	90-109	53-67
Toddler 1-3 years	75-130	25-35	95-105	56-68
Pre-School Age 3-5 years	75-120	22-32	99-110	55-70
School Age 5-11 years	70-110	20-30	97-118	60-76
Adolescent 13-18 years	65-105	16-22	110-133	63-83
Adult 18+ years	50-90	12-20	113-136	65-84

(Anonymous, 2009[c])

2.8. Laboratory value

Reference range values are for apparently healthy people are range and often overlap significantly with values for those who are sick. Actual values may vary significantly due to differences in assay methodologies and standardization. Institutions may also set up their own reference ranges based on the particular populations that they serve, thus regional differences may occur. Consequently, values reported by individual laboratories may differ from those listed in this appendix (Duh, 1996).

Biochemical and hematological tests are performed on most hospitalized patients and many outpatients for diagnosis, management, or screening of disease. These tests include complete blood counts (CBC), white cell differentials, and determinations of glucose, electrolytes, blood urea nitrogen (BUN), creatinine, bilirubin, alanine aminotransferase (ALT), aspartate aminotransferase (AST), albumin, total protein, uric acid, and alkaline phosphatase levels (Foran *et al*, 2003).

2.9. Disease and Disorder in Childrens

2.9.1. Respiratory Tract Infection (RTI)

Infection of the respiratory tract is a common cause of illness of infants. Although pathogens are often not confined to anatomical boundaries, the infections may be classified as: upper respiratory tract – common cold, tonsillitis, and otitis media; acute laryngitis and epiglottitis; lower respiratory tract – bronchitis, bronchiolitis, and pneumonia (Valman & Thomas, 2002).

2.9.1.1. Upper Respiratory Tract Infection

The upper respiratory tract comprises the cold, tonsillitis, and otitis media; acute laryngitis and epiglottitis. Upper respiratory tract infection is usually the least serious condition but blockage of the nose by mucus may completely obstruct the airway in those infants who cannot breathe through their mouths. Middle respiratory tract infection may totally obstruct airflow at the narrowest part of the airway. Lower respiratory tract infection produces trivial signs initially but may be lethal within a few hours (Valman & Thomas, 2002).

Viruses, are the most cause of respiratory tract infections, beside bacterial, which infections produce similar clinical illness. Different viruses may produce an identical clinical picture or the same virus may cause different clinical syndromes. Clinically it may not be possible to determine whether the infection is due to viruses, bacteria, or both. If the infection is suspected of being bacterial, it is

safest to prescribe an antibiotic, as the results of virus infection studies are often received after the acute symptoms have passed (Valman & Thomas, 2002).

A. Tonsillitis

Tonsillitis is an inflammation of the tonsils which most commonly caused by a viral or bacterial infection. Most common virus to come tonsillitis may be due to viruses such as adenovirus, rhinovirus, Influenza, corona virus and respiratory syncytial virus. It can also be caused by the Epstein-Barr virus, herpes simplex virus, cytomegalovirus or HIV. On the others side infection is the most common bacterial caused by Group A beta-haemolytic streptococcus(GABHS) which causes strep throat. Less common bacterial infections include Staphylococcus aureus, Streptococcus pneumoniae, Chlamydia pneumoniae, Mycoplasma pneumoniae, pertussis, Fusobacterium, diphtheria, syphilis and gonorrhea (ETND, 2012). Acute tonsillitis is together with viral infections of upper respiratory tract and middle ear are the most often infection diseases in daily practice of pediatricians (Pichichero, 1995).

2.9.1.2. Lower Respiratory Tract Infection

Lower respiratory tract infections include a whole range of conditions which may or may not involve the lung parenchyma. Infections involving the parenchyma: pneumonia. Infections which involving the parenchyma such as acute bronchitis and exacerbation of chronic bronchitis, bronchiolitis in young children (Bru *et al*., 2007).

A. Bronchopneumonia

Bronchopneumonia is characterized by inflammation of the small airway and pulmonary parenchyma as a result of inhalation of pathogenic particulates. Bacterial pneumonia may complicate viral respiratory infection. Which may followed by injury to respiratory epithelium, disruption of the epithelial barrier, loss of mucociliary function and local or systemic immunosupression (Ettinger and Feldman, 1983).

a. Aetiology of Pneumonia by Age Group in Developed Countries

Table. 3. Aetiology of Pneumonia by Age Group in Developed Countries

Age group	Predominant organisms**
0 to 1 months	Group B streptococcus Gram negative organisms *Chlamydia trachomatis* *Listeria monocytogenes*
1 to 24 months	Respiratory syncytial virus (RSV) and other viruses † *Streptococcus pneumoniae* *Haemophilus influenzae* (non typeable) *Bordetella pertussis*
2 to 5 years	Respiratory syncytial viruses (RSV) and other viruses † *Streptococcus pneumoniae* *Haemophilus influenzae* (non typeable)
6 to 18 years	*Mycoplasma pneumoniae* *Chlamydia pneumoniae* *Streptococcus pneumoniae* accounts for up to 30% Respiratory viruses account for < 15% of episodes

(Best *et al*, 2010)

B. Acute exacerbation of bronchial asthma (AEBA)

Acute exacerbation of bronchial asthma (AEBA) was defined as following episodes of rapidly progressive increase in shortness of breath, cough, wheezing, or chest tightness, or some combination of these symptoms necessitating a non-scheduled visit, and associated to a decrease of respiratory airflow quantified by measurements of peak expiratory flow (PEF). *Pneumoniae* and *M. Pneumoniae* causes AEBA both in children and adults. These agents are involved in upper respiratory tract infections acute bronchitis and exacerbations of chronic bronchitis, and pneumonia (Cosentini *et al*., 2008).

C. Community Acquired Pneumonia (CAP)

Most Community Acquired Pneumonia (CAP) are bacterial in origin and often follow brief viral upper respiratory tract infection. In upright position lower lobes are of the best lung ventilated. Therefore deposition of inhaled micro organisms is higher in these lobes. Inhalation pneumonia is most often due to microorganisms (a) that can remain suspended in air so as to be transported far away, (b) survive long enough while in transit, (c) have a size less than 5 μm (d) carry a high inoculum, and (e) evade local host defence mechanisms. Infection by intracellular bacteria such as Mycoplasma *pneumoniae*, Chlamydophila and Coxiella *burnetii* occurs through contaminated aerosol inhalation route. CAP due to Streptococcus *pneumoniae*, Haemophilus and gram-negative bacilli occurs through micro aspiration (Singh, 2012).

2.9.2. Meningitis

Meningitis is defined as inflammation of the meninges. The term meningitis denotes only by the presence of inflammation without a specific etiology. The specific etiology of meningitis is determined by clinical history, cerebrospinal fluid (CSF) profile, cultures, and specific studies of the CSF. Bacterial meningitis is the most feared form of pediatric meningitis. Bacteria, which colonize the skin, nasopharynx, or both, enter the bloodstream. These bacteria then the CSF. It is for this reason that blood cultures are positive in up to 90% of children with bacterial meningitis (Donald, 2005).

Patients with bacterial meningitis typically present with high fevers, headache, and an altered mental state. The classic clinical triad of bacterial meningitis is fever, nuchal rigidity, and a change in mental status, although only two thirds of patients with bacterial meningitis actually have all three of these symptoms. Kernig's sign is a clinical examination technique whereby 90% flexion of the hips causes subsequent painful extension of the legs. Brudzinski's sign is involuntary flexion of the knees and hips after passive flexion of the neck while supine. Although these clinical signs have traditionally been used to evaluate for bacterial meningitis, recent studies in adults have found that Kernig's and Brudzinski's signs actually have a low sensitivity for predicting the presence of bacterial meningitis. The entire clinical picture should be used in determining whether to obtain a lumbar puncture (Donald, 2005).

2.9.3. Urinary Tract Infections (UTI)

Pediatric urinary tract infection begins with colonization of the periurethral area with gastrointestinal bacteria. These bacteria may then ascend into the bladder, kidneys, or both. A variety of virulence factors may promote infection with certain bacterial isolates. Escherichia coli organisms, a primary cause of urinary tract infection, have a variety of adhesive molecules that facilitate binding to uroepithelial cells (Donald, 2005).

The diagnosis of urinary tract infection is often associated with signs such as increased frequency or dysuria; these symptoms may be lacking in young children. A urinary tract infection needs to be considered in any young child presenting with fever. Studies have shown that the rate of urinary tract infection in infants. Analysis of a properly obtained urine specimen can provide a clue to the presence of infection. However, there remains considerable debate about the best test to perform. Urine dipstick for nitrate and leukocyte esterase, evaluation for bacteruria, and the presence of pyuria have all been used as screening tests for urinary tract infections (Donald, 2005).

2.9.4. Nervous System

A. Seizure

A seizure or convulsion is a paroxysmal, time-limited change in motor activity and/or behavior that results from abnormal electrical activity in the brain. Most seizures in children are provoked by somatic disorders originating outside the brain, such as high fever, infection, syncope, head trauma, hypoxia, toxins, or cardiac arrhythmias. Other events, such as breath-holding spells and gastroesophageal reflux, can cause events that simulate seizures (Kliegman *et al.*, 2007).

Key Points (Anonymous, 2010[d]):

1. Febrile seizures (simple and complex) are almost always benign and generally are not associated with neurological consequences.
2. The mainstay of investigation and treatment is to rule out bacterial infection.
3. There are limited indications for investigations including blood work, neuroimaging or electroencephalography (EEG).
4. Clear explanation to and reassurance of caregivers is key in the management of the child.

Focal seizures may be characterized by motor or sensory symptoms and include forceful turning of the head and eyes to one side, unilateral clonic movements beginning in the face or extremities, or a sensory disturbance such as paresthesias or pain localized to a specific area. Focal

seizures in an adolescent or adult usually indicate a localized lesion, but investigation of focal seizures during childhood may be nondiagnostic. Focal seizures in a neonate may be seen in perinatal stroke. Motor seizures may be focal or generalized and tonic-clonic, tonic, clonic, myoclonic, or atonic. Tonic seizures are characterized by increased tone or rigidity, and atonic seizures are characterized by flaccidity or lack of movement during a convulsion. Clonic seizures consist of rhythmic muscle contraction and relaxation; myoclonus is most accurately described as shocklike contraction of a muscle. The duration of the seizure and state of consciousness (retained or impaired) should be documented. The history should determine whether an aura preceded the convulsion and the behavior of the child immediately preceding the seizure. The most common aura experienced by children consists of epigastric discomfort or pain and a feeling of fear. The posture of the patient, presence and distribution of cyanosis, vocalizations, loss of sphincter control (particularly of the urinary bladder), and postictal state (including sleep, headache, and hemiparesis) should be noted (Kliegman *et al.*, 2007).

Febrile convulsions, the most common seizure disorder during childhood, generally have an excellent prognosis but may also signify a serious underlying acute infectious disease such as sepsis or bacterial meningitis. Therefore, each child with a seizure associated with fever must be carefully examined and appropriately investigated for the cause of the fever. During the acute evaluation, a physician's most important responsibility is to determine the cause of the fever and to rule out

meningitis or encephalitis. If any doubt exists about the possibility of meningitis, a lumbar puncture with examination of the cerebrospinal fluid (CSF) is indicated. A lumbar puncture should be strongly considered in children <12 mo of age and considered in those 12–18 mo of age, especially if seizures are complex or sensorium remains clouded after a short postictal period (Kliegman *et al.*, 2007).

Although the precise mechanisms of seizures are unknown, several physiologic factors are responsible for the development of a seizure. To initiate a seizure, there must be a group of neurons that are capable of generating a significant burst discharge and impairment of the γ-aminobutyric acid (GABA)–ergic inhibitory system. Seizure discharge transmission ultimately depends on excitatory glutamatergic synapses. Evidence suggests that excitatory amino acid neurotransmitters (glutamate, aspartate) may have a role in producing neuronal excitation by acting on specific cell receptors. Seizures may arise from areas of neuronal death, and these regions of the brain may promote development of novel hyperexcitable synapses that can cause seizures. Lesions in the temporal lobe (including slow-growing gliomas, hamartomas, gliosis, hippocampal sclerosis, and arteriovenous malformations) cause seizures, and when the abnormal tissue is removed surgically, the seizures are likely to cease. Two hypotheses have been suggested to explain the origin of seizures after brain injury. One suggests that inhibitory neurons are selectively damaged and remaining principal excitatory neurons become hyperexcitable. The other hypothesis suggests that aberrant excitatory circuits are formed as

part of reorganization after injury. Convulsions may be produced in experimental animals by the phenomenon of kindling. In this model, repeated subconvulsive stimulation of the brain (amygdala) ultimately leads to a generalized convulsion by changes in synapses. This synaptic mechanism may also occur in humans (Kliegman *et al.*, 2007).

B. Epilepsy

Epilepsy is a disorder that is best viewed as a symptom of disturbed electrical activity in the brain caused by a wide variety of etiologies. It is a collection of many different types of seizures that vary widely in severity, appearance, cause, consequence, and management. Epilepsy implies a periodic recurrence of seizures with or without convulsions. Seizures that are prolonged or repetitive can be life-threatening. The effect epilepsy has on patients' lives can be extremely frustrating. Indeed, studies have shown that patients with epilepsy who do not experience complete seizure control have lower self-reported qualityof- life scores than patients who are seizure-free. It is also important to recognize that seizures may be just one (albeit the most obvious) symptom of an epileptic disorder. Not uncommonly, patients have other comorbid disorders, including depression, anxiety, and potentially neuroendocrine disturbances. Patients with epilepsy also may display neurodevelopmental delay, memory problems, and/or cognitive impairment. While, by convention, the focus of drug treatment is on the abolition of seizures, clinicians also need be attentive to addressing these common comorbidities (Dipiro, 2008).

Attack disorders such as faint and epilepsy produce their effects because some element of physiology becomes disordered, temporarily disturbing the function of the brain. For a test to positively identify the nature of an attack disorder, an attack must be recorded, and the disturbed physiology detected. As this is usually impractical, the routine diagnosis of attack disorders is largely clinical, based on history. The history should make clear what occurred before, during and after the attack, from both patient and eyewitness points of view. A number of clinical features are common to different types of attack, so diagnosis should be based on the ensemble of the clinical features, not on single features. A generalised tonic-clonic seizure may be the presenting symptom in people with previously unrecognised epilepsy and a detailed history should be taken to uncover previous myoclonic, absence or partial seizures (Stokes *et al.*, 2003).

2.9.5. Nephrotic syndrome

Nephrotic syndrome is a clinical condition characterized by proteinuria, hypoalbuminemia, hypercholesterolemia, and edema. Sometimes accompanied hematuri, hypertension and filtration glomerulus decreased rate. Because would not clear, regarded autoimmune disease (Hull & Goldsmith, 2008).

1. **Proteinuria**

Massive proteinuria the basis of the disorder nephritic syndrome. Proteinuria is largely derived from glumerulus leakage (proteinuria glumerulus) and only a small portion coming from tubular secretion (tubular proteinuria). Basically this massive proteinuria resulted by total serum protein increases, with physiological capacity of the renal tubules to reabsorb filtrate protein is decreased.

Epithelial cells and basal membrane of nephron is negatively charged. Therefore this inhibit the positively charged molecul such as in all forms of nephritic syndrome, it is found there is a processes fusion of food resulting in damage to the negatively charged polianion normally a filter or barrier to negatively charged serum albumin, and these changes lead to increased permeability of the capillary walls glumerulus to serum protein (Ronald, 2004).

2. Hipoproteinemia

Plasma contains several different proteins and most will extra vascular space (EV). The main plasma protein are IgG, transferring and albumin were with a small molecular weight (MW) (69,000), making it easily to be excreted through the urine. cause the term hipoproteinemia synonymous with hypoalbuminemia. Hypoalbuminemia may occur when proteinuria 3-5 grams / day, due to increased of albumin catabolism or decrease of protein intake. This will happen to patient experiencing anorexia or increased utilization of amino acids, protein loss through the intestine or protein loosing enseropathy (Stevens *et al*., 2006).

Liver plays an important role for protein synthesis when the body loses some protein, thought renal and extra-renal. Compensatory mechanism to increase the synthesis of protein (albumin) is primarily to maintain the composition of the proteins in the extra-vascular space (EV) and intra-vascular (IV). In nephritic syndrome protein synthesis by the liver is usually normal but may be increased or decreased. Protein synthesis by the liver can increase 2 times normal but not adequate to compensate the loss of the protein. That, the overall reduction in total protein of the body including muscles is coursed. A decrease of plasma albumin, as a compensatory mechanisms of albumin synthesis in the liver is not quite adequate (Gunawan, 2006).

