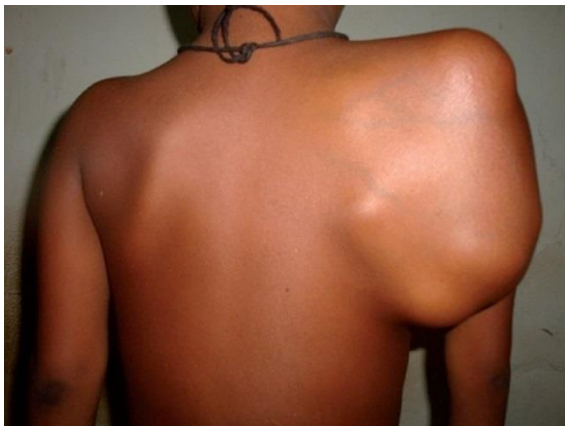
Cancer Association of South Africa (CANSA)

Research • Educate • Support

Fact Sheet on Ewing's Sarcoma in Adults

Introduction

Ewing's sarcoma is a cancer that occurs primarily in the bone or soft tissue. Ewing's sarcoma can occur in any bone, but most often it is found in the hip bones, ribs, or in the long bones, such as the femur (thigh), tibia (shin), or humerus (upper arm). It can involve the muscle and the soft tissues around the tumour as well. Ewing's sarcoma cells can also spread (metastasise) to other areas of the body including the bone marrow, lungs, kidneys, heart, adrenal gland, and other soft tissues.



[Picture Credit: Ewing's Sarcoma]

Ewing's sarcoma is a very rare cancer in adults. However, Ewing's sarcoma accounts for about one percent of childhood cancers. It is often described as the second most common malignant bone tumour in children and adolescents. Ewing's sarcoma most often occurs in children between the ages of ten and 20. More males are affected than females.
(Johns Hopkins Medicine).

Who was Ewing's Sarcoma Named After ?

James Ewing, 1866-1943, first described the tumour that was to be named after him in the 1920's. It was Ewing's work which established that the disease was separate from lymphoma and other types of cancer known at that time.
Ewing was originally born in Pittsburgh and embarked on his medical career in 1888. In 1899 he was appointed as the first Professor of Pathology at Cornell University where he developed a keen interest in cancer. He was a co-founder of both the American Association for Cancer Research in 1907 and the American Cancer Society in 1913. He was also a pioneer in the use of radiotherapy in the treatment of cancer.
James Ewing died from bladder cancer at the age of 76.

(Cancerindex.org).

Researched and Authored by Prof Michael C Herbst
[D Litt et Phil (Health Studies); D N Ed; M Art et Scien; B A Cur; Dip Occupational Health]
Approved by Ms Elize Joubert, Chief Executive Officer [BA Social Work (cum laude); MA Social Work]

Ewing's Sarcoma in Adults
According to research, survival rates for children with Ewing's sarcoma can exceed 75%, but five-year survival for adults with localised disease was just 54%. Five-year survival for those adults whose disease had metastasised was only 10%, according to the Mayo Clinic in Rochester, Minnesota.
(Medpage Today).

The Cause of Ewing's Sarcoma
In all Ewing's sarcoma cases, a change occurs in a cell to move a gene called EWS on chromosome No. 22 next to a section of DNA on one of several other chromosomes that causes the EWS gene to turn on. No one knows why this happens. It is not inherited; rather it occurs after the child is born. This change can be tested for in the biopsy specimen used to confirm the diagnosis.
(WebMD).

Every cell of the body contains the genetic information needed to create a new person. This information is contained in millions of genes encoded on a large densely packed molecule, called DNA. At a specific stage of cell division the DNA becomes visible under a microscope as a set of 23 chromosomes, each pair consisting of one chromosome copy from the father and another from the mother. The chromosome pairs differ in length and structure. Based on their individual sizes the chromosomes are numbered from 1 to 22. The 23rd pair is the sex determining (X and Y) chromosomes.

In a cancer cell the genetic information may contain mistakes and rearrangements. Some of these defects can be seen under the microscope as altered chromosome structures. In the Ewing's sarcoma family of tumours a piece of chromosome 11 has moved to chromosome 22 and a piece of chromosome 22 has moved to chromosome 11. The result of this so called translocation is a recombination of two unrelated genes to form new genetic information. This novel gene appears to be involved in the abnormal regulation of other genes. The 11;22 translocation and resulting "fusion gene" are specifically found in Ewing's sarcoma and closely related tumours and can, therefore, be used to help in the diagnosis of this disease.
(Cancerindex.org).

