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Pediatric Oncology: Causes, Treatments, and the Role of Integrated Medicine

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Abstract

Cancer is responsible for approximately 10%-12% of childhood deaths, and is second only to accidents as the leading cause of death in individuals over age 14 (Rape & Bush, 1994). There are various forms of cancer that can afflict a child and numerous ways to combat the disease. While it is important to fight the physical aspects of the disease to increase the child's chance of survival, it is also important to deal with the psychological issues that accompany pediatric oncology. Various psychological treatments are available to help a child endure the emotional and physical stresses associated with chemotherapy and other medical procedures. This review paper assesses various studies that evaluate the effects of many psychological treatments aimed at reducing anticipatory nausea/vomiting and children's emotional reactions to future treatments. The studies found that caring attention and emphasis on relaxing techniques to take the children's minds off the pain cancer treatment is causing help the children cope with the effects that the treatment has on them both physically and emotionally.

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by Maria Furnari

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Introduction

Cancer is a disease with which almost everyone is familiar. Cancer can strike anyone at anytime. Whether the disease has struck an individual, or an individual's family member, cancer can bring a great deal of fear and pain to everyone who must come into contact with the horrible repercussions that the disease can have on the human body. While the diagnosis of the disease in an adult is awful, the discovery that the disease is destroying a child's body is even more horrendous.

When a child is diagnosed with cancer, the impact that the diagnosis has on the child and the child's family is heartbreaking. Unfortunately, childhood cancer is not rare. Cancer is responsible for approximately 10%-12% of childhood deaths, and is second only to accidents as the leading cause of death in individuals over age 14 (Rape & Bush, 1994). It is estimated that one in 350 American children will develop the disease before they reach the age of 20 (Steen & Mirro, 2000). While cancer is still not easy to treat, there have been many advances in the treatment of the disease over the past 25 years that offer some encouraging news for survival. While treatment in the 1960's offered pediatric patients diagnosed with cancer only a few more months of life, more children who are diagnosed today will survive through remission and will live healthy and prosperous lives. While there are many children who still die from the disease, it is estimated that 80 percent of the children who are diagnosed with some form of cancer will be cured (Steen & Mirro, 2000).

Cancer at the Cellular Level

While most people are aware of the ravaging physical effects cancer can have on the body, many are unaware of the biological mechanisms that lead to the disease the medical community has termed as "cancer." Carcinogenesis, the cancer process, has been the focus of a great deal of research in the medical community. Cancer begins with the misfunctioning of one cell, which has the ability to affect millions of other cells within the body. While it is still uncertain what causes a cell to misfunction, the mutation in the cell will be transmitted to the new cells formed after mitosis, the term used for cell division. These misfunctions lead to a

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mutation of the genetic code. A great deal of evidence has accumulated showing that most of the mutations that occur within these cancer cells affect the genes that are responsible for cellular growth (Steen & Mirro, 2000). The changes that are seen in the cancer cells are much different than the mutations that occur in cells that cause other diseases. While most diseases stem from mutations in cells that are injured or dying, cancer cells seem to be perfectly healthy (Prescott & Flexer, 1986).

There are three characteristics of cancer cells that separate them from cells that cause other diseases (Prescott & Flexer, 1986). First, cancer cells grow and divide at a much faster rate than other cells. Secondly, cancer cells do not differentiate themselves normally and are unable to perform their usual functions in the body. Third, cancer cells do not die in the same time frame in which normal cells are supposed to die. These three characteristics allow a cancerous cell to duplicate at an astronomical level. These cancerous cells will continue to invade the body and will eventually lead to the body's inability to carry out the functions that a particular group of cells were meant to do.

While there is this basic understanding of what cancer cells are, there continues to be a important quest to find out what exactly causes the cells to initially mutate and leads them to be so different from other cells. Researchers have consistently probed deeper into the study of cancer by turning away from simply studying organs, tissues and cells, and have moved towards the study of the subcellular level, genes and macromolecules to gather the answers needed to better explain what cancer is (Prescott & Flexer, 1986).

As the cancerous cells continue to duplicate themselves, they will eventually form into a tumor that is associated with some part of the body. As the tumor establishes itself in a particular part of the body, it will slowly begin to take away from the energy supply that is needed for the body part (Buckman, 1997). As the cancerous tumor continues to grow, the amount of energy that it requires will eventually overtake all of the energy that was once supplied to the body part. The functions of this part of the body will eventually slow down, and ultimately stop.

Eventually, cells from the tumor will break off and will "migrate" to other parts of the body. The process by which cancer spreads to other parts of the body is known as metastasis (American Institute, 1999). The interaction between the normal cells and the cancerous cells will be much like the initial tumor growth. As these cancerous cells continue to remove the energy supply needed by the organs of the body, the individual's immune system will begin to be suppressed. This suppression of the immune system allows the individual to become more susceptible to diseases which can ultimately threaten one's life.

Possible Causes of Cell Mutation

By studying the particular mutations of cancerous cells, the medical community will be better able to treat particular forms of cancer, and ultimately may lead to clues on how to prevent cancer from developing (Steen & Mirro, 2000). In trying to understand why cells are susceptible to mutations, there has been a great deal of research concerning the possible factors that lead to cancer. While research has shown that cancer does have some genetic basis, research has also made it quite clear that a majority of cancers are not due to inherited mutations (Steen & Mirro, 2000). Through research, a number of possible carcinogenic factors have been identified, including viruses and bacteria, over- or under-expression of growth-controlling genetic factors, environmental hazards (chemical or

cosmic forces), poor nutrition, physical inactivity, and an overabundance of hormones or other growth factors (American Institute, 1999). A single form of cancer can be caused by several different agents, and a given agent may under some circumstances cause many different kinds of cancer (Prescott & Flexer, 1986).

While the environment and lifestyle of an individual can affect the presence of a genetic mutation that leads to cancer, other potential clues that can point to cancer within a family is the occurrence of the same cancer within individuals of different generations. While cancer itself cannot be inherited, the risk of developing cancer can be (Coleman, 1998). With cancers that have a hereditary component, an abnormal gene is passed from the parent to the child. This cell can only become abnormal with more changes in the genetic component of the cell (changes in the DNA) or by the effect that a carcinogen in the environment can have on the cell (Coleman, 1998). A new field, genetic counseling, allows people who are concerned with the passing on of such genes that cause cancer to speak to genetic counselors that are able to identify the presence of such genes and if there is anything that can be done by the individual to prevent the cancer from developing.

Once a cell has been mutated by one of the aforementioned factors, it must find an environment that is conducive to its replication. There are many substances that can support the growth of these cancerous cells. Such substances include phorbol ester derivatives (found in conventional plant food), certain barbituate drugs, chlorinated hydrocarbons from industry or agriculture (i.e. pesticides or industrial chemicals), and alcohol (American Institute, 1999). The likelihood of these substances having an affect on an individual is linked to the particular lifestyle of the individual. A patient's lifestyle can either inhibit or enhance the replication of the mutated genes. Those who are in shape physically, eat well, and do not suffer from an imbalance of hormones are less likely to provide the favorable environmental factors upon which tumors can grow. Also, the presence of oncogenes (growth-regulating genes that are abnormally activated) and the lack of tumor suppressor genes (genes that usually stop cells from growing are inactivated) determine whether a cancerous cell will continue to develop and replicate (Steen & Mirro, 2000).

While the focus of this paper will be on the multiplication of mutated cells that cause cancer, it is important to note that not all cell mutations are cancerous. It is possible that cells may mutate, duplicate and form a tumor which remains localized. When this is the case, the tumor is referred to as benign and is usually non-life threatening (Gaes & Gaes, 1992). Once the tumor has formed, it can be removed surgically and the patient is given a clean bill of health. The formation of a cancerous tumor occurs when the mutated cells duplicate to form a tumor, and the cells from the tumor have the potential to move to other tissues and organs in the body. Such a tumor is referred to as being malignant (Gaes & Gaes 1992).