3. Hiperlipidemia

In most patients with nephritic syndrome, the level of cholesterol, triglycerides and phospholipids were increased to plasma, cholesterol and lipoprotein constituents of LDL (Low Density Lippo Protein), VLDL (Very low density lippo protein), HDL (High Density Lippo Protein), and LDL cholesterol in patients with nephritic syndrome and VLDL always rising while normal HDL or down. In patients with nephritic syndrome occurs inverse association between cholesterol and albumin, so this manipulation support the hypothesis that decreased serum albumin and oncotic pressure stimulates liver cells to form lipid or lipoprotein lipogenesis (Stephen, 2006).

4. Edema

Clinical swollen or edema is showed by an accumulation of fluid in the interstitial spaces of the body that can be determined by inspection and palpation. Mechanisms of edema include: the increase in permeability glumerular capillary, which large filtered and produced albumin hypoalbuminemia. This will result in a decreased of plasma intravascular oncotic pressure. This situation leads to an increasing of fluid transudation through the capillary wall from the intravascular in to the interstitial space causing edema formation (Stephen, 2006).

The reduction of effective blood volume will decrase renal blood flow, which lead to increase RASS aldosteron activity and skip nervous as well The increase in aldosterone hormones will affect proximal tubule cells to reabsorb Na^+ ions, decreases it's excretion. Furthermore, the sympathetic nervous activating causing an increase in vascular resistance also kidney resistance which excretion due may also cause a decrease in salt filtration and reduced Na^+ and water. From aboves would cause an increase in cellular fluid volume (VCES) and edema will produced (Gunawan, 2006).

2.9.6. Gastrointestisinal

A. Constipation

Constipation is defined as having a bowel movement less than three times per week. With constipation stools are usually hard, dry, small in size, and difficult to eliminate, painful to have a bowel movement and often experience straining, bloating, and the sensation of a full bowel (Anonymous, 2007[b]). Constipation is frequently multifactorial and can result from systemic or neurologic disorders or medications. Constipation can be classified into three broad categories: normal-transit constipation, slow-transit constipation, and disorders of defecate or rectal evacuation (Lembo & Camilleri, 2003).

Normal-transit constipation (or "functional" constipation) is the most common form of constipation that clinicians see. In patients with this disorder, stool traverses at a normal rate through the colon and the stool frequency is normal, yet patients believe they are constipated. In this group of patients, constipation is likely to be due to a perceived difficult with evacuation or the presence of hard stools. The patients may experience bloating and abdominal pain or discomfort, and they may exhibit increased psychosocial distress (Ashraf *et al*, 1996) Symptoms of constipation typically respond to therapy with dietary fiber alone or with the addition of an osmotic laxative (Voderholzer *et al*, 1997).

Slow-transit constipation is the condition often starts at puberty. Associated symptoms are an infrequent urge to defecate, bloating, and abdominal pain or discomfort. In patients with a minimal delay in colonic trans tranPsit, dietary and life style factors contribute to symptoms. In these patients, a high-fiber diet may increase stool weight, decrease colon-transit time, and relieve constipation. Patients with more severe slow-transit constipation have a poor response to dietary fiber and laxatives. Such patients have more delayed emptying of the proximal colon and fewer high-amplitude peristaltic contractions after meals, which normally induce movement of content through the colon. Colonic inertia, a related condition, is characterized by slow colonic transit and the lack of an increase in motor activity after meals or after the administration of bisacodyl, cholinergic agents, or anticholinesterases such as neostigmine (Lembo & Camilleri, 2007).

Defecatory disorders are most commonly due to dysfunction of the pelvic floor or anal sphincter. Other terms used to describe defecatory disorders include anismus, pelvic-floor dyssynergia, paradoxical pelvic floor contraction, obstructed constipation, functional rectosigmoid obstruction, the spastic pelvicfloor syndrome, and functional fecal retention in childhood. Functional fecal retention in children may result in secondary encopresis due to leakage of liquid stool around impacted stool, which can lead to an initial misdiagnosis of diarrhea (Lembo & Camilleri, 2007).

B. Acute Gastroenteritis (AGE)

Gastroenteritis is defined as the inflammation of the mucus membranes of the Gastrointestinal tract and is characterized by diarrhea or vomiting and very commonly disease in the word (Chow *et al*, 2010). The clinical manifestations of acute gastroenteritis can include diarrhea, vomiting, fever, anorexia, and abdominal cramps. There are three clinical classifications of diarrheal Conditions Acute diarrhea, lasting several hours or days, Acute bloody diarrhea or dysentery and Persistent diarrhea, lasting 14 days or longer (Granado-villar *et al.*, 2012).

Etiological of Acute Gastroenteritis in children can be Viruses such : Rotaviruses; Noroviruses (Norwalk-like viruses); Enteric adenoviruses; Caliciviruses; Astroviruses; Enteroviruses. Bacteria such; Campylobacter jejuni; Nontyphoid Salmonella spp; Enteropathogenic Escherichia coli; Shigella spp; Yersinia enterocolitica; Shiga toxin producing E coli; Salmonella typhi and S paratyphi. Vibrio cholerae such; Protozoa; Cryptosporidium; Giardia lamblia; Entamoeba histolytica; Helminths; Strongyloides stercoralis (Elliott, 2007).

2.9.7. Autoimmune Disorders

Autoimmune disease occurs when the immune system attacks self-molecules as a result of a breakdown of immunologic tolerance to autoreactive immune cells. Many autoimmune disorders have been strongly associated with genetic, infectious, and/or environmental predisposing factors. Comprising multiple disorders and symptoms ranging from organ-specific to systemic, autoimmune diseases include insulin-dependent diabetes mellitus, rheumatoid arthritis, systemic lupus erythematosus, scleroderma, thyroiditis, and multiple sclerosis. There are also implications of autoimmune pathology in such common health problems as arteriosclerosis, inflammatory bowel disease, schizophrenia, and certain types of infertility (Smith and Germolec,1999).

Our bodies have an immune system, which is a complex network of special cells and organs that defends the body from germs and other foreign invaders. The core of the immune system is able to tell the difference between self and nonself: what's you and what's foreign. A flaw can make the body unable to tell the difference between self and nonself. When this happens, the body makes autoantibodies that attack normal cells by mistake. At the same time special cells called regulatory T cells fail to do their job of keeping the immune system in line. The result is a misguided attack on our own body. This causes the damage which known as autoimmune disease. The body parts that are affected is depend on the type of autoimmune disease (Goldmuntz and Penn, 2010).

A. Idiopathic Thrombocytopenic Purpura (ITP)

Idiopathic thrombocytopenic purpura is the most common autoimmune blood disorder. In this disease, autoantibodies interact with platelets to render them susceptible to rapid clearance from the circulation. In adults, it is usually a chronic and life-long condition but in children it is often self limiting (Ahn & Horstman, 2002).

Immune thrombocytopaenic purpura (ITP) is a heterogeneous disease characterised by increased platelet destruction and thrombocytopaenia. A number of features suggest this destruction is immune-mediated and that it may involve not only the destruction of the platelet, but also inhibition of platelet release by the megakaryocyte. The exact mechanism of the immune dysfunction, however, is generally not known. In addition, certain patients who apparently have ITP may have an indolent form of myelodysplasia that is not yet evident on bone marrow examination. Some of the difficulties in defining the pathology of ITP arise because it a heterogeneous disease with individual patients having different causes of thrombocytopaenia and other difficulties relate to the limited nature of assays, such as the antiplatelet antibody (Cooper & Bussel, 2006).

B. Systemic Lupus Erythematosus (SLE)

Systemic lupus erythematosus often abbreviated to SLE or lupus. It is a systemic autoimmune disease (or autoimmune connective tissue disease) that can affect any part of the body. As occurs in other autoimmune diseases, the immune system attacks the body's cells and tissue, resulting in inflammation and tissue damage. It is a Type III hypersensitivity reaction caused by antibody-immune complex formation. The course of the disease is unpredictable, with periods of illness (called flares) alternating with remissions. One manifestation of SLE is abnormalities in apoptosis, a type of programmed cell death bin which aging or damaged cells are neatly disposed of as a part of normal growth or functioning. (Bhattacharya *et al*., 2011).

The pathogenesis of lupus remains unclear although the concept of apoptosis goes some way. Autoantigens are released by necrotic as well as apoptotic cells. Defects in the clearance of apoptotic cells have been described in SLE which may lead to aberrant uptake by macrophages which then present the previously intracellular antigens to T and B cells thus driving the autoimmune process. Recent work has expanded these concepts and dissected out possible defects in clearance of apoptotic bodies including complement deficiencies, defects in macrophage handling and presentation of these antigens to the immune system (Cervera *et al*,. 2009).

2.10. Management Therapy in Childrens

Management therapy of pediatric patients based on the type of disease and the symptoms in each patient. Pediatricians must be concerned not only with particular organ systems and biologic processes, gender, body weigth, age, diagnosis, route of drugs use, but also with environmental and social influences. This may have major impacts on the physical, emotional, and mental health and social well-being of children and their families (Kliegman *et al.*, 2007).

Intention of the management therapy for children is to increase health outcomes and quality of life . Advance quality of patient care through optimal medication management based on sound pharmacotherapeutic principles (Dipiro, 2008). Medicines should be given to children only when they are necessary, and in all cases, the potential benefit of administering the medicine should be considered in relation to the risk involved. In particular, the child and the child's carer should be helped to distinguish the adverse effects of prescribed drugs from the effects of the medical disorder. When the beneficial effects of the medicine are likely to be delayed, this should be highlighted (Anonymous, 2009[d]), because children not the miniature of adulth.

2.10.1. Tonsillitis Therapy Management

Good hydration for children with tonsillitis, analgesic and an anti-inflammatory is the first line of treatment. If the throat swab is not showing positive one could wait for another throat swab result if symptoms persist as tonsillitis, as it may be due to viral infection. If symptoms become worse and the throat swab is still negative one should start on antibiotics (Shenoy, 2012).

Penicillin is recommended as the first line choice although other antibiotics are effective in the bacteriologic and clinical cure of GABHS tonsillitis. Lincomycin, clindamycin and amoxicillin clavulanate (Kaplan & Johnson, 1988) are most effective in relapsing GABHS tonsillitis. Cephalosporins are superior to penicillin in both acute and relapsing GABHS tonsillitis, eradicate GABHS better and faster, and preserve alpha haemolyticus streptococci that may colonise the tonsils and their efficacy is explained by their activity against beta lactamase producing organisms (Brook, 2007).

2.10.2. Bronchopneumonia Therapy Management

Children suspected with bacterial pneumonia should be treated with antibiotics. Antibiotics do not prevent pneumonia in children with upper respiratory tract infections. In contrast to pneumococcal meningitis, respiratory infections with pneumococci with reduced susceptibility to penicillin have not been shown to have worse outcomes and decreased susceptibility can be overcome with the use of high oral or IV dosing of penicillin (Best *et al.*, 2010).

a. Oral Antibiotics

The use oral antibiotic for childrens with bronchopneumonia diagnosis based on patient age group see Table 4.

Table. 4. Oral Therapy Antibiotic for Bronchopneumonia

Age	Antibiotic	Dose	duration
3 month to 5 years	High dose amoxycillin	30 mg/kg/dose TDS, maximum 500mg/dose	5-7 days
≥ 5 years	High dose amoxycillin	30 mg/kg/dose TDS, maximum 1000mg/dose	5-7 days
≥ 5 years	erythromicin	12.5mg/kg/dose QID	
Mycoplasma pneumonia suspected	OR, roxytrhomicin (tablets only)	4mg/kg, BD	7-10 days

(Best *et al.*, 2010)

b. Intra Vena

The use Intra Venal antibiotic for childrens with bronchopneumonia diagnosis based on patient age group see Table 5 and special antibiotic treatment should be given to the childrens with complicated bronchopneumonia as showed in Table 6.

Table. 5. Intra Vena Therapy antibiotic for Bronchopneumonia

Age	Antibioyic	Dose	Interval (hrs)
Less than 3 months	Cefatroxime + amoxycillin	50mg/kg/dose 50mg/kg/dose	8 6
≥ 3 months (fully immunised)	amoxycillin	30-50mg/kg/dose Maximum 2000 mg/dose	8

(Best *et al.*, 2010)

Table. 6. Therapy Antibiotic for Complicated Bronchopneumonia

Age	Antibiotic	Dose	duration
< 3 months	Cefotaxime and amoxycillin as above		
≥ 3 months	Amoxycillin + clavulanic acid	30mg/kg/dose (max 1.2g/dose q6h)	6-8 hourly
	OR		
	cefuroxime	30mg/kg/dose (max 1.5g/dose)	8 hourly

(Best *et al.*, 2010)

2.10.3. Acute Exacerbation of Bronchial Asthma (AEBA) Therapy Management

The management of acute asthma exacerbation in childrens remains controversial. In general, primary treatment for athsma exacerbation is administration of oxygen, inhaled β_2-agonists (bronchodilator), and or systemic corticosteroids, but the dose and frequency of administration, along with the frequency of patient monitoring, differ depending on the severity of the exacerbation.

a. Oxygen.

Humidified oxygen is administered as the firs-line treatment for acute asthma to ease breathing dificulties. In addition, oxygen must always accompany the administration of β-agonists, delivered by air compressors, to offset the further aggravation of hypoxemia by their bronchodilator of the relatively poorly ventilated area of the lung (ventilation-perfusion mismatch) (Volovit, 2008 & Camargo *et al.*, 2009).

b. Bronchodilator

β_2-adrenoceptor agonists are effective bronchodilators with a rapid onset of action, and their use the initial phase of acute atsma is assential. They can be administered alone only in mild cases and only in children withaout a previous history af acute asthma exacerbation. Otherwise, inhaled β_2-agonists are given together with oral or inhaled corticosteroid. In very young children, or in children with severe obstruction of the airway (i.e. oxygen saturation below 92%), wet nebulization with humidified oxygen is the preferred method of administration, because of the uncertainly of delivery via spacers and inhaler. However, in older children, if the attack is not severe anough to warrant treatment with oxygen, inhalers and spacers may be equally effective (Volovit, 2008 & Camargo *et al.*, 2009).

c. Corticosteroid

The early intake of systemic corticosteroid by the intravenous, intramuscular or oral route for acute asthma has been found to reduce hos[pital admission rates by 60% and the risk of relapse in both children and adult. Oral corticosteroid to be effective for the outpatient treatmentof recurren, acute asthma episodes in children. Guidelines recommended the earlyuse (within 24 h) of systemic corticosteroid 0.5-1.0 mg/kg/day or equivalent in the acute setting in children.in anothers trial, a short course of 1-2 mg/kg/day corticosteroids in patient with acute atshma exacerbation led to a significant decrease in the number of relapes and in β_2-agonists use, without an apparent increase in side effect (Volovit, 2008).

2.10.4. CAP (Community Acquired Pneumonia) Therapy Management

The initial management of Community Acquired Pneumonia (CAP) depends on the patient's severity of illness. They do not represent the only approach to diagnosis and therapy; there is considerable variation among children in the clinical course of pediatric CAP, even with infection caused by the same pathogen (Bradley et al., 2011).

a. Oxygen therapy

Patients whose oxygen saturation is ≤ 92% while breathing air should be treated with oxygen given by nasal cannulae, high-flow delivery device, head box or face mask to maintain oxygen saturation >92% (Smyth *et al* 1998).

b. Antibiotic Therapy

Amoxicillin is recommended as first choice for oral antibiotic therapy in all children because it is effective against the majority of pathogens which cause CAP in this group, is well tolerated and cheap. Alternatives co-amoxiclav, cefaclor, erythromycin, azithromycin and clarithromycin. Macrolide antibiotics may be added at any age if there is no response to first-line empirical therapy. Macrolide antibiotics should be used if either mycoplasma or chlamydia pneumonia is suspected or in very severe disease. In pneumonia associated with influenza, co-amoxiclav is recommended (Harris *et al*, 2011).

c. Adjunctive Therapies

Prednisolone therapy (40 mg once daily) for one week did not improve outcomes in hospitalized patients with CAP (Snijders *et al.*, 2010). The IDSA/ATS guidelines recommend considering drotrecogin alfa (Xigris) within 24 hours of hospital admission in patients with severe CAP and persistent septic shock (Mandell *et al.*, 2007).

2.10.5. Meningitis Therapy Management

The initial treatment approach to the patient with suspected acute bacterial meningitis depends on early recognition of the meningitis syndrome, rapid diagnostic evaluation, and emergent antimicrobial and adjunctive therapy (Tunkel, 2004).

a. Therapy Antibiotic

Use empirical antimicrobial therapy for purulent meningitis based on patient age and specific predisposingcondition see table 7.