Incidence of Ewing's Sarcoma in South Africa
The National Cancer Registry (2012) does not provide any information regarding the incidence of Ewing's Sarcoma.

According to the National Cancer Registry (2012) the following number of cases of bone cancer was histologically diagnosed in South Africa during 2012:

Group - Males 2012	Actual No of Cases	Estimated Lifetime Risk	Percentage of All Cancers
All males	100	1:2 864	0,27%
Asian males	2	1:4 817	0,26%
Black males	60	1:4 628	0,51%
Coloured males	10	1:1 761	0,23%
White males	28	1:1 002	0,14%

Group - Females 2012	Actual No of Cases	Estimated Lifetime Risk	Percentage of All Cancers
All females	79	1:4 050	0,21%
Asian females	0	-	-
Black females	48	1:6 457	0,29%
Coloured females	8	1:2 384	0,20%
White females	23	1:1 494	0,14%

The frequency of histologically diagnosed cases of bone cancer in South Africa for 2012 was as follows (National Cancer Registry, 2012):

Group - Males 2012	0 – 19 Years	20 – 29 Years	30 – 39 Years	40 – 49 Years	50 – 59 Years	60 – 69 Years	70 – 79 Years	80+ Years
All males	31	35	6	9	10	2	6	0
Asian males	0	1	0	1	0	0	0	0
Black males	22	19	2	4	6	0	1	0
Coloured males	2	4	1	0	0	1	1	0
White males	3	5	1	2	9	3	1	0

Group - Females 2012	0 – 19 Years	20 – 29 Years	30 – 39 Years	40 – 49 Years	50 – 59 Years	60 – 69 Years	70 – 79 Years	80+ Years
All females	24	13	10	11	9	6	3	2
Asian females	0	0	0	0	0	0	0	0
Black females	19	12	7	3	2	3	0	1
Coloured females	1	1	0	2	2	0	1	0
White females	4	0	2	5	5	3	1	1

N.B. In the event that the totals in any of the above tables do not tally, this may be the result of uncertainties as to the age, race or sex of the individual. The totals for 'all males' and 'all females', however, always reflect the correct totals.

Signs and Symptoms of Ewing's Sarcoma

Many things, ranging from infections to accidental injuries, can cause symptoms that resemble the symptoms caused by Ewing's sarcoma. Because early diagnosis is important for successful treatment, any child with any of the following symptoms should be evaluated by a doctor.

- Pain or swelling, most commonly in an arm or leg, chest, back, or pelvis; the pain gets progressively worse, and does not subside.
- A swelling, which may or may not feel warm
- Swelling and limited range of motion of a joint
- Fever for no known reason
- A bone that breaks with no apparent cause

Children often get lumps and bumps from play. But any lump or bump that does not quickly go away (even in adults) should be seen by a doctor. A tumour that has spread can cause the person to feel very tired and to lose weight. If it has spread to the lungs, it can also cause breathlessness. Tumours near the spine can cause unexplained weakness or even paralysis. If Ewing's sarcoma develops inside the chest wall, it is possible for the tumour to progress with no apparent symptoms until it has gotten very large and possibly spread.

Less common symptoms, rare and very rare symptoms**:**

- Fever (pyrexia)
- Tiredness or feeling weary, (lethargy)

- Pain accompanied by tingling and numbness (pins and needles)
- Weight loss
- Loss of appetite
- Breathlessness

Symptoms vary from patient to patient and can range in their severity. They may be mild at first coming on over a period of a couple of weeks. They may also appear suddenly. Some patients report their symptoms disappearing for relatively long periods before suddenly returning.

Symptoms may be present for weeks or months, sometimes even longer before patients are diagnosed. This can be because the symptoms of Ewing's sarcoma are quite general and could indicate a number of conditions, for example, In older children, adolescents and young adults:

- Tendonitis,
- Osgood-Schlatter disease (rupture of the growth plate where the knee cap tendon inserts),
- Trauma (Injury)
- Slipped Epiphysis
- In younger children
- Osteomyelitis, which is infection of the bone.

The intermittent nature of pain may lead doctors to think the condition is temporary. Most patients do not actually feel ill until the cancer is fairly well advanced.
In addition, because most Ewing's sarcoma patients are in their teens, the pain is sometimes mistaken for bone growth or 'growing pains.' Patients in this age group are also usually very physically active and the pain may be suspected to be from a sports injury or everyday activities.

Clinical signs:
- A mass that can be felt (palpable) when undergoing physical examination.
- Broken bone (fracture) resulting from weakening of bone due to a tumour, this is known as a 'pathological fracture.'