Diagnosing Childhood Cancer

When a doctor suspects childhood cancer, a routine check of the patient's history and a physical examination is necessary to help provide clues regarding the patient's genetic predisposition to cancer (Steen & Mirro, 2000). The doctor begins by addressing the medical problems that have brought the child in for medical treatment. Once the medical problem has been assessed, the doctor turns to the past medical history of the child to identify ongoing medical problems that can prove to be sign of malignancy (Keene, 1997). Since malignancies may be caused by genetic predispositions, the family history of the child is important to possibly identify

genetic mutations that could have been transmitted to the child.

Laboratory tests are also needed to help provide medical information to the doctors. Initial blood tests provide a blood count and blood chemistries. In a complete blood count (CBC) a quantity of the patient's blood is withdrawn , and the number of red cells, white cells, and platelets are counted (Coleman, 1998). The information that is gathered from a CBC allows the doctors to identify any problems that may be present in the patient's ability to fight infectious diseases. A CBC that does not come back normal may be an indication that there is a problem in the functioning of the body's bone marrow, the place in the body where blood is made (Steen & Mirro, 2000). It is also a way for the doctors to make sure that the liver, kidneys, and other important organs are functioning properly (Coleman, 1998). A second important blood test is the white blood count (WBC). The total WBC is normally 5,000 to 10,000 cells per microliter (Steen & Mirro, 2000). A high WBC may be an indication of the presence of an infection or leukemia. A low WBC may be a sign of cancer (Steen & Mirro, 2000).

Another important test that is used in the diagnosis of cancer is the bone marrow test. Although a very painful procedure, it allows doctors to extract bone marrow from the patient and careful analysis of the marrow will show whether any tumors have spread to the marrow. It is also an important indicator for any infection that may be present in the body (Keene, 1997). Tests can also be administered to find any biological markers in the body. Biological markers are usually proteins produced by tumors that indicate a particular type of cancer (Steen & Mirro, 2000). While biological markers may be rare, when present, they offer a very accurate way of identifying the presence of a tumor in the body.

Diagnostic imaging can also be used to determine the presence of cancer. These tests include x-rays, computerized tomographic (CT) scans, nuclear medicine scans, magnetic resonance imaging (MRI), and positron emission tomographic (PET) scans (Coleman, 1998). These are usually non-invasive tests that allow medical professionals to identify the presence of an unusual growth in the body. While these tests may not be painful for the patient, younger children may fear the tests due to the confined space and positioning of his/her body during the testing.

There are instances where blood testing and diagnostic imaging are not enough to identify the presence of cancer in a patient's body. An invasive procedure referred to as a tumor biopsy may be necessary to positively identify the presence of a tumor in the body of a patient. There are three ways in which tissue can be obtained from a tumor. These methods include a needle biopsy, a minimally invasive biopsy, and an open biopsy. With a needle biopsy, a growth that can be felt close to the skin's surface will be studied by inserting a needle through the skin to aspirate cells to study the growth (Steen & Mirro, 2000). If a needle biopsy does not provide enough information to the medical care provider, or is not possible to administer, a minimally invasive biopsy will be performed. In such cases, a small incision is made in the neck, back, or other extremity where a sizable amount of sample tissue can be obtained (Steen & Mirro, 2000). This procedure can be done in an outpatient basis and requires very little time for recuperation. In worst-case scenarios, it may not be possible to obtain enough of a tissue sample due to the location of the tumor. In such cases, an open biopsy is required. In such a procedure, the patient is placed under local anesthesia and faces a surgical procedure to obtain the tissue needed for analysis (Steen & Mirro, 2000). Unfortunately, the highly

invasive nature of this procedure requires several days of hospitalization and more time to recover from the procedure.

Once the tests needed to identify the problem the patient is experiencing have been completed, doctors will analyze the results of the tests to conclude the presence of cancer, and what form of cancer the patient may have. The time that is spent by the family and the patient is often nerve-wracking and frightening. While the patient may have had to endure many procedures to properly diagnose the presence of cancer, careful analysis and testing of the patient ensures that a proper and accurate diagnosis is possible.

Types of Cancer

There are numerous forms of cancer that can afflict a child's body. One of the most well known forms of childhood cancer is leukemia. Leukemia is the term that is used to describe cancers that begin in the blood-forming tissues of the bone marrow (http://www.acor.org/ped-onc/diseases/leuk.html). With leukemia, the bone marrow produces diseased white cells that are unable to fight infection. As these diseased blood cells continue to be produced and infiltrate through the bloodstream, they eventually prevent the production of red blood cells and platelets (Gaes & Gaes, 1992). As a result of the inhibition of the production of red blood cells, the child become anemic, which leads to weakness, irritability and shortness of breath. Once platelets cease to be produced, the child's blood is unable to clot correctly and the child may face excessive bleeding.

As previously stated, white blood cells play an important role in the body by attacking foreign substances such as viruses, bacteria, and fungi. Also, when there is an infection in the body, more white blood cells are produced to help combat the disease. There are three different kinds of white blood cells. They include monocytes, lymphocytes, and granulocytes (Keene, 1997). Monocytes contain enzymes that fight foreign bacteria (Keene, 1997). Lymphocytes, which include T-cells and B-cells, prevent infection and help provide immunity to diseases (Keene, 1997). Granulocytes are the initial combatants of infection (Keene, 1997). With all forms of leukemia, the white blood cells are affected in an adverse manner. The specific type of leukemia that a child may have rests upon the specific white blood cell type that is affected.

The most common form of leukemia to afflict children is acute lymphoblastic leukemia (ALL). It represents 23% of all cancer diagnoses for children under the age of 15 (http://www.graylab.ac.uk/ cancernet /100026.html). For over four decades, it has served as the model for cancer therapy and research of other malignant diseases for both children and adults (Steen & Mirro, 2000). While the cause for ALL is not definitely known, there are several indicators that show a higher chance for developing the disease. ALL is more common in people with inherited disorders, especially Down's syndrome (Buckman, 1997). One of the most striking feature leading researchers to believe that the disease is caused by some form of biological factors is the fact that identical twins tend to develop the disease within a short time period of each other (Steen & Mirro, 2000). The environment may also play a role in the development of ALL. Exposure to ionizing radiation may be a factor in the development of the disease (Buckman, 1997). Some researchers believe that ALL may be caused by an abnormal response to infections (http://my.webmd.com/dmk/dmk_article_5461686).

With ALL, malignancies arise in the B-cell or T-cell lymphocytes (http://my.webmd.com. . .). ALL begins when the bone marrow over-produces

malignant, immature lymphocytes known as lymphoblasts (http://my.webmd.com/. . .). The lymphoblasts multiply at an alarming rate, interfere with, and eventually overpower infection-fighting white blood cells, red blood cells, and platelets (http://my.webmd.com. . .). The lymphoblasts will be carried through the blood and may eventually affect the lymph nodes, leading them to swell.

There are many symptoms that may give parents and doctors an idea that a child is suffering from ALL. Early signs can be very similar to those of the flu. These symptoms include a constant fever, weakness, frequent infections, pain in the bones and joints, and swollen lymph nodes (http://www.emedicine.com/med/topic3146.htm). Other symptoms include anemia (which leads to tiredness and lethargy), pale complexion, shortness of breath, prolonged or severe infections brought on by the immune systems inability to fight disease, or bruising/easy bleeding due to the lack of platelets in the blood (Buckman, 1997).