Table. 7. Antimicrobial Therapy For Purulent Meningitis

Predisposing	Common bacterial pathogens	antimicrobial therapy
Age		
< 1 month	Streptococcus agalactis, Escherichia coli, Listeria monocytogenes, Klebsiellaspecies	Ampicillin plus cefotaxime or ampicillin plus an aminoglycoside
1-23 months	Streptococcus pneumoniae, Neisseria meningitis, S. Agalactiae, Haemophilus influenza, E coli	Vancomycin plus a third-generation cephalosporin [a,b]
2-50 years	N. meningitis, S. pneumonia	Vancomycin plus a third-generation cephalosporin [a,b]
>50 years	S. pneumonia, N meningitidis, L. Monocytogenes, aerobic gram-negative bacilli	Vancomycin plus ampicillin plus a third-generation cephalosporin
Head trauma		
Basilar skull fracture	S. pneumonia, H, influenza, group A β-hemolytic streptococci	Vancomycin plus a third-generation cephalosporin [a]
Penetrating trauma	Staphylococcus aureus, coagulase-negative staphylococcus lespecially Staphylococcus epidermidis, aerobic gram-negative bacili including Pseudomonas aeruginosa	Vancomycin plus cefepime Vancomycin plus ceftazidime, or Vancomycin plus meropenem
postneurosurgery	aerobic gram-negative bacili including P. Aeruginosal, S. Aureus, coagulase-negative staphylococcus lespecially S. epidermidis.	Vancomycin plus cefepime Vancomycin plus ceftazidime, or Vancomycin plus meropenem
CSF shunt	coagulase-negative staphylococcus lespecially S. epidermidis. S. Aureus aerobic gram-negative bacili including P. Aeruginosa, propionibacterium acnes	Vancomycin plus cefepime Vancomycin plus ceftazidime, or Vancomycin plus meropenem

(Tunkel *et al*,. 2004)

Note: a Ceftriaxone or cefotaxime.
b Some experts would add rifampin if dexamethasone is also given.
c In infants and children, vancomycin alone is reasonable unless Gram stains reveal the presence of gram-negative bacilli.

b. Adjunctive Therapy – Corticosteroids

Current evidence suggests that early steroids (first dose given before, with or just after antibiotics) in children with acute bacterial meningitis reduce the risk of hearing loss and neurological sequelae. Steroid use in children with acute bacterial meningitis does not appear to influence

mortality. Steroid use is not associated with increased adverse events. The timing of steroids (before, with or after first dose of antibiotics) appears equivalent in efficacy. The range of time applicable to "after the first dose" has not been adequately defined. There is insufficient information about steroids in infants < 3 months of age and in those presenting with severe sepsis. The influence of antibiotic penetration into the CNS if steroids are used is uncertainly (Tunkel *et al*,. 2004).

In children ≥ 3 months of age with suspected ABM, steroids (dexamethasone) should be given early, just before or at the time of antibiotics, as a single push to minimise potential delay in antibiotic administration. The dosing regimen is 0.15 mg/kg, IV, every 6 hours for 4 days. If resistant pneumococcus is found (or suspected), careful monitoring of patients during therapy for indications of failure of drug therapy should be done (Anonymous, 2012).

2.10.6. Urinary Tract Infections (UTI) Therapy Management

Treatment of UTI depend on whether the clinician determines that antimicrobial therapy is warranted immediately or can be delayed safely until urine culture and urinalysis results are available (Anonymous, 2011[b]).

Management therapy for acute UTI to nfants younger than 3 months with a possible UTI should be referred immediately to the care of a paediatric specialist. Treatment should be with parenteral antibiotics in line with feverish illness in children. For infants and children 3 months or older with acute pyelonephritis/upper urinary tract infection oral antibiotics treatment for 7–10 days is necessary. The use of an oral antibiotic with low resistance patterns is recommended cephalosporin or co-amoxiclav. If oral antibiotic cannot be used intravenus (IV) such cefotaxime or ceftriaxone for 2-4 days followed by oral antibiotic for total duration of 10 days. For infants and children 3 months or older with lower urinary tract infection treat with oral antibiotics for 3 days. The choice of antibiotics should be directed by locally developed multidisciplinary guidance. Trimethoprim, nitrofurantoin, cephalosporin or amoxicillin (Anonymous, 2007[c]).

Some empiric antimicrobial agents for oral treatment of UTI with dose based on patient bady weight see Table 8, for prophylaxis purposes, while for parenteral can be seen Table 9

Table. 8. Therapy Oral Antimicrobial

Antimicrobial Agents	Dosage
Amoxycillin-clavulanate	20-40 mg/kg per day in 3 doses
sulfonamide	
Trimethropim-sulfametoxazole	6-12 mg/kg trimethropim and 30-60 mg/kg sulfamethoxazole per day in 2 doses
Sulfametoxazole	120-150 mg/kg per day in 4 doses
Cephalosporin	
Cefixime	8 mg/kg per day in 1 dose
Cefpodoxime	10 mg/kg per day in 2 doses
Cefrozile	30 mg/kg per day in 2 doses
Cefuroxime axetil	20-30 mg/kg per day in 2 doses
Cephalexin	50-100 mg/kg per day in 4 doses

(Anonymous, 2011[b])

Table. 9. Therapy Parenteral Antimicrobial

Antimicrobial Agents	Dosage
Ceftriaxone	75 mg/kg, every 24 h
Cefotaxime	150 mg/kg/day. Divided every 6-8 h
Ceftazidime	100 – 150 mg/kg/day. Divided every 8 h
Gentamicine	7.5 mg/kg/day. Divided every 8 h
Tobramycine	5 mg/kg/day. Divided every 8 h
Piperacillin	300 mg/kg/day Divided every 6-8 h

(Anonymous, 2011[b])

2.10.7. Seizure Therapy Management

Prehospital management of the convulsing patient centers on securing the airway, maintaining oxygenation, obtaining intravenous access, protecting the patient from injury, (Jagoda & Colucciello, 2000) breathing, and stopping the seizure. The patient should be positioned to allow for an open airway, and if necessary, an oral or nasal airway should be inserted. Oxygen should be administered and further equipment for assisted ventilation should be at the bedside (Friedman & Ghazala, 2006).

If the patient continues to convulse or remains confused or unresponsive, paramedics should immediately measure the patient's blood sugar or, if this test is not available, they can empirically administer dextrose (D_{50}). If the seizure continues for more than several minutes, lorazepam (2 mg intravenously every minute up to a maximum of 10 mg) will generally stop the seizure (Jagoda & Colucciello, 2000; Friedman & Ghazala, 2006).

Diazepam (5 mg intravenously every minute up to a total of 20 mg), also can be used, but its shorter duration of action and its water insolubility makes it less desirable than lorazepam. The rectal route is useful when intravenous access is not available (Jagoda & Colucciello, 2000; Friedman & Ghazala, 2006).

Rectal diazepam (0.5 mg/kg) or lorazepam (0.1 mg/kg) should be administered if intravenous access cannot be established readily. Buccal midazolam (0.5 mg/kg; max dose 10 mg) was more effective than rectal diazepam for children (McIntyre *et al.*, 2005).

Intravenous lorazepam is at least as effective as intravenous diazepam and is associated with fewer adverse events (including respiratory depression) in the treatment of acute clonic tonic convulsions. Where intravenous access is unavailable, there is limited evidence from one trial that midazolam is the treatment of choice (Macleod *et al.*, 2008).

Management antimicrobial therapy for febrile seizures based on route example Buccal, intravenous dose and rectal dose see table 10.

Table .10. Medications for use In Febrile Seizures

Medication	Buccal	IV dose	Rectal dose
Midazolam	0.5 mg/kg to max 10 mg		
Diazepam		0,3 mg/kg et rate of 2 mg/min (max 5 mg/dose for < 5 years; 10 mg for ≥ 5 years)	0.5 mg/kg (max 20 mg per dose) may be administered undiluted
Lorazepam		0.05 – 0.1 mg/kg over 1-2 min (max 4 mg per dose)	0.1 mg/kg (max 4mg per dose) dilute 1:1 with water prior administration

(Esau, 2007; Lau, 2008)

2.10.8. Epilepsi Therapy Management

The approach to the antiepileptic drugs (AED) used in the acute medical management of seizures has developed since the availability of intravenous diazepam in the mid 1960 (Naquet, 1965). Drug of first choice is now a benzodiazepine on the basis that this will achieve rapid seizure control with minimal side effects in the majority of children. Such drugs act quickly by several routes, can be given again within a short space of time and may be all that is required. Second line AED, for refractory seizures, should be compatible with such first line AED, should ideally work synergistically without contributing to side effects and be more effective in preventing ongoing seizures. Phenytoin and phenobarbitonen remain the cornerstone of second line therapy (Anonymous, 2009[e]).

a. First Line Anti-Convulsants (Anonymous, 2009[e])

Diazepam has been used both intravenously and rectally for the first line control of status epilepticus. Intravenous administration produces rapid control of seizures in approximately 80 per cent of patients. After rectal administration, therapeutic serum levels are seen within five minutes and rapid seizure control occurs in up to 80 %. Whilst there may be benefit from subsequent IV diazepam in those not responding, seizures resistant to a single rectal dose correlate with seizures resistant to all acute therapies and those needing 'second line treatments.

Midazolam has now replaced diazepam as drug of first choice before venous access has been obtained, because of improved effectivity and preferred route of administration (buccal vs rectal). Midazolam was used initially as a second line AED in refractory status epilepticus. It is, however, highly effective as a first line anti-convulsant stopping the majority of seizures within one minute after IV injection of 0.1–0.3 mg/kg and IM within 5–10 minutes. It has superior absorption in comparison with diazepam and lorazepam when given IM because of its water solubility. Intra-nasal & IM midazolam has been adopted by the NSW Ambulance Service as the drug of first choice in status epilepticus.

Lorazepam IV is used in North America and the UK. There is evidence of longer duration and reduced need for repeated doses. There is suggestion of more success over IV diazepam in control of acute seizures with a similar side effect profile although this did not reach statistical significance. There is significant difference in comparison with diazepam in the reduced need for second dose. Although there is evidence for advantage in adults, the evidence is less convincing in children, it is currently available on SAS scheme only in Australia. There may be more resistance to its effects in children on regular benzodiazepines.

b. Second Line Anti-Convulsants (Anonymous, 2009[e])

Phenytoin has been introduced as the first nonsedating anti-convulsant. It has been used as a drug of choice for some time. In intravenous doses of 20 mg/kg for children, seizures are well controlled in 60–80 per cent within 20 minutes. Concurrent use of phenytoin with benzodiazepines results in a faster onset of therapeutic effect. Although several combination regimes were compared albeit in adults32 there was no significant difference.

Phenobarbitone has been used in seizure and highly effective. After intravenous loading there is a biphasic distribution and highly vascular organs, excluding the brain, benefit first. Although penetration to the brain has been reported to occur 12–60 minutes after administration, this may happen faster in status epilepticus because of increased cerebral blood flows.

A preparation of IV sodium valproate is available on SAS in Australia. Because of the risks of hepatotoxicity in infants and young children, it has not been adopted as standard second line treatment.

2.10.9. Nephrotic Syndrom Therapy Management

International Study for Kidney Diseases in Children (ISKDC) empirically recommended a protocol for nephrotic syndrome prednisolone (Bagga & Mantan, 2005). There is increasing evidence that longer initial courses of prednisolone are associated with a lower incidence of relapse, and therefore a 12-week initial course is recommended. Dose is calculated based on surface body area, such 60 mg/m2/day for 4 weeks (maximum 80 mg), 40 mg/m2/day for 4 weeks (maximum 60 mg), and to reduce dose by 5-10 mg/m2 each week for another 4 weeks, and then stop (Beattie, 2007).

The patient with alow serum albumin alone is not an indication for intravenous albumin. If there is evidence of hypovolaemia, give 1 g/kg 20% albumin (5ml/kg) over 4 - 6 hours. Give 2mg/kg of iv frusemide mid-infusion. If clinically shocked_give 10ml/kg 4.5% albumin. Children should be closely monitored during albumin infusions, and where possible they should be administered during working hours (Beattie, 2007).

In nephrotic syndrom, children are at increased risk of infection, particularly with encapsulated organisms such as pneumococcus. There is no evidence that antibiotic prophylaxis is of benefit, and some centres do not use prophylaxis. Penicillin V can be given while there is proteinuria and discontinued when the child goes into remission. Grossly oedematous children are at risk of cellulitis and may benefit from antibiotic prophylaxis. Usualy used for children under 5 years old 125 mg two times a day, and 5 years old or above 250 mg two times a day (Beattie, 2007).

2.10.10. Constipation Therapy Management

When medication is necessary in the daily treatment of constipation, mineral oil (a lubricant) or magnesium hydroxide, lactulose, sorbitol, polyethylene glycol (PEG) (osmotic laxatives), or a combination of lubricant and laxative is recommended. At this stage in the treatment of constipation, the prolonged use of stimulant laxatives is not recommended (Williams & Wilkins, 2006). Extensive experience with long-term use of mineral oil (McClung, 1993), magnesium hydroxide, and lactulose or sorbitol has been reported. Long-term studies show that these therapies are effective and safe (Leoning-Baucke, 1993; Clark , 1987). PEG 3350 appears to be superior to other osmotic agents in palatability and acceptance by children. Preliminary clinical data in 12 infants suggest that administration of PEG 3350 to infants is effective with no adverse effects noted (Michail *et al.*, 2004).

2.10.11. Acute Gastroenteritis (AGE) Therapy Management

Pro-biotics and Zinc may have some clinical benefits in the management of gastroenteritis, and may be available in some commercially available products such as yoghurts. These can be given to children when a normal diet is reintroduced (Anonymous, 2010[e]).

Infants and children with gastroenteritis require additional fluids to prevent dehydration, or for rehydration. The enteral route is preferred for rehydration of children with mild or moderate dehydration. Such as Oral Rehydration Solution

(ORS) either by mouth or via nasogastric tube. Babies who are breastfed should recieve small frequent breastfed to ensure normal urine output. Together with suplement and ORS, if an ORS is unvailable, a mixtured of 1 part of juice/lemonade and 4 parts of water , can be used only if a child is not dehydrated (Anonymous, 2010[e]).

2.10.12. Idiopathic Thrombocytopenic Purpura (ITP) Therapy Management

Patients with acute Idiopathic Thrombocytopenic Purpura (ITP) who are losing large amounts of blood or bleeding into their central nervous system require emergency treatment. This includes transfusions of platelets, intravenous immunoglobulins, or prednisone.

a. Platelet transfusion

Platelet transfusion is given for patient with ICH (intracerebral hemorrhage) and other life threatening bleeds, this treatment is along with immunomodulatory drugs.

b. Intravenous Immunoglobulin (IVIG)

IVIG is effective in elevating the platelet count in 75% of patients, of whom 50% will achieve normal platelet counts. However the responses are transient lasting between 3 to 4 weeks. Combination of IVIG/ oral prednisolone seemed to be more effective than IV methylprednisolone/ oral prednisolone in adults with severe ITP. There is no difference between the two dosing of IVIG 0.4g /kg/day for 5 days and 1 g/kg/day for two days. Adverse effects with intravenous immunoglobulin are common but

generally mild including fever, chills, rigors, headache and backache (Anonymous, 2006[c]).

c. Corticosteroid

Two thirds of patients will respond to prednisolone at 1mg/kg body weight/ day for 2-4 weeks However long term remission is seen only in 10-20% of patients. The response to oral steroids is slower compared to intravenous methylprednisolone (Anonymous, 2006[c]).

2.10.13. Systemic Lupus Erythematosus (SLE) Therapy Management

Treatment of Systemic Lupus Erythematosus (SLE) depends on the clinical manifestations and the presence/absence of major organ involvement. Corticosteroids are a major cause of morbidity and mortality in pSLE but they continue to be a mainstay of treatment due to their dramatic and rapid impact on lupus flares. Their effectiveness in treating SLE has been recognized since the 1950s. Intravenous (IV) pulse methylprednisolone (MEP) can be successfully used to treat major organ involvement and/or life-threatening manifestations of SLE. Antimalarials are effective for milder manifestations and improve bone-mineral density and Dyslipoproteinemia (Borba & Bonfa, 2001).