(Bone Cancer Research Trust; WebMD).

Staging of Ewing's Sarcoma

The AJCC uses one system to describe all bone cancers, including Ewing tumours that start in bone. Extraosseous Ewing's (EOE) tumours (Ewing's tumours that do not start in bones) are staged differently. They are staged like soft-tissue sarcomas.

The AJCC staging system for bone cancers is based on 4 key pieces of information:

- **T** describes the size of the main (primary) **tumour** and whether it appears in different areas of the bone.
- **N** describes the extent of spread to nearby (regional) lymph **nodes** (small bean-sized collections of immune system cells). Bone tumours rarely spread to the lymph nodes.
- **M** indicates whether the cancer has **metastasised** (spread) to other organs of the body. (The most common sites of spread are to the lungs or other bones.)
- **G** stands for the **grade** of the tumour, which describes how the cells from biopsy samples look. Low-grade tumour cells look more like normal cells and are less likely

to grow and spread quickly, while high-grade tumour cells look more abnormal. (All Ewing's tumours are considered high-grade tumours.)

Numbers or letters after T, N, M, and G provide more details about each of these factors.

T categories of bone cancer
T0: There is no evidence of a main (primary) tumour.
T1: The tumour is 8 cm (around 3 inches) across or less.
T2: The tumour is larger than 8 cm across.
T3: The tumour is in more than one site in the same bone.

N categories of bone cancer
N0: There is no spread to regional (nearby) lymph nodes.
N1: The cancer has spread to nearby lymph nodes.

M categories of bone cancer
M0: There is no spread (metastasis) to distant organs.
M1a: The cancer has spread only to the lungs.
M1b: The cancer has spread to other distant sites in the body.

Grades of bone cancer
GX: Grade can't be assessed
G1-G2: Low grade
G3-G4: High grade
(All Ewing tumours are considered G4.)

Stage grouping
Once the T, N, and M categories and the grade of the bone cancer have been determined, the information is combined and expressed as an overall stage. The process of assigning a stage number is called *stage grouping*. The stages are described in Roman numerals from I to IV (1-4), and are sometimes divided further.

Stage IA*
T1, N0, M0, G1 to G2 (or GX): The tumour is 8 cm across or less (T1) and is low grade (or the grade can't be assessed). The cancer has not spread to nearby lymph nodes (N0) or to distant parts of the body (M0).

Stage IB*
T2 or T3, N0, M0, G1 to G2 (or GX): The tumour is either larger than 8 cm across (T2) or it is in more than one place in the same bone (T3). It is low grade (or the grade can't be assessed). The cancer has not spread to nearby lymph nodes (N0) or to distant parts of the body (M0).

Stage IIA
T1, N0, M0, G3 to G4: The tumour is 8 cm across or less (T1) and is high grade (G3 or G4). The cancer has not spread to nearby lymph nodes (N0) or to distant parts of the body (M0).

Stage IIB
T2, N0, M0, G3 to G4: The tumour is larger than 8 cm across (T2) and is high grade (G3 or G4). The cancer has not spread to nearby lymph nodes (N0) or to distant parts of the body (M0).
Stage III

T3, N0, M0, G3 to G4: The tumour is in more than one place in the same bone (T3). It is high grade (G3 or G4). The cancer has not spread to nearby lymph nodes (N0) or to distant parts of the body (M0).

Stage IVA
Any T, N0, M1a, any G: The tumour has spread only to the lungs (M1a). It has not spread to the lymph nodes or to other distant sites. (It can be any size or grade.)

Stage IVB (if either of these applies)
Any T, N1, any M, any G: The tumour has spread to lymph nodes (N1). It can be any size or grade, and may or may not have spread to other distant sites.
Any T, any N, M1b, any G: The tumour has spread to distant sites other than the lungs (M1b). It can be any size or grade.
*All Ewing's tumours are classified as G4 (high grade), so they are never stage I bone cancers.
(American Cancer Society).

Treatment of Ewing's Sarcoma
Ewing's sarcoma is usually sensitive to chemotherapy and radiotherapy. Modern treatments are based on chemotherapy combined with local therapy (surgery and/or radiotherapy to the main tumour):

- chemotherapy (using drugs to kill cancer cells)
- surgery (to take out the tumour in an operation)
- radiotherapy (using high-dose x-rays to kill cancer cells)

Chemotherapy is given to kill malignant cells that may be circulating around the body. It is generally administered before and after the local therapy. The choice of local treatment (surgery and/or radiotherapy) will depend on the size and location of the tumour, if the cancer has spread or not, and other individual factors. Due to progress in *limb-salvage* surgery and awareness of problems associated with radiotherapy, surgery is the most frequent type of local therapy. Radiotherapy is usually reserved for tumours that are difficult to reach surgically or locations associated with surgical complications (e.g. spine, pelvis and skull). Sometimes radiotherapy is given as well as surgery, particularly following marginal resections.