Acute myelogenous leukemia (AML) is a second form of leukemia that is common in children. AML accounts for approximately 15-20 percent of all the diagnosed leukemia cases in children (Keene, 1997, Steen & Mirro. 2000). AML is often diagnosed from birth to age 10, with a slight increase in diagnosis during the teenage years (Steen & Mirro, 2000). AML, which is also referred to as acute myelogenous, acute myeloblastic, and acute granuloctic leukemia, affects white blood cells that contain granules or particles (Murphy, Morris, & Lange, 1997). This form of leukemia seems to form in the bone marrow that are the granulocyte series of white blood cells (Buckman, 1997). There are seven different types of AML diagnosis, each with different types of granulocytes involved (Keene, 1997). A definitive diagnosis is made once the cells have been examined microscopally for any type of abnormality which may be identified through the presence of beadlike sacs under the microscope (http://www.marrow.org/MEDICAL/aml.html).

While the exact cause of AML is unknown, there are several congenital syndromes that increase the likelihood of developing AML. These syndromes include Fanconi anemia, Bloom syndrome, Kostmann syndrome, and Down's syndrome (Steen & Mirro, 2000). Individuals who have been exposed to nuclear accidents are also more likely to develop AML (Buckman, 1997). Prior exposure to several forms of chemotherapy has also been linked to a greater likelihood of AML development (Steen & Mirro, 2000).

While AML primarily affects white blood cells, it also affects red blood cells and platelets (Steen & Mirro, 2000). AML involves an uncontrolled growth of "blast" cells and AML patients can have decreased numbers of all three mature blood cells (white blood cells, red blood cells, and platelets) (http://www.marrow.org/MEDICAL/aml.html). There are many observable symptoms associated with AML. Since blasts replace normal blood cells in the bone marrow, a testing of the child's blood count will be abnormal (Steen & Mirro, 2000). Anemia may be the result of the abnormalities in the blood, as well as easy bruising or bleeding that can be linked to a decrease in the number of needed platelets (Steen & Mirro, 2000). The spleen and liver often enlarge in AML patients and the lymph nodes occasionally swell also (Murphy, Morris & Lange, 1997). Some children also develop masses on bones or soft tissues due to the leukemic blasts (Steen & Mirro, 2000).

Hodgkin's disease, which affects the lymph nodes, is another category of cancer that is common in children. While Hodgkin's disease is uncommon in children under 5

years of age, it is most commonly diagnosed in children under 16 years of age (http://www.curehodgkins.com /hodgkins_ information/childhood_intro.html). The disease is also more common in boys than girls (Buckman, 1997).

The lymph nodes are a part of the lymphatic system, which is comprised of small lymph nodes and lymphatic vessels, and are responsible for circulating fluid and cells (Steen & Mirro, 2000). The lymphatic system also collects and transports white blood cells which helps fight against infection in the body (Steen & Mirro, 2000). When the cancerous cells overcome the normal white blood cells, the body's ability to fight infection is severely compromised. The cells that are characteristic of Hodgkin's disease are Reed-Sternberg cells (Murphy, Morris & Lange, 1997). These cells are abnormally large immune cells that compromise the work of the immune system.

Since lymph tissues are found throughout the body, Hodgkin's disease can affect any part of the body, including the liver, bone marrow, and spleen (http://www.meb.uni-bonn.de /cancernet/203043.html). The cancer cells are able to spread throughout the lymphatic tissue into other lymphatic vessels. Hodgkin's malignancies invade lymphatic vessels throughout the bodies which can cause overwhelming pressure on several structures throughout the body (http://www.curehodgkins.com/hodgkins_ information/childhood_intro.html).

Hodgkin's disease involves four stages. Stage I involve only a single lymph node or a different site or organ that is not a lymph node (Buckman, 1997). Stage II involves two or more lymph node regions that are located around the diaphragm area or one area outside of the lymph nodes and the lymph nodes around it (http://www.meb.uni-bonn.de/cancernet/203043.html). Stage III involves the lymph node regions around the diaphragm area and the presence of cancerous cells in an area near or around the lymph node or the spleen (http://www.meb.uni-bonn.de/cancernet/203043.html). Stage IV involves the spreading of the cancerous cells to one or more region other than the lymph nodes or the cancer has spread to one organ that is far away from any lymph nodes (Murphy, Morris, & Lange, 1997).

There are several signs and symptoms that can point to the presence of Hodgkin's disease in children. These symptoms include a swelling of the neck, armpit or groin, recurrent fever, night sweats, fatigue, weight loss, enlarged abdomen, and difficulty swallowing (Gaes & Gaes, 1992). While these symptoms may seem universal for several types of diseases, a prolonged presence of the symptoms may be an indication of a much more serious disease, possibly Hodgkin's disease. Other tests such as a biopsy (the removal of what is thought to be an abnormal lymph node) may provide more conclusive results about the patient's illness.

Malignant lymphoma, a cancer involving lymphoid tissues, is the third common malignancy in children (Steen & Mirro, 2000). Among children under the age of 15 who are diagnosed with cancer, 60 percent of the diagnoses are non-Hodgkin's lymphoma (NHL) (Steen & Mirro, 2000). The main way to identify NHL from Hodgkin's disease is the absence of Reed-Sternberg cells (Murphy, Morris, & Lange, 1997). Some other differences include the fact that Hodgkin's disease consists of only found subtypes and is usually a "orderly" disease (http://www.patientcenters.com/ lymphoma/news/nhl2.html). NHL is usually characterized by many different cell types, can be found in various parts of the body, and takes unknown paths throughout the parts of the body that it ultimately invades

(http://www.patientcenters.com/ lymphoma/news/nhl2.html).

The different types of NHLs are classified at the rate at which they grow, with low-grade NHLs growing the slowest (indolent) and high-grade growing the fastest (aggressive) (Murphy, Morris & Lange, 1997). The three main types of NHL that are found in children are Burkitt's lymphoma, lymphoblastic lymphoma, and large-cell lymphoma (http://www.lympho mainfo.netchildhood/nhl-diagnosis.html). Burkitt's lymphoma is the malignancy of the B-cells found in the body (Steen & Mirro, 1997). Lymphoblastic lymphoma is an aggressive form of lymphoma that affects the T-cells (http://www.lymphomainfo.net /nhl/types/lbl.html). This is the form of lymphoma that is most likely to occur in children and is more likely to affect males (Steen & Mirro, 1997). Large-cell lymphoma, which affects the gastrointestinal tract, testes, thyroid, skin, breasts, central nervous skin, or bones, is unlikely to be found in children (http://www. lymphomainfo.net/nhl/largecell.html).

NHL can occur during any point in a childhood, but usually occurs in children under the age of three (Steen & Mirro, 1997). The symptoms that are associated with NHL are similar to those that accompany Hodgkin's disease and can include fevers that are difficult to treat, a constant tiredness, unexplained weight loss, and itching (Murphy, Morris & Lange, 1997). While most of the symptomology is the same for NHL and Hodgkin's disease, the various forms of NHL can bring out different symptoms that are associated with the specific part of the body that is being affected by the NHL.

Solid tumors are also frequently diagnosed in children. The main types of solid tumors include neuroblastoma, Wilms' tumor, and retinoblastoma. Neuroblastoma is a tumor that is usually found during early childhood, usually in children under 5 years of age (http://imsdd.meb. uni-bonn.de/cancernet/100530.html). It is the most common malignancy found in children under one year of age and is the third most common tumor type in older children (Steen & Mirro, 2000). It is a malignant cancer of the sympathetic nervous system (Gaes & Gaes, 1997). More specifically, it is a cancer of a group of cells that are usually related with glandular tissues and the sympathetic nerves (Buckman, 1997). Neuroblastoma initially affects the neck, chest, abdomen, and pelvis (http://allserv.rug.ac.be/~fspelema /neubla/about.htm). Once the cancer has mestasized, it has spread to a variety of points in the body, which could include the lymph nodes, liver, lungs, bones, and bone marrow (http://allserv.rug.ac.be/~fspelema /neubla/about.htm).