Cyclophosphamide (CYC) remains the first-line treatment for major organ involvement. It has been shown to reduce morbidity and improve mortality in lupus patients. Over 20 years ago a National Institute of Health (NIH) study (Austin *et al.*, 1986). showed that monthly IV pulses of CYC were as effective, but less toxic, than daily oral CYC. Since then the gold standard

immunosuppressive treatment of LN has been monthly IV pulse CYC for 6-7 months, in combination with high-dose glucocorticoids, followed by a 2-year maintenance phase (CYC for 2-3 months). All patients receiving CYC and high-dose glucocorticoids should also receive prophylaxis with low-dose trimethoprim-sulfametoxazole inorder to prevent the most common opportunistic infection, *Pneumocysti jiroveci* pneumonia (Stichweh & Pascual, 2005).

Treatment of SLE includes not only pharmacological therapies, but also patient education, such as protection from ultraviolet light, management and prevention of infections, cardiovascular risk factors, and treatment of complications including osteoporosis (Stichweh & Pascual, 2005).

CHAPTER III

RESEARCH METHODOLOGY

3.1. Place and Time Research

Research carried out for two months from April to Mei 2012 in the Hospital University Sains Malaysia (HUSM) Kelantan Malaysia.

3.2. Research Methodology

3.2.1. Types of Research

The research was conducted using method longitudinal observative that the data was collected based on data of patients admitted at pediatric ward of Hospital University Sains Malaysia.

3.2.2 Type of Data

3.2.2.1. Qualitative Data

Including the frequency of patients based on gender, age, diagnosis, drug therapy, complication, and patient discharge.

3.2.2.2. Quantitative Data

All vital sign (Blood pressure, heart rate, temperature) and laboratory value include: Haemoglobin; White Bood Control; Sodium; Potasium; Calcium; Ureum; Albumin and Creatinin.

3.2.3. Source of Data

Data source is patient including medical record and interview with patient if the patient improve, or interview with the patient's mother in the pediatric ward.

3.3. Research Procedure

3.3.1. Determinated Criteria of Patients to be Used

The universal sampling, that all patients was treated at pediatric ward of HUSM Kelantan Malaysia during the April to Mei 2012.

3.3.1.1. Criteria for Inclusion

All medical records of patients admitted at pediatric ward the HUSM Kelantan Malaysia .

3.3.1.2. Exclusion Criteria

All medical record of patients who do not treat in Pediatric ward at The HUSM Kelantan Malaysia.

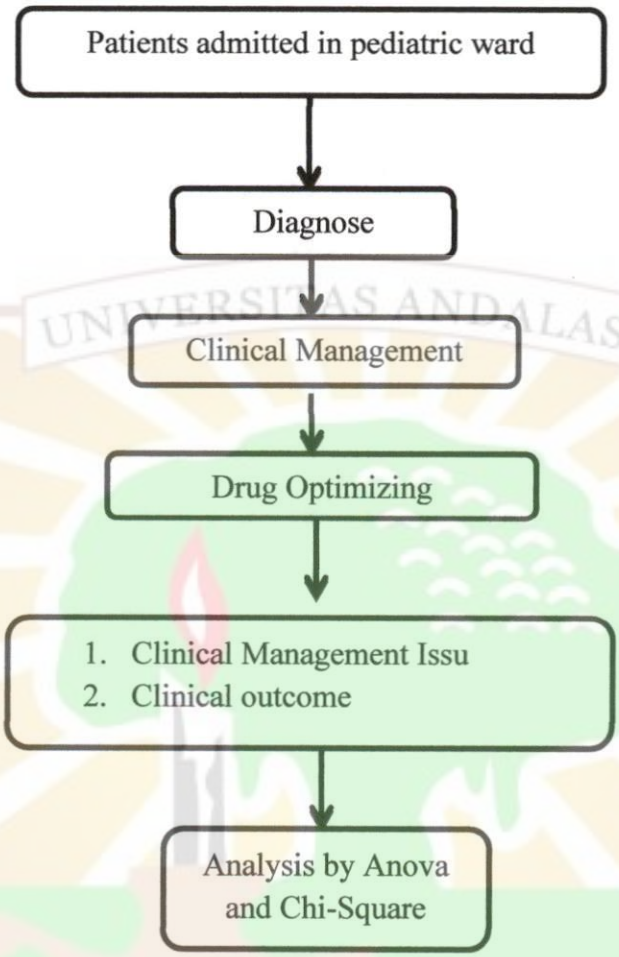
3.3.2. Procedures of Data Collection

Datum were collected from the patient medical record including from sociodemography (gender, age, body weight, and lenght of stay), diagnosis patients (diagnosis patients in population study, gender, age, body weight, and lenght of stay comparison among diagnose of population study), medicine of patients' disease (antibiotic drugs its combinations, steroid drugs its combinations, anti hypertension drugs its combinations, bronchodilator drugs its combinations, anti convulsan drugs its combinations, lacsative drugs its combinations, antidehidration drugs its combinations), the laboratory value (Haemoglobin; White Bood Control; Sodium; Potasium; Calcium; Ureum; Albumin and Creatinin), clinical outcome (the relations outcome patients with diagnosa).

3.3.3. Analysis of Data

1. Data descriptive of patient sociodemography (gender and age) in studied population.
2. Diagnosis patients with gender with chi-quare SPSS (Statistical Package for sciences) version 17.
3. Data relationship diagnosa with medication (antibiotic drugs and combinations, steroid and combinations, anti hypertension and combinations, bronchodilator and combinations, anti convulsan and combinations, lacsative and combinations, antidehidration and combinations) with Chi-quare SPSS (Statistical Package for sciences) version 17.
4. Data laboratoy value with Anova.

3.4. Research Framework



CHAPTER IV

RESULT AND DISCUSSION

4.1. Result

Research on the management of therapy in the children's ward has been done from April to May 2012 at the Hospital Universiti Sains Malaysia (HUSM). All 59 (100%) patient involved in this study is malay.

4.1.1. Socio Demographic Data

Socio demographic data collected includes: gender, age, body weight, and lenght of stay. A number of 59 patients are involved in study consisted of 62.7% (37 patients) of male and 37.2% (22 patients) of female respectibility. The average body weight of the patient were 14.65 ± 11.44 Kg, and the average age of the patients were 4.94 ± 4.05 years (Table 11).

Table. 11. Frequency Sosio Demographics Patients in Studied Population

Karakteristik	Mean ± SD	N	%
Gender			
Male		37	57,6
Female		22	37,2
Age	4,94 ± 4,05		
Bodyweight	14,65 ± 11,44		
Length of stay	3,24 ± 3,00		

4.1.1.1 Diagnostic of Patient

From 59 patient in pediatric ward at the Hospital Universiti Sains Malaysia (HUSM) during the study all list there were 7 categories af diseases diagnoses on the patient good on the symptome such as RTI (Respiratory Tract Infection), Others infection were neuronal , renal, gastrointestinal, autoimun, and others. The categori of RTI diseases include bronchopneumonia, AEBA (Acute Exacerbation Bronchial Atsma), Croup, CAP (Community Acquired Pneumonia) and Acute Tonsilitis. The categori of others infection disease were meningitis, and UTI (Urinaria Tract Infaction). Neuronal diseases such as Seizure and Epilepsi. While Renal diseases such as Nephrotic Syndrome and AGN (acute Glomerulus Nefritis). The categori of Gastrointestisinal diseases such as Constipation and AGE (Acute Gastroenteritis). Autoimun diseases such ITP (idiopphatic trombocitopenia) and SLE (Systemic Lupus Erythematosus). A diseases such as Chronic Hydrocephalus, Alleged insect, AVSD (Athresia Ventricles Septum deseas), Syncope and pseudotumor cerebri. URTI is the most frequancce disease diagnosed (45.75%) (Table 12).

Table. 12. Data List of Disease, Complications and Symptoms

Diagnosis	N	(%)	Comlication	Clinical symtomps
RTI				
• Bronchopneumonia	20	32.20	Fitt + tro UTI	Fever, cough, wheezing, SOB, runny nose, vomitting
• AEBA (Acute Exacerbation Bronchial Atsma)	5	8.47		SOB, cough, fever, wheezing
• Croup (laringotracheobronchitis)	2	3.38		Noise breathing, barking cough, fever, difficulty breathing
• CAP (Community Acquired Pneumonia)	1	1.70		Sneezed, bluish over the lips
• Acute Tonsilitis	3	6.78	Tro infedious mononucleosis	Fever, cough, mild dehidration,
Infection				
• Meningitis	2	3.38		
• UTI (Urinary Tract Infaction)	2	3.38	Pharingitis	fever, and foul smelling urine, vomiting and abdominal pain
Neuronal				
• Seizure	6	10.20	UTI + RTI	Fever, fitt, Muscle stiffness, rigidity, convulsions, Brief loss of consciousness
• Epilepsi	2	3.38		Seizure, Weakness, Anxiety, Loss of Consciousness, Contraction, or Jerking, of Body Muscles

Renal				
• Nephrotic Syndrome	2	3.38		Swelling, fever, ↓ urin output, high BP, abdominal pain,
• AGN (acute Glomerulus Nefritis	2	3.38		Dark colored urine, fever, swelling, protein urine ++
Gastrointestisinal				
• Constipation	3	5.10		Fever, solid stool no blood, abdominal pain
• AGE (Acute Gastroenteritis)	1	1.70		mild dehidration, fever, vomit, diare
Autoimun				
• ITP (idiopphatic trombocitopenia purpura)	1	1.70		Brass face, mucocele bleed
• SLE (Systemic Lupus Erythematosus)	1	1.70		Fever, Skin Rashes, stiffness and swelling
Others				
• Chrinic Hydrocephalus	1	1.70		large head size, vomiting, sleepiness, seizures
• Alleged insect	2	3.38		Fever, sweeling
• AVSD (Athresia Ventricles Septum deseas)	1	1.70		Difficulty in feeding, poor weight gain, enlarged heart and liver, fast irregular breathing and cyanosis (blueness)
• Syncope	1	1.70		Light-headedness, Falling for no reason, Dizziness, Drowsiness
• pseudotumor cerebri	1	1.70		Vomit, headache, dizzenes
Jumlah	59			

4.1.1.2. The Relationship Between Diagnosis and Age in Studied Population

Table 4 showed the relationship between the diseases and patient age. Based on statistical analysis, there was no significant relationship between patient age and the diagnosis (P = < 0.1), except for the patients with renal disease, the patient suffer from Neprhotic Syndrom were at the age of 11.7 ± 0.494 yaers old, while with AGN (acute Glomerulus Nephritis) were at the age of 7.6 ± 5.027 yaers old P = < 0.05. (Table 13).

Table .13. The Relationship Between Diagnosis and Age Studied Population

Diagnosis	N	(%)	Age Mean ± SD	P value*
RTI				0.242
• Bronchopneumonia	20	32.20	4.0±3.947	
• AEBA	5	8.47	6.4±3.957	
• Croup	2	3.38	1.0±2.310	
• CAP	1	1.70	1.4±0.636	
• Acute Tonsilitis	3	5.10	4.40±2.861	
Infection				0.373
• Meningitis	2	3.38	1.65±0.643	
• UTI	2	3.38	1.4	
Neoro				0.911
• Seizure	6	10.20	5.1±5.794	
• Epilepsi	2	3.38	3.7±0.989	
Renal				0.034*
• Nephrotic Syndrome	2	3.38	11.7±0.494	
• AGN (acute Glomerulus Nefritis	2	3.38	7.6±5.027	
Gastrointestisinal				0.989
• Constipation	3	5.10	4.6±4.975	
• AGE	1	1.70	5.0	
Autoimun				0.927
• ITP (idiopphatic trombocitopenia)	1	1.70	2.9	
• SLE	1	1.70	11.0	
Others				0.163
• Chrinic Hydrocephalus	1	1.70	9.0	
• Alleged insect	2	3.38	3.6±2.192	
• AVSD	1	1.70	5.0	
• Syncope	1	1.70	9.8	
• pseudotumor cerebri	1	1.70	14.0	
Jumlah	59			

*ANOVA

4.1.1.3. The Relationship Between Diagnosis and Gender in Studied Population

Relationship between diagnoses by gender, there were no significant relationship between diagnosis and gender P = > 0.1. This means that gender does not affect the patient's illness of all categories of the diseases (Table 14).

Table. 14. The Relationship Between Diagnosis and Gender in Studied Population

Diagnosis	Gender				P value*
	Male		Female		
	N	(%)	N	(%)	
RTI					0.236
• Bronchopneumonia	9	15.2	11	18.6	
• AEBA	4	6.78	1	1.7	
• Croup	2	3.38			
• CAP	1	1.7			
• Acute Tonsilitis	3	5.10			
Infection					0.114
• Meningitis	2	3.38			
• UTI	2	3.38			
Neoro					1.000
• Seizure	4	6.78	1	1.7	
• Epilepsi	1	1.7	1	1.7	
Renal					0.510
• Nephrotic Syndrome	2	3.38			
• AGN (acute Glomerulus Nefritis	1	1.7	1	1.7	
Gastrointestisinal					0.718
• Constipation	1	1.7	2	3.38	
• AGE	1	1.7			
Autoimun					0.135
• ITP (idiopphatic trombocitopenia)			1	1.7	
• SLE			1	1.7	
Others					0.929
• Chrinic Hydrocephalus	1				
• Alleged insect	1		1		
• AVSD	1				
• Syncope	1				
• pseudotumor cerebri			1		
Jumlah					

*ANOVA

4.1.1.4. The Relationship Between Diagnosis and Body Weight in Studed Population

Table 6 is relationship between the disease and patient body weight. Ia as followers There were no significan relationship between patient body weight ($P > 0.1$). except in Renal and other diseases ($P < 0.0001$), ($P < 0.001$) respectibility. In this cases most of the patient suffer from Neprhotic Syndrom of 40.7 ± 16.546 kg , and AGN (acute Glomerulus Nephritis of 28.5 ± 17.677 kg, While the body weight patient suffer from chronic Hydrocephalus were of 20.5 ± - kg, Alleged Insect of 14.0 ± 5.656 kg, AVSD of 10.5 ± - kg, Syncope 20.0 ± - kg, and Pseudotumor Cerebri of 62.0 ± - kg. (Table 15).

Table.15. The Relationship Between Diagnosis and Body Weight in Population Study

Diagnosis	N	(%)	Body Weight Mean ± SD	P value*
RTI				0.069*
• Bronchopneumonia	20	32.20	9.3±5.656	
• AEBA	5	8.47	14.7±2.284	
• Croup	2	3.38	9.7±3.676	
• CAP	1	1.70	2.5±-	
• Acute Tonsilitis	3	5.10	16.8±3.253	
Infection				0,479
• Meningitis	2	3.38	7.3±1.697	
• UTI	2	3.38	8.5±2.870	
Nefron				0.895
• Seizure	6	10.20	16.3±12.617	
• Epilepsi	2	3.38	12.0±0.000	
Renal				0.000*
• Nephrotic Syndrome	2	3.38	40.7±16.546	
• AGN (acute Glomerulus Nefritis	2	3.38	28.5±17.677	
Gastrointestisinal				0.981
• Constipation	3	5.10	15.7±12.770	
• AGE	1	1.70	16.0	
Autoimun				0.604
• ITP (idiopphatic trombocitopenia)	1	1.70	10.5	
• SLE	1	1.70	25.5	
Others				0.001*
• Chrinic Hydrocephalus	1	1.70	20.5	
• Alleged insect	2	3.38	14.0±5.656	
• AVSD	1	1.70	10.5	
• Syncope	1	1.70	20.0	
• pseudotumor cerebri	1	1.70	62.0	
Jumlah	59			

*significant with the P Value < 0.05

4.1.2. The Relationship Between Diagnosis and Drugs

4.1.2.1. The Relationship Between RTI Diseases with Antibiotic and Bronchodilator

There was significant different in antibiotic theraphy among all of patient with different diagnosis of RTI disease ($P < 0.05$). In this case most of the pasient treated with antibiotic drugs (64.40%), while patient with untreated antibiotic of 28.81 %. The most of antibiotic drug treatment is amoxicillin and clavulanic acid . Of the RTI diseases, BP was the most commond patient treted with antibiotic, while AEBA, croup CAP and Acute Tonsiliti were seldom. For the bronchodilator theraphy, among all of patient with different diagnosis of RTI disease, most of them didn't treat with bronchodilatir drugs, (76.27%) while pasient treated with bronchodilator of 23.72%. The most of drug used to treat patient was salbutamol, most of them suffer from BP (Table 16).

Table. 16. The Relationship Between RTI Diseases and Drugs Bronchodilator and Antibiotic

Drugs	RTI Disease							P Value*
	No RTI Disease	BP	AEBA	Croup	CAP	Acute Tonsiliti	Quota N (%)	
Antibiotic								0.050*
• amoxicillin and clavulanic acid	5	9	2	-	-	1	17 (28.81)	
• penicilin	2	-	-	-	-	1	3 (5.08)	
• cefotaxim	2	1	-	-	-	-	3 (5.08)	
• cefixim	1	-	-	-	-	-	1 (1.70)	
• ampicillin	-	1	1	-	-	-	2 (3.38)	
• azitromicin	-	1	-	-	-	-	1 (1.70)	
• doxacillin	1	-	-	-	-	-	1 (1.70)	
• metronidazole + amoxicillin and clavulanic acid	1	-	-	-	-	-	1 (1.70)	
• cefotaxim + ampicillin	1	-	-	-	-	-	1 (1.70)	
• gentamicin + penicilin	-	-	-	-	1	-	1 (1.70)	
• Ampicillin + azitromicin	-	-	1	-	-	-	1 (1.70)	
• amoxicillin and clavulanic acid + ampicillin	-	2	1	-	-	-	3 (5.08)	
• amoxicillin and clavulanic acid + azitromicin	-	2	-	-	-	-	2(3.38)	

• amoxicillin and clavulanic acid + cefotaxim + azitromicin + cefuroxim	1	-	-	-	-	-	1 (1.70)	
Quota							38 (64.40)	
No	15	4	-	2	-	-	21 (35.6)	
Quota of patien	31	20	5	2	1	3	59	
Bronkhodilator	-	-	-	-	-			0.127
• Salbutamol	-	6	1	-	-	-	7 (11.86)	
• theopilin	3	-	-	-	-	-	3 (5.08)	
• ventolin	-	1	-	-	-	-	1 (1.70)	
• combivent + ventolin	-	-	1	-	-	-	1 (1.70)	
• ventolin + salbutamol	-	-	1	-	-	-	1 (1.70)	
• prednisolon + ventolin + salbutamol	-	-	1	-	-	-	1 (1.70)	
Quota							14 (23.72)	
no	25	13	1	2	1	3	45 (76.27)	
Quota of patien	31	20	5	2	1	3	59	

*significantwith the P value < 0.05

4.1.2.2. The Relationship Between Others Infection Diseases and Antibiotic Therapy

There was significant relationship between antibiotic theraphy among patient diagnosis with others infection disease category ($P < 0.05$). It means that most of those pasient treated with antibiotic therapi (64.40%), while patient untreated with antibiotic of 35.60%. The most common antibiotic used to treat those patient was amoxicillin and clavulanic acid . (Table 17).

Table. 17. The Relationship Between Antibiotic, Others Infection Diseases Category and Antibiotic Therapy

Drugs	Infection Disease				P Value*
	No Infection Disease	Meningitis	UTI	Quota N (%)	
Antibiotic					0.011*
• amoxicillin and clavulanic acid	17	-	-	17 (28.81)	
• penicilin	3	-	--	3 (5.08)	
• cefotaxim	1	1	1	3 (5.08)	
• cefixim	0	-	1	1 (1.70)	
• ampicillin	2	-	-	2 (35.6)	
• azitromicin	1	-	-	1 (1.70)	
• doxacillin	1	-	-	1 (1.70)	
• metronidazole + amoxicillin and clavulanic acid	1	-	-	1 (1.70)	
• cefotaxim + ampicillin	-	1	-	1 (1.70)	
• gentamicin+ penicilin	1	-	-	1 (1.70)	
• Ampicillin +azitromicin	1	-	-	1 (1.70)	
• amoxicillin and clavulanic acid + ampicillin	3	-	-	3 (5.08)	
• amoxicillin and clavulanic acid + azitromicin	2	-	-	2 (35.6)	
• aygmentin + cefotaxim + azitromicin + cefuroxim	1	-	-	1 (1.70)	
Quota				38 (64.40)	
No	21	0	0	21 (35.60)	
Quota of patien	55	2	2	59	

* significant with the P Value < 0.05

4.1.2.3. The Relationship Between Neuronal Diseases and Anticonvulsan Therapy

There was significant relationship between anticonvulsan theraphy and Neuronal diseases ($P < 0.05$). It means that, most of the pasient didn't treat with anticonvultion drugs 84.74 %, and patient treated with anticonvultion of 10.16 %. The most common drug used to treated neuronal disease was carbamazepine (Table 18).

Table.18. The Relationship Between Neuronal Diseases and Anticonvulsan Therapy

Drugs	Neuronal Disease				P Value*
	No Neuronal Disease	Seizure	Epilepsi	Quota (%)	
carbamazepine	1	1	-	2 (3.38)	0.019*
clobazam + phenobarbital	1	-	-	1 (1.70)	
penitoin	-	-	1	1 (1.70)	
phantoprazole + clorazepham + Lamotigin	1	-	-	1 (1.70)	
phenitoin + carbamazepin + Clobazam + Panthoprazole + Phenobarbital	-	1	-	1 (1.70)	
Total				6 (10.16)	
No	48	1	1	50 (84.74)	
Quota of Patient	51	2	2	59	

* significant with the P Value < 0.05

4.1.2.4. The Relationship Between Renal Disease with Antihypertension and Steroids Therapy

There was significant different in antihypertension theraphy among all of patient with different diagnosis of renal disease ($P < 0.05$). In this case, most of the pasient didn't treat with antihypertensive drugs (88.13%), and patient treated with antihypertension of 11.86 %. The dominantly drug used to treat hypertension patient is Nifedipine and HCT. For the steroid theraphy there is no significant between steroid therapy among all of the patient with renal diseases ($P > 0.1$). (Table 19).

Table. 19. The Relationship Between Diagnosis Renal with Antihipertension and Steroids Therapy

Drugs	Renal Disease				P Value*
	No Renal Disease	Nephrotic Syndrome	AGN	Quota (%)	
Hipertension					0.007*
Nifedipin	-	1	1	2 (3.39)	
Propanolol	1	-	-	1 (1.70)	
HCT	2	-	-	2 (3.39)	
Captopril + furosemid	1	-	-	1 (1.70)	
lasix + Nifedipin + analapril	-	1	-	1 (1.70)	
Quota				7 (11.86)	
No	51	-	1	52 (88.13)	
Quota of Patient	55	2	2	59	
Steroid					0.214
Prednisolon	4	-	1	5 (8.47)	
Hydrochortison	1	-	-	1 (1.70)	
Deksamethason	1	-	-	1 (1.70)	
Prednisolon + hydrocortison	3	1	-	4 (6.77)	
Quota				11 (18.64)	
No	46	1	1	48 (81.35)	
Quota of Patient	55	2	2	59	

* significant with the P Value < 0.05

4.1.2.5. The Relationship Between Gastrointestisinal Diseases Drugs Laksativ and Dehidration Theraphy

There was significant different in lacsative and antidehidration theraphy among all of patient with different diagnosis of gastrointestinal ($P < 0.05$). Most of the pasient didn't treat with lacsative drugs (91.527%). The most of lacsative drug treat is ravin enema and ravin enema + lactulose. And most of patient didn't treat with antidehidration drugs (96.91%). The most of antidehidration drugs treat is ORS (Oral Rehidration Salt) (Table 20)

Table. 20. The Relationship Between Gastrointestisinal Diseases and Drugs Laksativ and Antidehidration

Drugs	Gastrointestinal Disease				P Value*
	No Gastrointestinal Disease	Constipatio	AGE	Quota (%)	
Laksative					0.018*
Lactulosa	1	0	0	1 (1.70)	
ravin enema	1	1	0	2 (3.38)	
ravin enema + lactulosa	0	2	0	2(3.38)	
Quota				5 (08.47%	
no	53	0	1	54 (91.52)	
Quota of Patient	55	3	1	59	
Antidehidration					0.036*
ORS (Oral Rehydration Salts)	1	0	1	2 (03.38)	
Quota				2 (03.38)	
No	54	3	0	57 (96.91)	
Quota of Patient	55	3	1	59	

* significant with the P Value < 0.05

4.1.2.6. The Relationship Between Autoimune Diseases and Steroid Theraphy

There was no significanly different in steroid theraphy among all of patient with the different diagnosis of autoimun diseases (P > 0.1). It means is every autoimune disease can't be treated with steroid therapy (Table 21).

Table.21. The Relationship Between Autoimun Diseases and Steroid Theraphy

Drugs	Autoimun Disease				P Value*
	No Autoimun Disease	ITP	SLE	Quota (%)	
Prednisolon	4	-	1	5 (8.47)	0.341
Hydrochortison	1	-	-	1 (1.70)	
Deksamethason	1	-	-	1 (1.70)	
Prednisolon + hydrocortison	4	-	-	4 (6.77)	
No	47	1	-	48 (81.32)	
Quota of Patient	57	1	1	59	

4.1.2. The Relationship Between Diagnosis and Data Laboratorium

4.1.3.1. The Relationship Between RTI Disease and Laboratory Data

Most of the laboratorium data (Hb, Na, K, Ca, Cr, and albumin) of patient with RTI disease (Bronchopneumonia, AEBA, Croup, CAP, Acute Tonsiliti) were no significant different ($P > 0.1$). Except plasma urea of patient with CAP was lower as compaire those in patient with BP, AEBA, Croup and Acute Tonsiliti (Table 22).

Table. 22. The Relationship Between Diagnosis RTI Disease and Laboratory Data

Laboratorium value	RTI Disease					P Value*
	Bp Mean ± SD	AEBA Mean ± SD	Croup Mean ± SD	CAP Mean ± SD	Acute Tonsiliti Mean ± SD	
Hb	11.9 ± 1.064	11.8 ± 1.607	11.6 ± 0.141	1	12 ± 0.424	0.353
WBC	16.120 ± 5.311	16.667 ± 6.855	11.000 ± 0,282	15.750	11.7 ± 9.206	0.112
Na	136 ± 2.445	136 ± 2.516	134	136	133 ± 2.12	0.680
K	4.23 ± 0.665	3.90 ± 0.608	4.40	5.40	4.2 ± 0.212	0.509
Ca	2.7 ± 1.178	-	-	-	2.1	0.528
Urea	6.8 ± 1.487	4.2 ± 2.050	7.3	1.4	4.2	0.099*
Cr	51.9 ± 10.696	55.5 ± 4.949	50.0	43.0	67 ± 1.41	0.262
Albumin	42.3 ± 4.062	-	-	-	39	0.736

* significant with the P Value < 0.05

4.1.3.2. The Relationship Between Infection Disease and Laboratory Data

Most of the laboratorium data (Hb, WBC, Na, Ca, Cr, and albumin) of patient with infection disease (Meningitis, and UTI), were not significant different (P> 0.1). Except plasma K of the meningitis patient was higher as compaire to plasma K of the UTI diseases, while plasma urea of UTI was higher then patient with meningitis. (P< 0.05) (Table 23).

Table. 23. The Relationship Between Infection Disease and Laboratory Data

Laboratorium value	Infection disease		P Value*
	Meningitis Mean ± SD	UTI Mean ± SD	
Hb	11 ± 2.192	11 ± 1.131	0.586
WBC	12.500 ± 0.141	21.100 ± 0.000	0.122
Na	136 ± 0.707	138 ± 0.000	0.645
K	6.0	4.2	0.016*
Ca	2.4	-	0.941
Urea	4.3 ± 0.141	9.6 ± 0.000	0.026*
Cr	48.0 ± 7.701	50.0 ± 0.000	0.401
Albumin	45	-	0.564

* significant with the P Value < 0.05

4.1.3.3. The Relationship Between Renal Disease dan Laboratory data

Most of the laboratorium data (Hb, WBC, Na, Ca, K, and Urea) of patient with Renal Disease (Sindrome Nephrotic and AGN), there were not significant different ($P > 0.1$). Except plasma creatinine of the patient with nephrotic Syndrome was lower as compaire to plasma creatinine of the AGN diseases and albumin of patient with AGN were significanly higer then patient with Neprhotic Syndrome ($P< 0.05$) (Table 24).

Table. 24. The Relationship Between Renal Diseases dan Laboratory data

Laboratorium value	Renal Disease		P Value*
	Nephrotic Syndrome Mean ± SD	AGN Mean ± SD	
Hb	12 ± 1.109	12	0.711
WBC	9 ± 2.679	9	0.365
Na	136 ± 2.828	141	0.241
K	4.8 ± 0.848	3.9	0.416
Ca	2.0 ± 0.968	2.1	0.545
Urea	4.8 ± 0.565	8.7	0.341
Cr	61 ± 16.970	84	0.051*
Albumin	21.5 ± 10.605	34	0.000*

* significant with the P Value < 0.05

4.1.3.4. The Relationship Between Neuronal Disease and Laboratory data

Most of the laboratorium data (Hb, WBC, Ca, K, and Urea, Cr, and albumin) of patient with neuronal disease (Seizure and epilepsi), were not significant different (P > 0.1). Except plasma Na of the epileptic patient was higher as compaire to olasma Na of the seizure diseases (P< 0.05) (Table 25).

Table. 25. The Relationship Between Neuronal Disease and Laboratory data

Laboratorium value	Neoronal Disease		P Value*
	Seizure Mean ± SD	Epilepsi Mean ± SD	
Hb	11 ± 1.231	11 ± 1.131	0.498
WBC	12.680 ± 4.806	9.200 ± 2.828	0.387
Na	133 ± 3.435	136 ± 0.000	0.044*
K	4.0 ± 0.589	3.8 ± 0.707	0.364
Ca	2.6 ± 0.134	2.2 ± 0.077	0.848
Urea	5.8 ± 1.733	6.8 ± 0.707	0.845
Cr	54 ± 15.849	62 ± 14.860	0.747
Albumin	46.5 ± 0.707	-	0.258

* significant with the P Value < 0.05

4.1.3.5. The Relationship Between Gastrointestinsl Diseases and Laboratory Data

Most of the laboratorium data (Hb, WBC, Ca, K, and albumin) of the patient with diagnosgastrointestinal diseases (constipation and AGN), were not significant different (P> 0.1). Except plasma Na of the constipation patitnt was significanly higher as compaire to plasma Na of the AGE diseases. Plasma urea of patient with AGE diseases was significantly higer compaire to patient with constipation and the plasma creatinin of patient with AGE was significanly higer then patient with constipation. (P= < 0.05) (Table 26).

Table. 26. The Relationship Gastrointestinsl Diseases and Laboratory Data

Laboratorium value	Gastrointestinsl Disease		P Value*
	Constipation Mean ± SD	AGE Mean	
Hb	12 ± 1.457	12	0.734
WBC	11.143 ± 2.350	12.000	0.631
Na	137 ± 1.527	130	0.062*
K	4.7 ± 0.472	4.1	0.419
Ca	2.7 ± 0.183	-	0.631
Urea	4.2 ± 1.000	9.4	0.099*
Cr	62 ± 11.313	81	0.086*
Albumin	44		0.654

* Significant with the P Value < 0.05

4.1.3.6. The Relationship Between Autoimun Diseases and Laboratory Data

All of the laboratorium data (Hb, WBC, Ca, K, Na, Cr, urea and albumin) of the patient with diagnosed autoimun (ITP and SLE), were not significant different (P > 0.1) (Table 27).

Table. 27. The Relationship Between Autoimun Diseases and laboratory data

Laboratorium value	Autoimun Disease		P Value*
	ITP Mean	SLE Mean	
Hb	12	12	0.823
WBC	10.200	4.750	0.167
Na	-	137.000	0.801
K	-	3.900	0.551
Urea	-	3.700	0.293
Cr	-	59	0.845
Albumin	45.0	39.5	0.846

4.1.3.7. The Relationship Between Others Diseases and Laboratory Data

All of the laboratorium data (Hb, WBC, Ca, K, Na, Cr, urea and albumin) of the patient with diagnosed the others (cronic hydrocephalus, alleged insect, syncope, pseudotumor cerebri), were not significant different (P > 0.1) (Table 28).

Table. 28. The Relationship Between Others Diseases and Laboratory Data

Laboratorium value	Others Disease				P Value*
	Chrinic Hydrocephalus Mean	Alleged insect Mean	Syncope Mean	pseudotumor cerebri Mean	
Hb	12	12	-	12	0.782
WBC	10.560	13.560	8.200	15.760	0.802
Na	138	137	138	143	0.142
K	4.7	4.0	3.6	4.3	0.744
Ca	-	2.3	2.2	2.4	0.981
Urea	3.3	3.6	9.4	5.9	0.262
Cr	62	57	59	67	0.909
Albumin	-	41.5	-	47 0	0.689

4.1.4. The Relationship Between Diagnosis with Langht of Stay

Length of stay patient with infection, neuro, gastrointestinal, autoimun and others disease, were is not significanly different (P> 0.1). While the length of stay of patient with RTI and renal diseases were significanly effected by the diagnosis. In this situation patient with CAP stay in ward longer then patient bronchopneumonia, AEBA, Croup and Acute Tonsiliti and for renal diseases patient with neprhotic syndrome stayed in ward longer then patient with AGN P= <0.05 (Table 29).