Neuroblastoma can secrete a variety of substances that are active biologically and which would be normally secreted by nerve cells (Steen & Mirro, 2000). The symptoms associated with neuroblastoma include the swelling of the abdomen, chest, or eye, weakness, pain in the abdomen or sudden weight loss (Gaes & Gaes, 1997). Other common symptoms include pain in the joints or bones caused by the spreading of the cancer to the bones. (http://allserv.rug.ac.be/~ fspelema /neubla/about.htm). It is possible that the child be paralyzed if the tumor has traveled to the spinal cord area and is applying pressure to the spinal cord (http://www.acor.org/ped-onc/diseases/neuro.html).

Wilms' tumor is a cancer of the kidney (Buckman, 1997). It is usually seen in children ages three to four (http://www.icondata.com /health/pedbase /files/WILMS'TU.HTM). Wilms' tumor is usually a mass that is found in one kidney, but can occasionally affect both kineys (http://www.acor.org/diseases /ped-onc/diseases/wilms.html). The majority of the children affected by the disease show no underlying cause for the disease

(http://www.stjude.org/Medical/ wilms.htm). Symptoms of the disease include an enlarged abdomen, elevated blood pressure, abdominal pain or discomfort, vomiting, fever, and weight loss (http://www.ibionet.com/ wilmstumor.html).

Different Treatments for Cancer

When a child is diagnosed with cancer, the form of cancer that is present usually dictates what kind of treatment will be administered. There are several underlying assumptions that are the basis for prescribing treatment. These assumptions include removing all traces of the cancer, preventing the recurrence or spreading of the present cancer, and balancing the side effects of the treatment with the likelihood of curing the cancer (Murphy, Morris, & Lange 1997). The desire of every member in the child's treatment team is to return the child to a normal life as quickly as possible. An extended duration of treatment and the side effects often associated with treatment force the child into a life filled with a great deal of physical and emotional pain. All attempts are made to make sure that the cancer is being treated as aggressively as possible without undermining a child's basic needs and desires to continue to live a normal childhood. If the cancer proves incurable or is spreading too quickly, the principles of treatment shift to trying to control the spreading of the cancer as much as possible, and at the loss of all other hope, relieving the symptoms that are associated with the cancer, rather than combating the cancer itself (Murphy, Morris, & Lange 1997). When all hope is lost for a cure and the emphasis of treatment is placed on comfort and relief of symptoms, the treatment is referred to as palliative care.

The methods that are used to treat childhood cancer have dramatically changed over the past 40 years (Steen & Mirro, 2000). Cancers that were simply treated with surgery, or with supportive care without the hope for cure, are now being faced with new hope and the belief that a cure is possible 1(Steen & Mirro, 2000). When a child's cancer is treated with only one form of treatment, this is referred to as monotherapy or single modality therapy (Coleman, 1998). When more than one treatment type is used, this form of treatment is referred to as combination therapy or multimodal therapy (Coleman, 1998).

Regardless of what treatment type the child's family and physicians decide to use, the parents must sign an informed consent form to allow the administration of the treatment. The family must be aware of the possible side effects of the treatment as well as the chances of survival from the cancer. The side effects that the child may face can be temporarily debilitating and will cause the child a great deal of physical pain as well as emotional turmoil. Parents need to be prepared to deal with the difficult side effects associated with cancer and the various treatments that the doctors will use to treat and save their child.

Surgery is the oldest form of treatment. Surgery is readily used in various portions of the cancer treatment. This treatment allows for the area where the cancer has grown to be removed prior to the spreading of the cancer. A small portion of the healthy tissue surrounding the cancer must also be removed, but all efforts are made to ensure that the normal functioning and appearance of the area is possible (Buckman, 1997). Since cancer cells often spread through the lymphatic system, lymph nodes close to the site will be examined to ensure that the cancer has not spread through this route (Murphy, Morris, & Lange, 1997). The exact nature of the surgery will vary from patient to patient, thus the possible side effects of the surgery as well as the plan to recovery after surgery differs from child to child (Buckman, 1997).

Surgery is usually used to debulk a tumor, which refers to a complete or almost complete removal of the tumor (Coleman, 1998). A great deal of caution is used with this form of surgery due to the fact that side effects experienced with this form of treatment may be quite severe and may negatively affect the child's quality of life without actually curing the disease (Coleman, 1998). The child may be very uncomfortable and experiencing a great deal of pain upon completion of the surgery.

In many cases, it is not possible to completely remove the tumor by surgical means. While a complete removal may not be possible, other surgical procedures can aid in the treatment of the cancer. If a tumor is so advanced that it cannot be removed entirely, a doctor may consider a cytoreductive surgery to remove as much of the cancer as possible and then continue treating the cancer with other medical options, such as chemotherapy or radiation (Murphy, Morris, & Lange, 1997).

Chemotherapy is a second form of treatment that is widely used with childhood cancers. Since chemotherapy is a systematic treatment, which means that is affects the entire body, it can be used to treat a single tumor site or the entire body if the tumor has spread (Coleman, 1998).

Chemotherapy is usually administered in the form of several drugs so that the cancer can be attacked in more than one manner (Steen & Mirro, 2000). While chemotherapy is able to attack and kill cancerous cells, it also attacks and kills healthy cells. Since the drugs actively attack and kill all cells that are growing and dividing, most chemotherapy agents are unable to differentiate between cancerous cells and healthy cells. While this may cause several negative side effects for the patient, the reality of the situation is that cancerous cells are more likely to be growing and dividing at a faster rate than normal cells, so the agents that attack the cells in the body will have a more profound effect on the cancer cells rather than the normal cells (Buckman 1997). The challenge for the oncologist treating the child is to find the right balance of drugs without completely comprising the child's health and well being that may be threatened with the powerful effects of the chemotherapy.

Chemotherapy may be used in several treatment strategies. Chemotherapy can be used to either cure the cancer or allow the child to enter remission, a period of time when there is no sign of cancer or its symptoms in the child's body (Murphy, Morris, & Lange, 1997). Chemotherapy treatment may also be used to relieve the symptoms associated with cancer and to restore a patient's quality of life when there is no hope for survival (a form of palliative care) or to shrink a present tumor to a manageable size that can be removed more easily with surgical care (Murphy, Morris, & Lange, 1997).

Since chemotherapy is capable of destroying all cells in the body, both good and bad cells, chemotherapy is dispensed in series called courses, which allows healthy cells to recover during a brief break in the treatment (Gaes & Gaes, 1992). The first and most intensive course of the treatment is referred to as induction therapy, which lasts weeks or months and attempts to destroy as many cancerous cells as possible (Gaes & Gaes, 1992). Once the drugs have been administered for this long of a period of time, a second stage begins which is referred to as consolidation. This stage of treatment allows the oncologist in charge of treatment to prescribe a new drug or combination of drugs to combat abnormal cells that may have not been destroyed because the child's body has grown resistant to the initial drugs (Coleman, 1998).

There are five classes of drugs that can be used to treat cancer in children. The possible

classes of drugs include alkylating agents, antimetabolites, plant alkaloids, antitumor antibiotics, and hormones (Murphy, Morris, & Lange, 1997). Each class performs differently in the types of cells that the drug is able to attack and the side effects that may be caused by each class of drugs differ greatly (Murphy, Morris, & Lange, 1997). Certain chemotherapy agents have been shown to be more toxic to the body, which may strengthen the nausea and vomiting that are often side effects of the treatment.