Table. 29. The Relationship Between Diagnosis Lang of Stay

Diagnosis	N	(%)	Lang of stay (day) Mean ± SD	P value*
RTI				0.037*
• Bronchopneumonia	20	32.20	3 ± 1.257	
• AEBA	5	8.47	4 ± 0.548	
• Croup	2	3.38	2 ± 0.707	
• CAP	1	1.70	7	
• Acute Tonsilitis	3	5.10	4 ± 2.062	
Infection				0.692
• Meningitis	2	3.38	4 ± 2.828	
• UTI	2	3.38	3 ± 0.707	
Nefron				
• Seizure	6	10.20	3 ± 1.506	0.779
• Epilepsi	2	3.38	3 ± 0.707	
Renal				0.039*
• Nephrotic Syndrome	2	3.38	6 ± 2.121	
• AGN (acute Glomerulus Nefritis	2	3.38	5 ± 2.121	
Gastrointestisinal				0.950
• Constipation	3	5.10	3 ± 1.000	
• AGE	1	1.70	3	
Autoimun				0.363
• ITP (idiopphatic trombocitopenia)	1	1.70	2	
• SLE	1	1.70	5	
Others				0.387
• Chrinic Hydrocephalus	1	1.70	2	
• Alleged insect	2	3.38	2 ± 0.707	
• AVSD	1	1.70	2	
• Syncope	1	1.70	4	
• pseudotumor cerebri	1	1.70	2	
Jumlah	59			

* Significant with the P Value < 0.05

4.1.5. The Relationship Between Diagnosis with Outcome

Most of the diagnose patient with RTI, other infection, Renal, neuronal, autoimun and gastrointestinal discharge without complication, there is no significanly different between patient discharge with compire and without compaire among all diagnosed diseases on pediatric ward patient ($P > 0.1$). Except most of patient with others disease (Chrinic Hydrocephalus, alleged insect, AVSD, syncope, pseudotumor cerebri) discharge with complication ($P < 0.001$) (Table 30).

Table. 30. The Relationship Between Diagnosis with Outcome

Diagnosis	Outcome						P value*
	Pasient		Discargh without complication		Discargh with complication		
	N	(%)	N	(%)	N	(%)	
RTI							0.611
• Bronchopneumonia	20	32.20	20	32.20	0	-	
• AEBA	5	8.47	5	8.47	0	-	
• Croup	2	3.38	2	3.38	0	-	
• CAP	1	1.70	1	1.70	0	-	
• Acute Tonsilitis	3	5.10	4	6.78	0	-	
Infection							1.000
• Meningitis	2	3.38	2	3.38	0	-	
• UTI	2	3.38	2	3.38	0	-	
Nefron							1.000
• Seizure	6	10.20	6	10.20	0	-	
• Epilepsi	2	3.38	2	3.38	0	-	
Renal							0.251
• Nephrotic Syndrome	2	3.38	1	1.70	1	1.70	
• AGN (acute Glomerulus Nefritis	2	3.38	2	3.38	0	-	
Gastrointestisinal							1.000

• Constipation	3	5.10	3	5.10	0	-	
• AGE	1	1.70	1	1.70	0	-	
Autoimun							1.00
• ITP (idiopphatic trombocitopenia)	1	1.70	1	1.70	0	-	
• SLE	1	1.70	1	1.70	0	-	
Others							0.000*
• Chrinic Hydrocephalus	1	1.70	0	-	1	1.70	
• Alleged insect	2	3.38	2	3.38	0	-	
• AVSD	1	1.70	0	-	0	-	
• Syncope	1	1.70	1	1.70	0	-	
• pseudotumor cerebri	1	1.70	0	-	1	1.70	
Jumlah	59						

* Significant with the P Value < 0.05

4.2. Discussion

The sociodemographic data on the pediatric ward of HUSM hospital showed that patients treated in this ward were dominated by male. The same condition was reported by David *et al.*, (2001) on Myeloid Leukemia, and Wine *et al.*, (2004) on Pediatric Crohn's Diseases and Growth Retardation in which more boy patients were found than the female patients.

Males have shorter life expectancy than women (Grumbach, 2004; Anonymous, 2010[f]), but women have worse health than men (Macintyre *et al.*, 1996). This is due to the biological and physiological differences such as differences in the reproductive organs, hormones and chromosomes (Anonymous, 2010[b]).

The present study showed that the average age of children hospitalized in the pediatric ward was below five years old. Children at these ages are at high risk to have diseases (Wine *et a.l*, 2004; Descloux *et al.*, 2009; Hasan *et al.*, 2009; Going *et al.*, 2011). This problem is caused by changes in the physical size and the manifestation of morphologic changes, complex biochemical and physiological changes happening continuously during the growth period of children (Rudolph *et al.*, 2006).

In this study, the average weight of pediatric patients was ideal if compared with average age, 14.65±11.44 kg and 4.94±4.05 years. Anonymous (2009[f]) announced that children with average age of 4 years have average body weight of 14 kg.

The length of stay of patients in the USM hospital depends on the diseases. In this study, the average length of stay of the pediatric patients was 3

days. Other studies reported that the average length of stay of pediatric patients was about 2 days (Bellet & Whitaker, 2000) and 5 days (Bianco *et a.l,* 2003). The length of stay varies greatly influenced by the type of disease, the treatment regimen, the type of drug administered, and also medical skill factor.

Infectious diseases were the most common disease in the pediatric ward of HUSM which was counted 91.5%, while patients with other diseases were counted 8.5%. It was also reported from Indonesia (Anonymous, 2006[d]), Ethiopia (Agala, 2012) and Tanzania (Reyburn *et al.,* 2008) where infectious diseases were the most common disease in pediatrics. Infectious diseases are the main cause of death in children (Meadow & Simon, 2002) as they are particularly vulnerable to infectious diseases.

The most common infectious disease found in the pediatric ward of HUSM was bronchopneumonia. This is similar to a report from Anonymous (2006[b]) where pneumonia was the most common infectious disease that killed children. In South Asia such as India, Pakistan, and Bangladesh, pneumonia is a common type of infection (Zaidi, 2004). Children in the period of growth are very susceptible to bronchopneumonia (Kliegman *et al.*, 2007), and according to the Global Coalition Against Child (Anonymous, 2011[c]), pneumonia kills a child every 20 seconds. Besides bronchopneumonia, many other infectious diseases were also found in the children's ward of HUSM such as AEBA, Croup, CAP, acute tonsillitis, meningitis and UTI.

In the area central nervous system, we concerned in two types of disorders: seizures and epilepsy. These disorders are different in terms of the causes and the symptoms. Seizures are a finite episodes of brain dysfunction,

resulting from disruption of electrical communication in cerebral neurons (Katzung, 2010) that leads to temporal changes on awareness, behavior, motor activity, sensation, and autonomous function (Friedman & Ghazala, 2006). Seizures in newborns can occur because of primary central nervous system disorders such as, meningitis, cerebrovascular accident, encephalitis, intracranial hemorrhage, and tumor or secondary to systemic or metabolic problems such as hypoxic-ischemic-hypocalcemia, hypoglycemia, and hyponatremia (Rennie., 2005). On the other hand, epilepsy is a repeated attack that happens periodically with or without seizures, which can last for more than 30 minutes (Dipiro, 2008). Causes of epilepsy include trauma, lack of oxygen, tumors and infections (Engelborghs *et al.*, 2000).

The result of this study reveals that there was no significant association between the age factor and the diseases. It was seen in RTI diseases and other infections, nervous system disorders, digestive disorders, and autoimmune diseases. Several previous studies also suggested that the age factor did not affect the type of disease suffered by children (Rodman *et al.*, 2005; Callangham *et al.*, 2005). According to Kollmann (2012), children aged less than 5 years old are susceptible to infectious diseases, while Friedman & Ghazala (2006) and Nunes *et al.*, (2011) reported that children aged 3 to 4 years old are susceptible to central nervous system disorders. Hersh *et al.,* (2009) reported that autoimmune disease is common in adults, but can be detected during the childhood, and Cosnes *et al* (2011) reported that gastrointestinal disorders can be happening in any ages, but more common at the age of 20-40 years. The present study also showed a significant association between age factor and kidney diseases, confirming a study

reported by Descloux *et al.,* (2009). The age greatly varies among children with kidney disease. Many other studies have reported that kidney disease can be suffered by children at different ages, for example, at the age of 5-9 years (Saca *et al.*, 2007) and age less than 22 years (Susan *et al.*, 2012). So the age of the children in this study does not completely affect the type of disease, except for kidney disease.

In the present study, the the diagnosis and gender doesn't show a meaningful relationship. In the entire types of disease observed such as RTI, infection, central nervous system disorders, kidney disorders, and other diseases found that more boys than girls. The data on RTI diseases confirm a few studies reported by Kashyap *et al.*, (2008) and, Rijal *et al.*, (2011), while the data for infection diseases confirm studies of infection disease reported by Farag *et al.*, (2005); Steven *et al.*, (2006) and Bahador *et al.*, (2009), the data on central nervous system disorders also confirms many studies reported by Calisir *et al.*, (2006); Taheri *et al.*, (2009); Anonymous, (2010[g]), and Salih *et al.*, (2012) the data in kidney disorders also confirm a report from Riaz *et al.*, (2006); Malla, *et al.*, (2008), and Nadir *et al.*, (2011). The number of boy patients is much more than girl patients. This is due to higher activity levels in boys than girls (Pandey *et al.*, 2002). While the number of patients charged with gastrointestinal disease is the same between by boys and girl patients. Based on a study conducted by Wikswo & Hall (2012), AGE disease affects more girls than boys, but other studies conducted by Pashankar & Vera (2005) and Karaman *et al.,* (2010) found more male patients compared with female patients. These studies showed inconsistent data because the types of gastrointestinal disorders do not vary

among men and women (Chang *et al.,* 2006). For autoimmune diseases, the present study shows more girl patients than boy. This is also consistent with studies that have been reported by the National Institutes of Health (Anonymous, 2002[a]) and Henderson *et al.*, (2000). Autoimmune diseases affect many women than men due to differences in the response to the immune system, where women respond more quickly to immune system alteration, vaccination, trauma with increased antibody production (Fairweather *et al.*, 2008), genetic and anatomical differences (Fish, 2008).

The relationship between Respiratory Tract Infection (RTI) and other infectious diseases with antibiotics used in the therapy shows meaningful relationship where antibiotic used the most is amoxicillin and clavulanic acid. This confirms studies from BPAC (Anonymous, 2006[e]) in New York, and Miller *et al.,* (2010) in the UK that showed amoxicillin group as the most common antibiotics used for RTI and other infectious diseases. While in Croatia, the most widely used antibiotic used to treat infection was gentamicin (Likic *et al.*, 2007). The difference in the use of antibiotics for the treatment of infection in different countries depends on antibiotic resistance.

Relationship between central nervous system disorders with drugs used in the treatment shows a meaningful relationship, in which the most widely used drugs are carbamazepine and phenytoin. This confirms studies conducted by the Murro (2001); John & Pellock (2005) and WHO (2006[d]) in which the drugs used in the treatment of seizures and epilepsy were carbamazepine and phenytoin. In kidney disease, the relationship between the disease and the medications used

shows a significant relationship, in which the antihypertensives used the most are nifedipine and hydrochlorthiazide. Meanwhile, the most common steroids used are prednisolone and hydrocortisone for both AGN disease and nephrotic syndrome. This confirms studies conducted by Hogg (2005) and Beattie (2007). For gastrointestinal diseases, it's also seen that there is a significant association between the disease and the drugs used, where drug use is Ravin Enema and lactulose for constipation and ORS for dehydration. This is in line with studies conducted Williams (2006) and OHSU (Anonymous, 2011[d]).

The management therapy given to the patients at pediatric ward of HUSM Malaysia comply with Pediatric Protocol for Malaysian Hospitals where medications selected on each disease are based on the severity of the disease. In addition, the drug selection is also prioritized on first line drug treatment for each type of diseases. The medications and dosages are given based on the type of disease and the symptoms in each patient.

Antibiotics used in the treatment for pneumonia in the pediatric ward HUSM are amoxicillin, penicillin, ampicillin, azithromycin, doxycycline, cefixime, cefotaxime, and metronidazole. The protocol of therapy management in the treatment of pneumonia states the first-line treatment are *beta-lactam* antibiotics such as benzylpenicillin, amoxicillin, while the second line are cephalosporin antibiotics such as cefotaxime, cefuroxime and ceftazidime, and the third line are *carbapenem* antibiotics such as imipenem and other classes of antibiotics, for instance aminoglycoside antibiotics such as gentamicin, amikacin (Husain *et al.*,2008). The drug used in the treatment of pneumonia reported in

previous study was amoxicillin (Gray & Zar, 2010). In conclusion, the treatment for pneumonia in the children's ward of HUSM is based on protocols.

AEBA *(acute exacerbation of bronchial asthma)* is also a respiratory tract infection found during the present study in the pediatric ward of HUSM. This disease is very unpleasant. The management therapy given for AEBA disease in the children's ward of HUSM are antibiotics such as amoxicillin, ampicillin, azithromycin, and cefotaxime; bronchodilators such as salbutamol and ventolin; and steroids such as prednisolone. Previous studies have reported that primary care in the treatment of AEBA is to provide oxygen, and then administer bronchodilators, anticholinergics, steroids and theophylline (Corrales *et al,* 2011; Wang & Hong, 2011). Antibiotics were commonly used in the children's ward in the treatment of AEBA although it is not included in the protocol of therapy and doesn't confirm the reports from previous studies. The antibiotics are used since the patients experience fever and increased number of white blood cells count in the laboratory examination. This has led to the use of antibiotics in the pediatric ward of HUSM.

Croup is a kind of disease associated with respiratory tract characterized by "barking" cough, hoarse voice and respiratory discomforts with various severity. This due viral-induced inflammation of larynx, trachea and bronchus (Hussein *et al.,* 2008). In this study, the management of croup are steroids such as prednisolone. The protocol of therapy of HUSM in the treatment of croup recommends prednisolone as the initial therapy. When the symptoms are accompanied by vomiting, the patient is also given budesonide inhalation suspension. For intermediate severity of croup, oral or parenteral dexamethasone

and budesonide nebulizer can be used. For the most severe category of croup, nebulized adrenaline, parenteral dexamethasone and budesonide nebulizer can be given, followed by administration of oxygen (Hussain et al., 2008). Treatment of croup in pediatric ward HUSM is in line with those already reported by previous studies (Borland *et al.*, 2008; Harris *et al*, 2008; Rajapaksa & Starr, 2010). Patients in the children's ward of HUSM receive medications in accordance with protocols.

Patients diagnosed with meningitis admitted to the pediatric ward of HUSM receive the initial therapy of penicillin and cephalosporin antibiotics. The protocol of antibiotic therapy states that the drugs are given based on the age of the patients. Penicillin C antibiotic or cefotaxime are given to children aged 1-3 months, while children older than 3 months are given antibiotic therapy of C-penicillin and cefotaxime or ceftriaxone (Hussain *et al.*, 2008).The treatment of meningitis in the present study is in line with a report from Sáez-Llorens & McCracken (2003). The treatment performed in the pediatric ward of HUSM is in accordance with the protocol.

The management therapy received by the patients at pediatric ward of HUSM for acute tonsillitis infection during the treatment are amoxicillin and penicillin. Data from previous studies conducted in 1998-2001 showed that the treatment given for acute tonsillitis infection were in line with another study reported by Kuzelova *et al.*, (2004) in Bratislava, Slovakia.

Seizures in children are very common and are very serious problem that occur in children (Wheless *et al.*, 2007; Friedman, 2011). During the present study, cases of seizures were also found where the patients were given phenytoin;

carbamazepine; Benzodiazepine; pantoprazole, and penobarbital for the treatment. The HUSM guideline for the treatment of seizures states if the seizure lasts for more than 5 minutes, diazepam should be given. But if it last longer for 5-30 minutes, the patient should be given intravenous diazepam administered as slow bolus dose and followed by intravenous administration of phenytoin (Hussain *et al.*, 2008). This treatment of seizures is in accordance with previous studies (Varelas, 2005; Adams & Paul, 2007).