Chemotherapy can be administered in numerous ways. The most common ways to administer chemotherapy include by mouth or through a vein (Buckman, 1997). There are several positive aspects of taking chemotherapy orally. The drugs that can be taken orally are usually less toxic and have fewer side effects associated with them (Murphy, Morris, & Lange, 1997). The negative aspects of taking the drugs orally include the extensive instructions that one must follow on such a regime. The extra actions that the patient has to take with certain oral chemotherapy agents include having to drink a great deal of water, taking the medication on a full stomach, or taking the medication when food is being swallowed (Murphy, Morris, & Lange, 1997).

If the drug is to be administered intravenously, the chemotherapy can be injected using a syringe (referred to often as IV push) or inserting a hollow needle and then infusing the medicine through an IV drip which is attached to a plastic bag in an IV pole (Gaes & Gaes, 1992). Since children have such small veins, it is possible that the veins may collapse or become scarred/clogged after a few administrations of the drug. To combat this problem, a special catheter system may be put in place so that the veins are easily accessible. A child can be placed under local anesthesia and a right-atrial catheter can be placed into the child's body (Buckman 1997). Once the catheter is put into place, the drugs can be fed through the tube that emerges from the chest rather than searching for a new vein each time the drugs need to be administered.

While chemotherapy can prove to be quite rewarding in adequately treating cancer, there are many side effects that are associated with the various drugs that can be administered. The various symptoms include the blood's inability to clot, fatigue, hair loss, itching, loss of appetite, loss of weight and muscle mass, low platelet counts, diarrhea, mouth sores, and localized organ damage (Coleman, 1998). These side effects can create a great deal of trouble in the child's life and can further threaten the child's health and physical stability. The child's oncologist must play close attention to any adverse side effects that may present themselves after treatment and change the course of treatment if and when appropriate.

Radiation therapy is often another common option in the treatment of childhood cancer. Since radiation has been around for over a hundred years, a great deal is known about the treatment and the side effects that are often associated with treatment (Steen & Mirro, 2000).

The fundamental principle behind the use of radiation in treating cancer is the radiation's ability to destroy cancerous cells without attacking normal and healthy cells. The use of radiation in children afflicted with cancer depends on the type of tumor, the extent of the tumor spread, and the likely effects that will accompany radiation therapy (Steen & Mirro, 2000). Radiation therapy sends high-energy x-rays directly into the cancerous cells, damaging the cells in such a way that they cannot continue to mature and divide (Gaes & Gaes, 1992). Specifically, radiation therapy relies on high-energy electron beams, or radioactive isotopes, to shrink and destroy areas of cancerous growths (Murphy, Morris, & Lange 1997).

Radiation therapy can be used as the sole source of treatment or can be used in conjunction with other therapies. Radiation therapy is more likely to be used in conjunction with other therapies to maximize the possibility that the cancerous cells in the body, those that have been identified and those that have grown without the attention of the medical providers can be attacked and destroyed. Two factors are taken into account when deciding the amount of radiation that will be administered to a patient: calculating a high enough dose that will produce the most effective attack on the cancerous cells and assuring that the dose that will be administered does not threaten the normal tissues surrounding the area where the radiation therapy will be administered (Buckman, 1997). Specifically, the appropriate dose of radiation that will be administered to the child is calculated by taking into account the child's age, sex, overall weight, the site and mass of the tumor, the rate of development of the tumor, the surrounding tissues that may be affected, and whether or not the patient will be receiving chemotherapy simultaneously (Gaes & Gaes, 1992).

Radiation can be administered internally or externally. Internal radiation requires that radioactive material be placed inside the body to deliver radiation to the tumor in question (Murphy, Morris, & Lange, 1997). Internal radiation is often used with other external treatments (Murphy, Morris, & Lange, 1997). Temporary implants, referred to as brachytherapy, involves the implantation of radioactive isotopes in various sites throughout the body, including the head, neck, trunk, extremities, or within body cavities (Steen & Mirro, 2000). External radiation can be used with two different therapy measures. A low energy, orthovoltage radiation does not penetrate into the body very deeply and is usually used for surface tumors (Murphy, Morris, & Lange, 1997). High energy, or megavoltage, radiation is used to treat most other therapies because it is more capable of penetrating most internal organs and striking deep tumors (Murphy, Morris, & Lange, 1997). Each of these treatments is given each weekday and usually takes a couple of minutes.

While the child experiences no pain from the administration of the radiation itself, the treatment does pose several side effects to the child once the treatment session is completed. The magnitude of the side effects is determined by the size of the field that is involved, the area of the body that is targeted, and the dose of the radiation that is being administered (Buckman, 1997). It is possible that the child will not experience any side effects. While this may be possible, it is very unlikely. The general side effects associated with radiation therapy include fatigue, dry mouth, hair loss, problems with urinating or bowel movements, irritation/inflammation of the skin, low white blood cell count, nausea, vomiting, and sores in the mouth and intestines (Coleman, 1998).

Psychological Effects of Cancer and Possible Treatments

Once a child has been diagnosed with cancer, there is a great deal of fear that is experienced by the diagnosed child as well as the child's parents and siblings who will be forced to see their loved one experience some of the most painful events of his or her life. Not only will the child experience a great deal of physical pain that accompanies the disease, and the effects of the medication the child must take to cure the disease, but the child will also experience emotional pain as a result of his or her once carefree lifestyle being torn away. The child's days will no longer be filled with toys and friends. Doctors, nurses, medicine, and physical illness will replace all that was once important in the child's life. While this may

sound cruel, it is absolutely necessary for the child to receive the appropriate medical treatment in the hopes of conquering the disease that invaded the child's body.

From the moment that the child is diagnosed with cancer, parents are forced to make countless critical medical decisions. While the child's parents and medical doctors all have the same goals for the treatment, it must be acknowledged that the goals will be very difficult to reach. Everyone who is involved in the child's life wants to see the child cured and able to return to a normal lifestyle (Steen & Mirro, 2000). While the process of curing the child will be difficult for everyone involved, there is a very good chance that the child will once again obtain a normal life. Although the child yearns to be well again, the pain that he or she must endure to reach remission, the term used for when one's body is free of cancer cells, is oftentimes unbearable. As a result, the child deteriorates both physically and emotionally as the treatment continues.

The most commonly experienced side effects include fever, pain, and vomiting. Oftentimes these side effects are so severe that the child is unable to participate in many activities that used to bring joy into his or her life. As a result of all the pain that becomes associated with the treatments, the child develops a great deal of fear of the drugs and also the doctors and nurses who have been associated with the treatments. In some cases, patients may begin to experience the negative side effects of the drugs *prior* to their treatment. Estimates of the percentage of cancer patients who experience anticipatory nausea/vomiting have ranged from 21% to 65% (Redd & Andrykowski, 1982). As a result of the frequency of the anticipatory effects of the treatment, a great deal of research has been done to help find ways to deal with the negative side effects of the drugs and to find things that will make the child happier and more cooperative during the painful treatment.

Dolgin, Katz, McGinty, and Siegel (1985) found that many "anticipatory reactions have been conceptualized as a result of classical conditioning in which various spatial, sensory, and cognitive cues associated with chemotherapy acquire similar nausea/emesis-eliciting properties" (p. 547). A child learns an association between the treatments, nausea, and vomiting after experiencing a number of chemotherapy treatments. As a result of the effects of the treatment, high levels of stress and anxiety develop that lead to further negative reactions to all who are associated with the treatments, which in turn leads to family and staff avoidance and "patient self-depreciation" (Dolgin et al., 1985, p.547). As time progresses, the same people are present for each of the child's treatment and the nausea/vomiting that often results from the treatment. The child naturally fears the treatment and its side effects. But as the child is exposed to the same people during his or her treatment, these people will eventually strike fear in the child that they are associated with the illness and will cause more pain to him or her. Therefore, the child will respond with nausea and vomiting when encountering these people.