During the study, we also observed the management of epilepsy is phenytoin. The selected medications for primary therapy in the protocol of therapy in HUSM are carbamazepine, phenytoin, lamotrigine, and valproic acid (Hussain *et al.*, 2008). Valproic acid is a good choice to use for antiepileptic therapy because it has a broad spectrum of work and also prevents prolonged seizures. Valproic acid is the first choice as a maintenance therapy (Gupta, 2010). The antiepileptic therapy given to treat central nervous system disorders at the pediatric ward of HUSM complies with the protocol.

Therapy management of renal diseases such as AGN (acute glomerular nephritis) during the treatment at the pediatric ward of HUSM are steroids such as prednisolone, nifedipine, furosemide, and antibiotics. According to the protocol therapy, the treatment of AGN is performed by the administration of penicillin for 10 days, then furosemide to resolve edema problem, and either nifedipine, sodium nitroprusside, labetolol, or hydralazine to overcome hypertension. Previous studies reported that if no response found to the therapy of steroids and antihypertensive, renal biopsy should be performed. On the other hand, if it shows a good response, the dose of prednisolone should be tapered (Hogg, 2005). The

use of steroids for AGN disease provides a positive therapeutic response. The existing therapy in the HUSM is in compliance with the protocol.

Therapy management of nephrotic syndrome at the pediatric ward of HUSM are steroids such as prednisolone and hydrocortisone; antihypertensives such as nifedipine and enalapril; and diuretics such as furosemide. The protocol states the the treatment for nephrotic syndrome are prednisolone, diuretics, antihypertensives, low-sodium diet, and low sodium prophylaxis (Hussain *et al.*,2008). According to the guidline of *Management of nephrotic syndrome* developed by Beattie (2007), the medications used to treat nephrotic syndrome are prednisone and penicillin for prophylaxis. The therapy at the pediatric ward of HUSM is in compliance with the protocol.

Systemic Lupus Erythematosus (SLE) is an autoimmune disease involving multiple organs (Miah, 2008), which is caused by hormonal and genetic factors (Font *et al.*, 1998). The treatment choice for SLE really depends on symptoms, organ involved, and the severity of the disease (Gladman & Urowitz, 1999; Bertsias *et al.*, 2008). In this study, the medications given during hospitalization are steroids such as prednisolone. A previous study has reported that steroids is a primary choice in the treatment of SLE, because it has a rapid effect, especially when given intravenously (Stichweh & Pascual, 2005). Cyclophosphamide, an immunosuppressant, can also be used, depends on the severity of the organ involved (Rockville, 2011). In the pediatric ward of HUSM, these drugs were not found during the study. However, the existing therapy is in accordance with previous studies.

Constipation is a common symptom caused by gastrointestinal diseases (Li, 2008). The medications used to treat constipation at the children's ward of HUSM are ravin laxative enema (glycerin) and lactulose (bisacodyl). In addition, a combination of lubricants and laxatives is also found. The guideline of HUSM states the drugs used in the treatment of constipation are magnesium hydroxide, lactulose, sorbitol, polyethylene glycol (PEG) as osmotic laxatives (Hussain *et al.*, 2008). Previous studies reported by OHSU (Anonymous, 2011[d]) and Williams &Wilkins (2006) also included combination of lubricants and laxatives which is strongly recommended. The existing treatment is in compliance with the guidelines. For long-term treatment, it is recommended to use osmotic laxatives and stimulant laxatives and provided for short-term use (Rahman and Gerayly, 2009).

Laboratory examination has an important role in the assessment of health, health care, and ultimately, to the public health. The test results contribute to the diagnosis, the rate of cured diseases, monitoring of health status, and screening of disease population (Howerton, 2005). Laboratory test results affect 60% - 70% of the treatment decision (Johnson, 2008). Laboratory examinations for pre-analytical, analytical and post-analytical are the key to ensuring the safety of patients in medication (Marx, 2005). The aspect of laboratory anatomy and clinical pathology such as drugs and laboratory data is very influential on medical diagnoses in the United States (Anonymous, 2005[a]). Laboratory tests are conducted to determine the diagnosis of the disease that include hematology; chemistry, serology, microbiology, and urine examination (Johnson, 2008), while

samples taken for the tests are blood (serum and plasma); urine; sputum; cerebrospinal fluid and faeces (Anonymous, 2011[e]).

The present study shows only one laboratory examination performed during the treatment of patients at pediatric ward of HUSM. These tests are conducted only to determine the diagnosis of diseases such as that include hemoglobin; white blood cells count; sodium; potassium; calcium; creatinine, urea and albumin. In this study, the relationship between diagnosis and laboratory data for URTI disease shows a significant association seen in the examination of white blood cells and the levels of urea, while in other cases of infection, a significant association is seen on the levels of potassium and urea. Increased number of white blood cells indicates the presence of infection or acute inflammation process (Sutedjo, 2008), because white blood cells are responsible to fight infection and protect the body from foreign organisms by the mechanisms of phagocytosis and producing and distributing antibodies (Anonymous, 2011[f]). Thus, the white blood cells count is increasing while the infection happens.

The laboratory results that determine the diagnosis for kidney disease in this study were creatinine, urea and albumin levels. There is a significant relationship between kidney disease and laboratory results for creatinine and albumin, in which increased level of creatinine in the blood and high urea protein (albumin) can cause kidney disease. The level of blood urea is influenced by many factors outside the kidney that also affect the interpretation of the lab results. The blood urea level will increase along with protein intake; the lack of blood flow to the kidneys such as in dehydration or heart failure; in the upper gastrointestinal bleeding, in the state of hypercatabolism such as infections, post-surgery

condition and trauma. A few pharmaceuticals can also affect the lab results, for example: corticosteroids increase protein catabolism, while androgens increase protein anabolism. On the other hand, the blood urea level decreases in the lack of protein intake (Thomas, 1998; Lamb *et al.*, 2006). The creatinine level better represents kidney function that is more stable than the blood urea level, but the examination of creatinine level is also influenced other factors such as diet, initially protein diet eventhough it is not as much as influence onto the level of urea. Creatinine level is mainly influenced by muscle mass, therefore it is higher in men than women; increased in athletes with a lot of muscle mass, and also in disorders of muscle breakdown (rhabdomyolisis). In contrary, the creatinine level decreases in the elderly following the decrease of the muscle mass (Anonymous, 2002[b]). Therefore laboratory examination to determine kidney disease should not depend only on the level of urea and creatinine. In this study, the diagnosis is confirmed by other indications such as the presence of edema.

The present study shows a meaningful relationship between the central nervous system disorders with laboratory results, especially for sodium, which is likely the cause of seizures in many patients at the pediatric ward of HUSM. The sodium level that increases and decreases irregularly can lead to seizures (Kugler, 2000). The normal avativity of nervous system depends on the supply of glucose, oxygen, calcium, potassium, sodium, chloride, amino acids and pH, that are the factors that accelerate seizures. During seizures, the need for blood flow to the brain that carry out carbon dioxide increases, and brings substrate for metabolic activity. The longer the seizures, the more likely to experience ischemic that lead to nervous system and brain damage (Gomella, 2004; Dipiro, 2008). In

conclusion, sodium is not the only electrolyte in the blood that causes seizures, but also glucose, oxygen, calcium, potassium, chloride, amino acids and pH that can trigger seizures.

This study shows a significant relationship between the results of laboratory data with the diagnosis of gastrointestinal disease, especially for the levels of sodium, potassium and creatinine. To establish the diagnosis of gastrointestinal diseases, the laboratory tests conducted are gastric lymph fluid examination, lymph duodenum and bile analysis (Soetedjo, 2008). In constipation, the laboratory data is very helpful in diagnosis, such as complete blood count and chemistry examinations (total bilirubin, albumin, calcium, uric acid) (Waseem, 2004). While laboratory tests like blood electrolyte levels for gastroenteritis (acute diarrhea) is not required (Teach, 1997; Nager & Wang, 2002). Stool culture is performed for chronic dysentery, but not in acute conditions, but sometimes complete blood and urine tests can be performed in cases of sepsis or urinary tract infection (Anonymous, 2003). However, a study conducted by Yimalz *et al.,* (2003) showed that serum urea and bicarbonate concentration could be helpful in the estimation of fluid deficiency, independently to serum sodium concentration. In addition, it can be considered as a useful additional information for clinical evaluation in assessing the severity of dehydration. However, the laboratory data of sodium, creatinine, and urea have not been able to establish the diagnosis of gastrointestinal disease especially AGE disease. Physical examination is also needed to establish the diagnosis of gastrointestinal disease that includes evaluation of turgor for dehydration and diarrhea, examination of stool consistency for constipation.

The present study does not show significant relationship between the laboratory results with the diagnosis of autoimmune diseases. The diagnosis for autoimmune diseases can be established by the number of red blood cells and white blood cells counts, the presence of normocytic and normochromic anemia (Castro & Gourley, 2010) which is specific to the SLE diseases, while for ITP diseases, the platelet count and thrombocytes are low, and the test is positive for antinuclear antibody (ANA) (James *et al.*, 2000).

In this study, the clinical outcome of patients treated at the pediatric ward of HUSM shows a good outcome where all patients are discharged without complications. This outcome is influenced by several factors such as the establishment of a good diagnosis based on the results of laboratory data, drug selection and dosing according to the patient's disease, and treatments performed by medical professionals.

The present study, conducted in April to June 2012 at the pediatric ward of HUSM Kelantan Malaysia, has found seven diseases. We classified the diseases based on the diagnosis. The most common diseases are infectious diseases, especially bronchopneumonia.

Therapy management at the pediatric ward are based on the protocol of therapy of HUSM. The medications given to the patients are in compliance to the guideline. The diagnosis are established based on the results of laboratory examination. The determination of initial diagnosis is helpful only to guide the medical professional in providing temporary treatment. The diagnosis is also established based on the record of the patient that includes medical history, symptoms, and medication history. But the actual diagnosis is established after the

laboratory examinations are taken into account. All patients treated at the pediatric ward HUSM are discharged without complications. The average length of treatment is three days. Based on the above data it can be concluded that the management of therapy conducted at the pediatric ward of HUSM is in compliance with the guidline.

CHAPTER V

CONCLUSIONS AND SUGGESTIONS

5.1. Conclusions

The conclusions of the study on the clinical evaluation of management therapy at the pediatric ward of HUSM Malaysia conducted in April to June 2012 are as follows:

1. The most common disease suffered by pediatric patients is bronchopneumonia infection.
2. The management therapy of patient at the pediatric ward is amoxicillin and clavulanic acid for antibiotics, carbamazepine for anticonvulsants, nifedipine for antihypertensives, prednisone and combination of prednisone and hydrocortisone for steroids, ravin enema and combination of ravin enema with lactulose for laxatives, and ORS (Oral Rehydration Salt) for antidehydration.
3. The average length of stay of the patients is 2-4 days, except for nephrotic syndrome which is about 5-6 days.
4. The clinical outcome of the patients at the children's ward of HUSM shows that patients are generally discharged without complications, except for chronic hydrocephalus, cerebral pseudotumor and nephrotic syndrome, and dischargh with complication.

5.2. Suggestions

1. It is suggested to further study oncology aspect on the pediatric ward.
2. It is also suggested to have a study on the medications administered based on the laboratory test results.

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Appendix. 1. Normal Pediatric Laboratory Values

Table. 31. Normal Pediatric Laboratory Values (Andropoulos, 2012)

Item	Age	Normal
Hemoglobin	0–30 days	15.0–22.0 *g/dL*
	1 month	10.5–14.0 *g/dL*
	2–6 months	9.5–13.5 *g/dL*
	7 months –2yrs	10.5–14.0 *g/dL*
	3–6yrs	11.5–14.5 *g/dL*
	7–12yrs	11.5–15.5 *g/dL*
	13–18yrs/female	12.0–16.0 *g/dL*
	13–18yrs/male	13.0–16.0 *g/dL*
	≥19yrs/female	12.0–16.0 *g/dL*
	≥19yrs/male	13.5–17.5 *g/dL*
Sodium (Na)	Premature	132–140 *mmol/L*
	0–11 months	133–142 *mmol/L*
	≥1yr	136–145 *mmol/L*
White blood cell count (WBC)	0–30 days	9.1–34.0 ×*103/μL*
	1 month	5.0–19.5 ×*103/μL*
	2–11 months	6.0–17.5×*103/μL*
	1–6yrs	5.0–14.5×*103/μL*
	7–12yrs	5.0–14.5×*103/μL*
	13–18yrs	4.5–13.5×*103/μL*
	≥19yrs	4.5–11.0×*103/μL*
Albumin	0–30 days	2.9–5.5 *g/dL*
	1–3 months	2.8–5.0 *g/dL*
	4–11 months	3.9–5.1 *g/dL*
	≥1yr	3.7–5.5 *g/dL*
Calcium	0–11 months	8.0–10.7 *mg/dL*
	1–3yrs	8.7–9.8 *mg/dL*
	4–11yrs	8.8–10.1 *mg/dL*
	12–13yrs 8.8–10.6	8.8–10.6 *mg/dL*
	14–15yrs	9.2–10.7 *mg/dL*
	≥16yrs	8.9–10.7 *mg/dL*
Creatine kinase	0–3yrs	60–305 *M/F (U/L)*
	4–6yrs	75–230 *M/F (U/L)*
	7–9yrs	60–365 *M/F (U/L)*
	10–11yrs	55–215 *Male (U/L)*
	12–13yrs	60–330 *Male (U/L)*
	14–15yrs	60–335 *Male (U/L)*
	16–18yrs	55–370 *Male (U/L)*
	≥19yrs	55–170 *Male (U/L)*

Creatinine	0.12–1.06mg/dL	0.12–1.06mg/dL
Potassium (K)	0–30 days	4.5–7.0 (venous or arterial) *mmol/L* 4.5–7.5 (heel stick) *mmol/L*
	1–2 months 4	.0–6.2 *mmol/L*
	3–11 months	3.7–5.6 *mmol/L*
	≥1yr	3.5–5.5 *mmol/L*
Urea	0–1yr	8–28 *mg/dL*
	2–15yrs	5–25
	≥16yrs	5–20

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Management of Infection Diseases and Clinical Outcome in Pediatric Ward

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Research Article

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Abstract

Background: Almost 11 million children die before the age of 5 years old. The cause of this problem is varying, such as acute respiratory disease, malaria, diarrhoea, measles, dysentery, pneumonia, and cough.

Objective: The objective of this study is to evaluate the patient drug therapy management and its outcome in the paediatric ward.

Methodology: The research was conducted using longitudinal observative method data was collection from patients' medical record in pediatric ward of HUSM Malaysia.

Result : From 37 male and 22 female with the mean age of 4,94 ± 4,05 years old, the most common diagnose of patients are RTI (Respiratory Tract Infection) such AEBA (Acute Exacerbation Bronchial Asthma), Croup, CAP (Community Acquired Pneumonia) and Acute Tonsillitis; meningitis and UTI (Urinary Tract Infection). The most common antibiotic drug treatment in paediatric ward was augmentin. There was significant different in antibiotic therapy among all of patient with different diagnosis of RTI disease ($P < 0.05$). Most of the patient admitted in paediatric ward Discharge without complication.

Key words: pediatric ward, Therapy management, infectious diseases clinical outcome.

INTRODUCTION

Children health is an indicator for the health of a nation (RWJF, 2009). Health problem in children will affect their growth. WHO (2004) described almost 11 million children die before the age of 5 years old. World Vision Asian Pacific (2009) report the same case accurred in Camboja, India, and Laos. In United States, 200 from 1000 childern died before the age of 1 years old (Unicef, 2006). The cause of this problem is vary, such as acute respiratory disease, malaria, diarrhea, measles, malnutrition, dysentery, pneumonia, diphtheria, and cough (Unicef, 2006; World Vision Asian Pacific, 2009; Nelson, 2007). In fact, death can be avoided through rapid handling (Unicef, 2006).

Infectious diseases remain the leading cause of death and disability-adjusted life years (MMWR., 1994), 25% cause of death in children due to infection. The top five causes of death from infectious disease are lower respiratory tract infections, HIV, diarrhoeal diseases, tuberculosis and malaria. Of the 11 million deaths in children under five who die each year, half are lost to pneumonia, diarrhoea, malaria. (Brownlie, et al., 2006).

None of parent want their children hospitalized, but from the above data, possibility of children hospitalized very hight. For this reason, Hospital should give special notice for handling pediatric patients. Pediatric particulary neonates with a rudimentary organ metabolism can't accept the same treatment with adult. Drug treatment for pediatric need perfect management, start from enforcement diagnosis, drug selection, dosage plan, until monitoring of drug use (Agalu & Mekonnen, 2012).