Dolgin et al. (1985) proposed a study to find the prevalence and patterns of anticipatory nausea and vomiting among children with cancer and also sought to identify medical and demographic variables that contributed to its occurrence. The subjects for this study were 80 patients, each having received treatment on an outpatient basis at the Division of Hematology-Oncology of Children's Hospital of Los Angeles. The information gathered was usually obtained through the patient, or if the patient was too young the parent was the source of the information. An interview was

designed to collect information on the side effects of chemotherapy, current symptoms before chemotherapy, past symptoms occurring before chemotherapy, onset and etiology of anticipatory nausea and vomiting, communication about chemotherapy, and parental anxiety. Once the eligible patients were identified, the patients and their parents were approached during a normal clinic visit and the interviews were conducted at the clinic.

The researchers found that 23 patients were experiencing anticipatory nausea at the time of the study while 16 of the patients were experiencing some form of anticipatory vomiting. In most cases, the anticipatory nausea began two to four hours prior to treatment and was the worst immediately preceding the treatment. Anticipatory vomiting began within two hours of the treatment and was the worst during the administration of the medicine. The main reason cited for the anticipatory nausea and vomiting was treatment-related anxiety, including feelings of worry, nervousness, and fear. There also seemed to also be a preoccupation with the expected chemotherapy side effects.

Anticipatory nausea and vomiting were significantly correlated with the degree of nausea and vomiting that a particular chemotherapy drug is capable of eliciting. Patients who received a high-dosage of cyclophosphamide, a chemotherapy drug that elicits severe side effects, seemed to have experienced more severe anticipatory nausea and vomiting than patients who did not take this drug. Parental anxiety was also significantly correlated with the presence of anticipatory nausea and vomiting, which was an indication that parental anxiety was capable of affecting a child's own thoughts and led to a great deal of distress prior to treatment.

As the doctors noted prior to their study, "anticipatory nausea and vomiting has been conceptualized as a conditioned aversion to previously neutral stimuli" (Dolgin et al., 1985, p.551). This study further supports the notion that associations are made between neutral stimuli and nausea/vomiting. Drugs that led to more nausea and vomiting once administered led to more severe pre-treatment reactions by the patients. This phenomenon is related to the salience of an unconditioned stimulus and its ability to elicit a more severe unconditioned response. A stimulus that is new to a child is better able to elicit a strong unconditioned response compared to the response that would be elicited by a stimulus with previous exposure. Other factors that led to anticipatory nausea and vomiting were anxiety, stimulus screening and a parent's coping style. The study concludes that there is a need for developing a model that identifies a patient's vulnerability to anticipatory nausea and vomiting and the development of behavioral strategies that could help alleviate the anxieties associated with the stressful treatments.

Dolgin, Katz, Zeltzer, and Landsverk (1989) sought to assess the behavioral effects of chemotherapy in children and adolescents with cancer. Previous studies have found that many medical factors, which include the emetic potentials of chemotherapy and the time since the child's diagnosis, account for only a small portion of behaviorally conditioned side effects of treatment. Psychological variables, including the child's anxiety levels and parental management strategies, have been found to be most valuable in distinguishing patients in whom anticipatory nausea and vomiting develops from those in whom it does not. In addition to nausea and vomiting and their debilitating physical and emotional effects, other behavioral symptoms both precede and follow chemotherapy treatments. These symptoms include changes in eating behavior, disturbed sleeping patterns,

moodiness, extreme changes in anxiety levels, and somatic complaints.

The study conducted by Dolgin, et al. (1989) attempted to assess prospectively the behavioral effects of chemotherapy among children and adolescents with cancer. This study is an extension of previous research and integration which discussed anticipatory and post chemotherapy behavioral changes, along with nausea and vomiting. Specific emphasis was placed on developmental changes in the nature, degree, and course of chemotherapy-related distress.

Dolgin, et al. (1989) conducted the study at the Jonathan Jacques Children's Cancer Center of Memorial Medical Center, Long Beach, and the Division of Hematology-Oncology, Children's Hospital of Los Angeles. Newly diagnosed patients, 3 years of age and older, whose prescribed therapy included chemotherapy were eligible to participate in the study. Ninety-four eligible subjects agreed to participate in the study. The subjects were diagnosed with 12 different forms of cancers. The 94 subjects in the study were treated with 43 different chemotherapy protocols.

Dolgin, et al. (1989) used a structured interview to assess the occurrence and intensity of behavioral problems and symptoms during the 24 hours preceding the chemotherapy treatment and during the 72 hours following the treatment. The interview was conducted with both the parents and the child and assessed the following behavioral categories: (1) anxiety symptoms, (2) mood changes, (3) changes in activity level, (4) sleep disturbances, (5) eating problems, (6) somatic complaints, (7) treatment resistance, and (8) nausea/vomiting. For each category, both the parents and the child were asked to rate categories on a scale of 0-5 (0 indicating none to 5 indicating severe). A Total Anticipatory Distress Score and Total Post chemotherapy Distress Score were computed separately by summing the appropriate categories. These assessments were made during the first, fourth, and seventh month following diagnosis.

Dolgin, et al. (1989) were able to make several conclusions about anticipatory behavioral distress. The most common manifestations of anxiety during the 24 hours period preceding chemotherapy treatment were verbal expressions of worry and fearfulness of the treatment. Other common manifestations of anxiety were increased nervous behaviors such as thumb sucking, nail biting, and tics. For the overall sample, a decline in the frequency of anxiety symptoms was seen over the three sessions. While this may be the overall trend for the group, adolescents seemed to experience more anxiety which remained at a stable, higher level. In terms of mood changes, anger and irritability follow sadness and depression during the anticipatory period. The adolescent children also seemed to take part in less activities, experience more sleep disturbances, face a decreased appetite, and have more somatic complaints during the times preceding chemotherapy and continued throughout the testing sessions. Also, anticipatory nausea and vomiting was greater for adolescents during the first assessment and progressed steadily worse through the fourth assessment.

Dolgin, et al. (1989) also made several conclusions about post chemotherapy behavioral distress. While anxiety symptoms were common during the 24 hours preceding treatment, anxiety symptoms were not common in the 72-hour post chemotherapy treatment. In terms of mood changes, anger and irritability, followed in frequency by sadness and depression, continued to be the most common mood changes experienced by children. Children also experienced more withdrawal and decreased activity after chemotherapy rather than in anticipation of it. The same can be said for sleep disturbances. Children seemed to have considerable

difficulties falling asleep and remaining asleep following chemotherapy than preceding it. Several distress categories decreased in intensity following chemotherapy administration when compared to the levels preceding chemotherapy. These categories include eating problems, somatic complaints, and nausea/vomiting.

As Dolgin et al. (1989) found, the treatment experience of pediatric patients undergoing chemotherapy entails a wide variety of direct behavioral and emotional repercussions. These effects of the treatments, along with the physical side effects of the cancer treatments, have severe and measurable effects on the patient. Since most oncological care focuses on the physical aspects of treatment, a conscious effort must be made to help deal with these traumatizing events in a child's life to better prepare the child for the challenging times.

The effects of hypnosis have also been studied in an attempt to find ways to alleviate anticipatory nausea and vomiting. Zeltzer, Kellerman, Ellenburg and Dash (1983) proposed hypnosis could reduce the amount of vomiting in children with cancer, as well as reduce the amount of reported anxiety and disruption that results from the cancer treatment. For this study, twelve children were referred by their oncologists due to the nausea and vomiting they were experiencing. As a result of the small sample size and the fact that most of the children suffered from similar types of cancer, a control group was not established. Rather, the researchers compared the change from the preintervention to postintervention course of chemotherapy. Prior to the hypnotic treatments, the patients were asked to record the number of times they experienced nausea and vomiting. Also prior to their hypnotic treatment, the patients were evaluated psychologically for trait anxiety, self esteem, perception of control over their health, and the impact their illness has had. Once this initial information about the patients was gathered, the "patients experienced one to three hypnosis sessions prior to and during their next course of chemotherapy" (p.79). Posthypnotic suggestions were also given to the patients in an attempt to supply them with self-relaxing techniques following the treatment.