Pediatric patients require special attention from health professionals in terms of drug interactions, because children have a different response to the drug with adults. Parts of the body which is responsible for the excretion perfectly not fully developed until the age of 1 year, so that the half-life of the drug is to long, that lead it's to toxicity (Novaes, 2006).

Objectives of this study is to determine the patient diagnoses in pediatric ward HUSM Kelantan

Malaysia, to determine how management therapy of infection diseases, and to determine outcome therapy infection disease with data laboratory.

MATERIAL & METHODS

This is prospective longitudinal study, which was conducted on 59 patients in paediatric ward. Data sociodemographic include age, gender, diagnosis, medical story. Data sociodemographic and diagnosis were descriptive analysis while relationship diagnosis and therapy by chi-square analysis, and relationship diagnosis with laboratory data by ANOVA analysis.

RESULTS

From 59 patients involved in study, 62.7% (37 patients) of them are male and 37.2% (22 patients) of them are female. The average body weight of the patient were 14.65 ± 11.44 Kg, and the average age of the patients were 4.94 ± 4.05 years old (Table 1).

Table. 1. Frequency Sociodemographic Patients in Studied Population

Characteristic	Mean ± SD	N	%
Gender			
Male		37	57,6
Female		22	37,2
Age	4,94 ± 4,05		
Bodyweight	14,65 ± 11,44		
Length of stay	3,24 ± 3,00		

During the period this study, RTI (Respiratory Tract Infection) case are of 31 (52.5%), while others infections diseases of 4 (6.8%), neuronal diseases of 8 (13.6%), renal diseases of 4 (6.8%), gastrointestinal diseases of 4 (6.8%), autoimmune diseases of 2 (3.4%), and others diseases of 6 (10.2%). From this data the most frequency disease diagnosed were RTI 31 (52.5%), and the second frequency is neuronal 8 (13.6%) (Table. 2).

In this study, the most common antibiotic used to treated the patient with RTI and others infection diseases is augmentin (Table,3 and 4).

Table .2. The Relationship Between Diagnosis and The Age of Studied Population

Diagnosis	N	(%)	Age Mean ± SD	P value *
RTI diseases				0.242
• Bronchopneumonia	20	32.20	4.0±3.947	
• AEBA	5	8.47	6.4±3.957	
• Croup	2	3.38	1.0±2.310	
• CAP	1	1.70	1.4±0.636	
• Acute Tonsilitis	3	5.10	4.40±2.861	
Others Infectious diseases				0.373
• Meningitis	2	3.38	1.65±0.643	
• UTI	2	3.38	1.4±-	
Neoro diseases				0.911
• Seizure	6	10.20	5.1±5.794	
• Epilepsi	2	3.38	3.7±0.989	
Renal diseases				0.034 *
• Nephrotic Syndrome	2	3.38	11.7±0.494	
• AGN (acute Glomerulus Nefritis	2	3.38	7.6±5.027	
Gastrointestisinal diseases				0.989
• Constipation	3	5.10	4.6±4.975	
• AGE	1	1.70	5.0±-	
Autoimun diseases				0.927
• ITP (idiopphatic trombocitopenia)	1	1.70	2.9±-	
• SLE	1	1.70	11.0±-	
Other diseases				0.163
• Chrinic Hydrocephalus	1	1.70	9.0±-	
• Alleged insect	2	3.38	3.6±2.192	
• AVSD	1	1.70	5.0±-	
• Syncope	1	1.70	9.8±-	
• pseudotumor cerebri	1	1.70	14.0±-	
Jumlah	59			

Table. 3. The Relationship between RTI Diseases and Antibiotic

Drugs	RTI Disease							P Value*
	No RTI Disease	BP	AEBA	Croup	CAP	Acute Tonsillitis	Quota N (%)	
Antibiotic								0.050*
• augmentin	5	9	2	-	-	1	17 (28.81)	
• penicilin	2	-	-	-	-	1	3 (5.08)	
• cefotaxim	2	1	-	-	-	-	3 (5.08)	
• cefixim	1	-	-	-	-	-	1 (1.70)	
• ampicillin	-	1	1	-	-	-	2 (3.38)	
• azitromicin	-	1	-	-	-	-	1 (1.70)	
• doxacillin	1	-	-	-	-	-	1 (1.70)	
• metronidazole + augmentin	1	-	-	-	-	-	1 (1.70)	
• *cefotaxim + ampicillin*	1	-	-	-	-	-	1 (1.70)	
• gentamicin + penicilin	-	-	-	-	1	-	1 (1.70)	
• Ampicillin + azitromicin	-	-	1	-	-	-	1 (1.70)	
• Augmentin + ampicillin	-	2	1	-	-	-	3 (5.08)	
• Augmentin + azitromicin	-	2	-	-	-	-	2(3.38)	
• aygmentin + cefotaxim + azitromicin + cefuroxim	1	-	-	-	-	-	1 (1.70)	
Total							38 (64.40)	
Total No Diseases and treat	15	4	-	2	-	-	21 (35.6)	
Total of patient	31	20	5	2	1	3	59	

Most of the laboratorium data (Hb, Na, K, Ca, Cr, and albumin) of patient with RTI disease (Bronchopneumonia, AEBA, Croup, CAP, Acute Tonsiliti) were no significant different ($P > 0.1$), except plasma urea of patient with CAP was lower as compaired to those in patient with BP, AEBA, Croup and Acute Tonsiliti, further more, most of the laboratorium data (Hb, WBC, Na, Ca, Cr, and albumin) of patient with others infection disease (Meningitis, and UTI), were not significantly different ($P > 0.1$), except plasma K of the meningitis patient was higher as compaire to plasma K of the patient with UTI diseases, where plasma urea of UTI patient was higher then patient with meningitis. ($P < 0.05$) (Table 6 and 7).

DISCUSSION

The sociodemographic data on the pediatric ward of HUSM hospital showed that patients treated in this ward were dominated by male. The same condition was reported by David et al, (2001) on Myeloid Leukemia, and Wine et al, (2004) on Pediatric Crohn's Diseases and Growth Retardation in which more boy patients were found than the female patients.

Males have shorter life expectancy than women (Grumbach, 2004; NMHP, 2010), but women have worse health than men (Macintyre et al, 1996). This is due to the biological and physiological differences of those sex, such as differences hormones and chromosomes (WHO, 2010).

The present study showed that the average age of children hospitalized in the pediatric ward was below five years old. Children at these ages are at high risk to have diseases (Wine et al, 2004; Descloux et al, 2009; Hasan et al, 2009; Going et al, 2011). This problem is due to a manifestation of changes in the physical size morphologic changes, biochemistry and physiological processes continuously during the growth period of children (Rudolph, 2006).

In this study, the average weight of pediatric patients was ideal if compared with average age, 14.65±11.44 kg and 4.94±4.05 years. WHO (2009) announced that children with average age of 4 years have average body weight of 14 kg.

The length of stay of patients in the USM hospital depends on the diseases. In this study, the average length of stay of the pediatric patients was 3 days. Other studies reported that the average length of stay of pediatric patients was about 2 days (Bellet and Whitaker, 2000) and 5 days (Bianco *et al,* 2003). The length of stay varies greatly influenced by the type of disease, the treatment regimen, the type of drug administered, and also medical skill factor.

Infectious diseases were the most common disease in the pediatric ward of HUSM which was counted 91.5%, while patients with other diseases were counted 8.5%. It was also reported from Indonesia (WHO, 2005), Ethiopia (Agala, 2012) and Tanzania (Reyburn *et al,* 2007) where infectious diseases were the most common disease in pediatrics. Infectious diseases are the main cause of death in children as they are particularly vulnerable to infectious diseases.

The most common infectious disease found in the pediatric ward of HUSM was bronchopneumonia. This is similar to a report from UNICEF where pneumonia was the most common infectious disease that killed children (WHO, 2006). In South Asia such as India, Pakistan, and Bangladesh, pneumonia is a common type of infection (Zaidi, 2004). Children in the period of growth are very susceptible to bronchopneumonia (Nelson, 2000), and according to the Global Coalition Against Child (2011), pneumonia kills a child every 20 seconds. Besides bronchopneumonia, many other infectious diseases were also found in the children's ward of HUSM such as AEBA, Croup, CAP, acute tonsillitis, meningitis and UTI.

The result of this study reveals that there was no significant association between the age factor and the diseases. Several previous studies also suggested that the age factor did not affect the type of disease suffered by children (Rodman, *et al.*, 2005; Callangham, 2005). According to Kollmann (2012), children aged less than 5 years old are susceptible to infectious diseases. So the age of the children in this study does not completely affect the type of disease, except for kidney disease.

Augmentin (amoxicillin and clavulanic acid) is the most commond Antibiotic treat for infectious diseases in clinical data from pediatric ward HUSM. This confirms studies from BPAC (2006) in New York, and Miller *et al,* (2010) in the UK, which showed amoxicillin group as the most common antibiotics used for infectious diseases. While in Croatia, the most widely used antibiotic used to treat infection was gentamicin (Liki et al, 2007). The difference in the use of antibiotics for the treatment of infection in different countries depends on antibiotic resistance.

Antibiotics used in the treatment pneumonia in the pediatric ward HUSM are amoxicillin, penicillin, ampicillin, azithromycin, doxycycline, cefixime, cefotaxime, and metronidazole. The protocol of therapy in the treatment of pneumonia states the first-line treatment are *beta-actam* antibiotics such as benzylpenicillin, amoxicillin, while the second line are cephalosporin antibiotics such as cefotaxime, cefuroxime and ceftazidime, and the third line are *carbapenem* antibiotics such as imipenem and other classes of antibiotics, for instance aminoglycoside antibiotics such as gentamicin, amikacin (Husain, 2008). The drug used in the treatment of pneumonia reported in previous study was amoxicillin (Gray & Zar, 2010). In conclusion, the treatment for pneumonia in the children's ward of HUSM is based on protocols.

AEBA *(acute exacerbation of bronchial asthma)* is also a respiratory tract infection found during the present study in the pediatric ward of HUSM. The medications given for AEBA disease in the children's ward of HUSM are antibiotics such as amoxicillin, ampicillin, azithromycin, and cefotaxime; biside bronchodilators such as salbutamol and ventolin; and steroids such as prednisolone. Previous studies have reported that primary care in the treatment of AEBA is to provide oxygen, and then administer bronchodilators, anticholinergics, steroids and theophylline (Wang *et al,* 2011; Corrales, *et al,* 2011). Antibiotics were commonly used in the children's ward in the treatment of AEBA although it is not included in the protocol of therapy and doesn't confirm the reports from previous studies. The antibiotics are used since the patients experience fever and increased number of white blood cells count in the laboratory examination. This has led to the use of antibiotics in the pediatric ward of HUSM.

Patients diagnosed with meningitis admitted to the pediatric ward of HUSM receive the initial therapy of penicillin and cephalosporin antibiotics. The protocol of antibiotic therapy states that the drugs are given based on the age of the patients. Penicillin C antibiotic or cefotaxime are given to children aged 1-3 months, while children older than 3 months are given antibiotic therapy of C-penicillin and cefotaxime or ceftriaxone (Hussain, 2008).The treatment of meningitis in the present study is in line with a report from Saez (2003). The treatment performed in the pediatric ward of HUSM is in accordance with the protocol.

The medications received by the patients at pediatric ward of HUSM for acute tonsillitis infection during the treatment are amoxicillin and penicillin. Data from previous studies conducted in 1998-2001 showed that the treatment given for acute tonsillitis infection were in line with another study reported by Kuzelova *et al* (2004) in Bratislava, Slovakia.

In this study, the relationship between diagnosis and laboratory data for URTI disease shows a significant association seen in the examination of white blood cells and the levels of urea, while in other cases of infection, a significant association is seen on the levels of potassium and urea. Increased number of white blood cells indicates the presence of infection or acute inflammation process (Sutedjo, 2008), because white blood cells are responsible to fight infection and protect the body from foreign organisms by the

Table. 4. The Relationship Between others Infection Diseases and Antibiotic

Drugs	Infection Disease				P Value*
	No Infection Disease	Meningitis	UTI	Quota N (%)	
Antibiotic					0.011*
• augmentin	17	-	-	17 (28.81)	
• penicilin	3	-	--	3 (5.08)	
• cefotaxim	1	1	1	3 (5.08)	
• cefixim	0	-	1	1 (1.70)	
• ampicillin	2	-	-	2 (35.6)	
• azitromicin	1	-	-	1 (1.70)	
• doxacillin	1	-	-	1 (1.70)	
• metronidazole + augmentin	1	-	-	1 (1.70)	
• cefotaxim + ampicillin	-	1	-	1 (1.70)	
• gentamicin+ penicilin	1	-	-	1 (1.70)	
• Ampicillin +azitromicin	1	-	-	1 (1.70)	
• Augmentin + ampicillin	3	-	-	3 (5.08)	
• Augmentin + azitromicin	2	-	-	2 (35.6)	
• aygmentin + cefotaxim + azitromicin + cefuroxim	1	-	-	1 (1.70)	
Total				38 (64.40)	
Total No Diseases and treat	21	0	0	21 (35.60)	
Total of patient	55	2	2	59	

Mechanisms of phagocytosis and producing and distributing antibodies (Kementerian Kesehatan Republik Indonesia. 2011). Thus, the white blood cells count is increasing while the infection happens.

In this study, the clinical outcome of patients treated at the paediatric ward of HUSM shows a good outcome where all patients are discharged without complications. This outcome is influenced by several factors such as the establishment of a good diagnosis based on the results of laboratory data, drug selection and dosing according to the patient's disease, and treatments performed by medical professionals.

Most of the diagnose patient discharge without complication, (Table, 5).

Table. 5. The Relationship between Diagnosis with outcome

Diagnosis	Outcome						P value*
	Patient		Discharge without complication		Discharge with complication		
	N	(%)	N	(%)	N	(%)	
RTI							0.611
• Bronchopneumonia	20	32.20	20	32.20	0	-	
• AEBA	5	8.47	5	8.47	0	-	
• Croup	2	3.38	2	3.38	0	-	
• CAP	1	1.70	1	1.70	0	-	
• Acute Tonsillitis	3	5.10	4	6.78	0	-	
Infection							1.000
• Meningitis	2	3.38	2	3.38	0	-	
• UTI	2	3.38	2	3.38	0	-	

Table 6. The Relationship Between Diagnosis RTI Disease and laboratory Data

Laboratory value	RTI Disease					P Value*
	BP Mean ± SD	AEBA Mean ± SD	Croup Mean ± SD	CAP Mean ± SD	Acute Tonsillitis Mean ± SD	
Hb	11.9 ± 1.064	11.8 ± 1.607	11.6 ± 0.141	1 ± -	12 ± 0.424	0.353
WBC	16.120 ± 5.311	16.667 ± 6.855	11.000 ± 0,282	15.750 ± -	11.7 ± 9.206	0.112
Na	136 ± 2.445	136 ± 2.516	134 ± -	136 ± -	133 ± 2.12	0.680
K	4.23 ± 0.665	3.90 ± 0.608	4.40 ± -	5.40 ± -	4.2 ± 0.212	0.509
Ca	2.7 ± 1.178	-	-	-	2.1 ± -	0.528
Urea	6.8 ± 1.487	4.2 ± 2.050	7.3 ± -	1.4 ± -	4.2 ± -	0.099*
Cr	51.9 ± 10.696	55.5 ± 4.949	50.0 ± -	43.0 ± -	67 ± 1.41	0.262
Albumin	42.3 ± 4.062	-	-	-	39 ± -	0.736

Table 7. The Relationship Between others infection Disease and laboratory Data

Laboratory value	Infection disease		P Value*
	Meningitis Mean ± SD	UTI Mean ± SD	
Hb	11 ± 2.192	11 ± 1.131	0.586
WBC	12.500 ± 0.141	21.100 ± 0.000	0.122
Na	136 ± 0.707	138 ± 0.000	0.645
K	6.0 ± -	4.2 ± -	0.016*
Ca	2.4 ±-	-	0.941
Urea	4.3 ± 0.141	9.6 ± 0.000	0.026*
Cr	48.0 ± 7.701	50.0 ± 0.000	0.401
Albumin	45 ± -	-	0.564

CONCLUSION

The conclusions of the study on the clinical evaluation of management therapy at the pediatric ward of HUSM Malaysia conducted in April to June 2012 are as follows:

1. The most common disease suffered by pediatric patients is infection.
2. The most antibiotic drug used at the pediatric ward is augmentin
3. The clinical outcome of the patients whit infections diseases at the pediatric ward of HUSM shows that patients are generally discharged without complications.

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