Zeltzer et al. (1983) found that three of the twelve patients rejected the hypnosis treatments and their symptoms went unchanged. These patients did not believe in hypnotherapy or felt uncomfortable during the sessions. The remaining nine patients who accepted the hypnosis treatment showed significant reductions in the number of times they vomited (a reduction of 19%-100%). The duration of the vomiting was also reduced for six of the nine patients.

Zeltzer et al. (1983) found that there seems to be a very high potential for the use of hypnosis to alleviate the distress related to cancer treatment. The researchers suggest that hypnosis is successful through its ability to make children become involved in the imagery and fantasy associated with hypnosis. It is through such involvement that the medical procedures in which these children are forced to endure become somewhat tolerable. While hypnosis was found to be successful in helping several of these children in coping with the distress associated with their treatment, there were three children who were unwilling to reap the benefits of such treatment. It was found through the testing prior to the attempt to use hypnosis that these three children were highly anxious. Patients with unusually high levels of anxiety may require non-hypnosis techniques to reduce their anxiety before they are able to respond to any hypnotic techniques. Therefore, a child's needs must first be assessed prior to providing appropriate treatment and intervention.

While hypnosis and other relaxation induction procedures have been shown to relieve distress associated with painful cancer treatment, there are other methods that also have been found to be effective in alleviating a child's distress. Redd et al. (1987) studied the use of distraction and its effects in reducing a patient's perception of pain associated with medical treatment. The study investigated whether video games can serve as distracters for patients who normally experience nausea immediately before, during, and immediately following treatment. Two experiments were conducted. The first experiment compared the changes in the intensity of conditioned nausea in patients who played a video game to those who did not play the video game. The second experiment examined the impact that playing the video game had on the level of conditioned nausea within individual patients.

In Redd et al. (1987), the patients studied were nine years of age and older, had received nausea-producing intravenous chemotherapy on a regular basis, had experienced conditioned nausea, and were able to provide self-reports of the nausea. Of the 32 patients approached, 26 agreed to participate in the study. Depending on the individual patient's schedule, the study procedures were either administered before, during or after the chemotherapy treatment. To evaluate the extent of the nausea, a 10cm self-report visual analog scale was labeled *no nausea* at the left and *nausea as bad as it could be* at the right end. This scale was used to evaluate the level of nausea before and after treatment in both the experimental and control condition. Patients who were assigned to the experimental condition (13 patients —10 boys, 3 girls) selected from a variety of popular video games. The children were allowed to play the video game for 10 minutes and then were reassessed for their level of nausea. Children in the control condition had no access to video games, toys, books, games or television. The researchers found that conditioned nausea was significantly reduced when patients played video games. Nine of the 13 patients who played video games reported a significant decrease in the amount of nausea that was experienced while only 3 of the 13 control patients reported a similar decrease in nausea.

In the second experiment of Redd et al. (1987), 15 of the 26 patients used in the initial part of this study participated. This experiment was also conducted during chemotherapy sessions. The patients were asked about their physical symptoms and recent medication that could cause nausea and vomiting. After a no-video game initial assessment, the patients played video games for 10 minutes, then spent 10 minutes without any video games, and then played video games for another 10-minute period. During each of these phases of the experiment, the patients were asked to evaluate their nausea and anxiety. Their pulse rates and blood pressure were also taken to measure the physiological effects of the treatment. It was found that the time period spent playing the video games led to a decrease in nausea, while the nausea experienced when the video games were not present increased. Anxiety also decreased when the children were able to play video games and increased when they did not have access to the games. Blood pressure also increased significantly when the children were playing video games as compared to when they were not playing video games.

The study conducted by Redd et al. (1987) found that video games significantly reduced the amount of conditioned nausea experienced by patients. Patients seemed to need distraction in order to take their attention away from the negative aspects of their treatment, and when this is accomplished, anxiety and negative physical

symptoms are alleviated. When a child is given the opportunity to engage in normal childhood activities, there is a greater likelihood that the physical and emotional treatment effects can be less detrimental to the child.

There are also several other cognitive and behavioral interventions that have been found to help alleviate children's distress during and after painful medical procedures. Jay, Katz, Elliott, and Siegel (1987) believed that a combination of cognitive-behavioral procedures such as modeling, relaxation, imagery, self-talk, and information could significantly reduce a child's response to typically stressful medical procedures. The purpose of the study performed by these doctors was to evaluate the efficacy of a "well-defined cognitive package intervention and a low-risk medication intervention as compared to minimal treatment-attention control condition" for those children who are forced to undergo painful medical treatment for their cancer.

In the study conducted by Jay et al. (1987), patients eligible to participate in the study were leukemia patients between the ages of 3 1/2 years and 13 years of age. Of the 73 patients who entered the study, 56 completed all three of the intervention conditions. The three experimental treatments consisted of cognitive-behavior therapy, the use of Valium, and minimal attention control. All three treatments were delivered in a repeated measures counterbalanced design. The cognitive behavior therapy intervention consisted of five components: filmed modeling, breathing exercises, positive incentive, imagery/distraction, and behavioral rehearsal. With the Valium intervention, the children were given a .3mg/kg dose of Valium prior to their chemotherapy treatment procedures. During the minimal attention control treatment, the children were allowed to watch cartoons for 30 minutes prior to their medical procedures. The children were evaluated on several different criteria. First, the *Observational Scale of Distress* was used and 11 operationally defined behaviors were looked for before, during, and after the chemotherapy procedure. The children were also asked to report the pain they were experiencing immediately following their treatment. The scale used was a "pain thermometer" where the children had to pick a number between 0 and 100 indicating their level of pain (0 indicating "no pain at all " and 100 indicating "the worst pain possible"). The patients' pulse rates and blood pressure were also measured.

Jay et al. (1987) found that during the behavior therapy treatment, the children exhibited less behavioral distress, reported lower levels of pain, and had significantly lower pulse rates than during the attention control condition. It was also found that Valium was helpful in lowering anticipatory distress, but was not helpful during the actual chemotherapy procedure. Overall, the study provided support for the efficacy of cognitive-behavior intervention in decreasing the distress experienced by children who must undergo painful treatment procedures. Significant effects were found for behavioral distress, pulse rate scores, and children's self reports of experienced pain. The cognitive-behavioral treatments designed to attain the attention of the children from the events that were surrounding their illness helped to reduce the negative physical and emotional effects that the treatment could have on the young cancer patients.

While several strategies have been tested and shown to be effective in helping children deal with medical procedures, there are differences in the efficacy of the different treatment methods. Wall and Womack (1989) compared hypnotic and cognitive strategies which serve to alleviate procedural distress in pediatric oncology patients. This study

attempted to address several issues: (1) subjects were assigned in a randomized manner whereby the subject was uninformed that hypnotic or hypnotic-like strategies were being used, (2) procedural information was standardized for all patients and their families, (3) distraction and hypnosis protocols were comparable in format and the amount of attention given, (4) presence or absence of hypnotic state during the session and medical procedures was noted, and (5) subjects were measured for hypnotizability to determine its predictive value for both distraction and hypnotic treatments.

Wall and Womack (1989) studied pediatric oncology patients from the Hematology-Oncology Clinic at Children's Orthopedic Hospital and Medical Center and the Outpatient Clinic at Fred Hutchinson Cancer Research Center. Patients were 5 to 18 years of age and were asked to take part in the study through a letter that indicated the study was about distraction, visual imagery, and relaxation for pain alleviation. From the 42 subjects who agreed to complete the study, only 20 completed the study due to changes in the subject's treatment protocols.

Wall and Womack (1989) grouped the subjects by age (12-18 years of age called "older" and 5-11 years of age called "younger") and then randomly assigned each subject to a treatment condition. After the random placement of each subject into a group, 9 were in the Cognitive Strategy Condition (2 older and 7 younger) and 11 were in the hypnosis condition (6 older and 5 younger). Subjects received the interventions within their assigned treatment condition by older/younger age groupings because the protocols designed targeted a specific age group.

Wall and Womack (1989) asked participants to rate their pain and anxiety on several different scales, including a visual analog scale, the State-Trait Anxiety Inventory, and the McGill Pain Questionnaire. An independent observer also rated procedural pain and anxiety using a visual analog scale. Subjects then received training in their assigned treatment condition during the week prior to the second scheduled bone marrow aspiration or lumbar puncture. During the time of the actual medical procedure, the Active Cognitive Strategy Group listened to taped reiteration of instructions given during group sessions pertinent to the particular chosen distraction technique. This group was presented with four activities designed to cause a shift in attention during the medical procedures to conscious voluntary concentration on motoric movement or sequential information. The Hypnosis Group listened to instructions which had been given during training for reentry into a hypnotic state. This group was taught to progress from relaxation to visual imagery which would lead to hypnotic induction. Ratings of pain, anxiety, and imaginative involvement were obtained immediately following the bone marrow aspiration or lumbar puncture.

Wall and Womack (1989) found standardized instructions in hypnotic and active cognitive strategies produce a significant reduction in reported pain. Self-directed usage of each technique was beneficial to subjects in the area of pain reduction. When comparing the efficacy of each treatment, no significant differences were found between active cognitive techniques and hypnosis. While many studies claim that hypnosis serves as a better mode for pain reduction when compared to simple distraction techniques, this study found that either method can prove to be equally beneficial in the reduction of pain and anxiety experienced by a pediatric oncology patient.

While chemotherapy plays an important role in the treatment of cancer, there are many other painful procedures that evoke a

great deal of distress from a patient. Lumbar punctures often have to be completed and such a procedure also has a great deal of pain and distress associated with it, both during and after the procedure has been completed. The memories that are formed during these difficult procedures often have a large impact on the way children recall the event and how they choose to deal with the procedure in the future. Chen, Zeltzer, Craske and Katz (1999) studied the effects that a child's memory plays in his or her future interaction with treatment associated with his or her illness. It is believed that certain procedures related to cancer treatment, such as lumbar punctures (LPs), serve as unconditioned stimuli that elicit an unconditioned response of anguish, which includes crying and screaming. During the course of treatment, the environmental stimuli surrounding children during the most difficult parts of the treatment become conditioned stimuli that are associated with the unconditioned stimulus and lead to a response of anticipatory distress preceding their treatment.

Chen et al. (1999) believed "unconditioned stimulus reevaluation occurs with additional contact of the unconditioned stimulus (in the absence of the conditioned stimulus) at a different intensity through verbally or socially transmitted information… or through the reevaluation of one's reaction to the unconditioned stimulus or conditioned stimulus." This reevaluation can occur by altering the child's memories of past experiences with the unconditioned stimulus. Patients who are very anxious or are in intense pain tend to recall the situation in a distorted manner. The situation will be remembered as having posed more threat to the child than it actually did. Children who showed greater distress during the LP, or children who were in more pain, had the tendency to report more negative results from the LP and were more likely to be more anxious during future LPs. Taking this information into account, Chen et al. (1999) hypothesized that children who received intervention prior to the LP would show a greater reduction of distress than children who did not receive any extra attention. It was also hypothesized that children in the intervention group would have more accurate memories of the procedure than patients who did not receive the intervention.

The study completed by Chen et al. (1999) was conducted at the outpatient Children's Center for Cancer and Blood Diseases at Children's Hospital Los Angeles. There were 50 participants who ranged in age from 3 to 18 years. Children who were in the treatment group were treated twice, immediately following the initial LP and before their second LP. The children's memories about their LP experience were elicited through a memory interview, which asked them to recall the details of the procedure, including the pain, and anxiety they felt during the LP. As the children recalled their experiences, the interviewer prodded the children to remember how their coping strategies helped them make it through the ordeal, asked the children to realistically recall their responses to the LPs, and made the attempt to make their memories more accurate. The children were then asked to write on a card a description of their memories for their previous LP experience and were asked to bring this card to their next LP with the intent that the card would trigger memories about the intervention associated with their memories of the LP. Patients who were not in the treatment group were engaged in non-treatment related activities after their initial LP and before their second LP.

Chen et al. (1999) found that intervention increased the accuracy of memories associated with LPs and decreased the exaggeration of the children's memories for the procedure. It was also found that psychological interventions aimed at

reframing children's memories of previous experiences with LPs led to the reduction of anticipatory distress, and the children's behavior during future LP experiences was much more cooperative following intervention treatment. While this intervention was useful in helping the children deal with the stress associated with the LP procedure both before and after it was completed, the children still experienced distress during the actual LP procedure. Most of the reductions in distress were not present until follow-up assessment. This may be due to the fact that immediately after the intervention the child is more capable of recalling coping mechanisms of the past and their reports of past experiences are more accurate.

While studies similar to Chen et al. (1999) indicate that intervention therapies alleviate pain and distress that children face before and after such painful and difficult procedures as LPs and chemotherapy administration, there are many hospitals that are either unwilling or unable to allocate the funds to provide such beneficial treatment. "Currently, 22% of the surveyed hospitals offer no preparation for pediatric oncology procedures" (Chen et al. 1999, p. 488). The study proposes that more hospitals allocate funds for such treatment. While the treatment may take an hour to complete, the final results of the intervention will lead to less time needed to calm a child down for future procedures as well as less anxiety and pain experienced by the child in the future.

There are many possible ways to help alleviate the anticipatory nausea/vomiting, levels of pain and emotional distress that is experienced by a young cancer patient. The various coping attempts which have been studied throughout these experiments have shown that by helping children take part in activities that they enjoy and which will relax them will lead to the development of better coping strategies to deal with their illnesses and treatments. These children are likely to be less afraid of all that faces them during their illness. By allowing for such techniques as hypnosis, video-game playing, etc. to be a part of a child's treatment, the connections that are normally formed between the unconditioned stimulus (such as chemotherapy) and the conditioned stimuli (the hospital, nurses, etc.) and the unconditioned responses of nausea and/or vomiting and emotional distress can be eliminated or experienced less often.

These various psychological treatments help children return to some sense of normalcy during their cancer treatments. The caring attention and emphasis on relaxing techniques to take the children's mind off of the hurt that chemotherapy is causing helps the children cope with the effects that the cancer treatment has on them physically and emotionally. Childhood cancer is one of the most dreaded and painful diseases that one could ever experience. During the time when a child is meant to be nurtured, cared for, and thrive emotionally and physically, the child is forced to undergo some of the most painful medical treatments that are known to humankind. By allowing the extra time to deal with the children in a manner that will decrease the negative effects of their cancer, the extra side effects that are associated with their cancer treatment can be diminished and made to be more tolerable.

As psychological interventions help the children remove the associations that have been created between the chemotherapy treatment effects and the hospital personnel, the children are more likely to be accepting of the staff and may experience less physical discomfort. A concerted effort has to be made to help the children return back to a sense of normalcy and to find ways in which the children are able to relax when facing cancer treatment. While such attempts may not completely alleviate the pain and distress the children are experiencing, there is a

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greater likelihood that the situation can be dealt with on a more positive note. One must try to make the best out of a very troubling situation.

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