Treatment of bone cancers is complex and involves a team of different specialists usually within an institution that is experienced in treating these types of cancers.

Ewing's sarcoma or PNET is a type of cancer found in children and young adults, with a peak incidence of between ages 10 and 20. It is less common in children under 5 or in adults over 30. There is no rationale for treating children and adults differently; chemotherapy is usually the same. However, children are thought to tolerate chemotherapy better than adults. Also children can develop more severe delayed late effects from radiation therapy, such as bone growth retardation. This is one of the factors taken into account to decide the type of local therapy given.

Several studies have shown similar results in adults and children when they are treated with the same protocol.
(Cancerindex.org).
About Clinical Trials

Clinical trials are research studies that involve people. These studies test new ways to prevent, detect, diagnose, or treat diseases. People who take part in cancer clinical trials have an opportunity to contribute to scientists' knowledge about cancer and to help in the development of improved cancer treatments. They also receive state-of-the-art care from cancer experts.

Types of Clinical Trials

Cancer clinical trials differ according to their primary purpose. They include the following types:

Treatment - these trials test the effectiveness of new treatments or new ways of using current treatments in people who have cancer. The treatments tested may include new drugs or new combinations of currently used drugs, new surgery or radiation therapy techniques, and vaccines or other treatments that stimulate a person's immune system to fight cancer. Combinations of different treatment types may also be tested in these trials.

Prevention - these trials test new interventions that may lower the risk of developing certain types of cancer. Most cancer prevention trials involve healthy people who have not had cancer; however, they often only include people who have a higher than average risk of developing a specific type of cancer. Some cancer prevention trials involve people who have had cancer in the past; these trials test interventions that may help prevent the return (recurrence) of the original cancer or reduce the chance of developing a new type of cancer

Screening - these trials test new ways of finding cancer early. When cancer is found early, it may be easier to treat and there may be a better chance of long-term survival. Cancer screening trials usually involve people who do not have any signs or symptoms of cancer. However, participation in these trials is often limited to people who have a higher than average risk of developing a certain type of cancer because they have a family history of that type of cancer or they have a history of exposure to cancer-causing substances (e.g., cigarette smoke).

Diagnostic - these trials study new tests or procedures that may help identify, or diagnose, cancer more accurately. Diagnostic trials usually involve people who have some signs or symptoms of cancer.

Quality of life or supportive care - these trials focus on the comfort and quality of life of cancer patients and cancer survivors. New ways to decrease the number or severity of side effects of cancer or its treatment are often studied in these trials. How a specific type of cancer or its treatment affects a person's everyday life may also be studied.

Where Clinical Trials are Conducted

Cancer clinical trials take place in cities and towns in doctors' offices, cancer centres and other medical centres, community hospitals and clinics. A single trial may take place at one or two specialised medical centres only or at hundreds of offices, hospitals, and centres.

Each clinical trial is managed by a research team that can include doctors, nurses, research assistants, data analysts, and other specialists. The research team works closely with other health professionals, including other doctors and nurses, laboratory technicians, pharmacists, dieticians, and social workers, to provide medical and supportive care to people who take part in a clinical trial.

Research Team

The research team closely monitors the health of people taking part in the clinical trial and gives them specific instructions when necessary. To ensure the reliability of the trial's results, it is important for the participants to follow the research team's instructions. The instructions may include keeping logs or answering questionnaires. The research team may also seek to contact the participants regularly after the trial ends to get updates on their health.

Clinical Trial Protocol

Every clinical trial has a protocol, or action plan, that describes what will be done in the trial, how the trial will be conducted, and why each part of the trial is necessary. The protocol also includes guidelines for who can and cannot participate in the trial. These guidelines, called eligibility criteria, describe the characteristics that all interested people must have before they can take part in the trial. Eligibility criteria can include age, sex, medical history, and current health status. Eligibility criteria for cancer treatment trials often include the type and stage of cancer, as well as the type(s) of cancer treatment already received.

Enrolling people who have similar characteristics helps ensure that the outcome of a trial is due to the intervention being tested and not to other factors. In this way, eligibility criteria help researchers obtain the most accurate and meaningful results possible.

National and International Regulations

National and international regulations and policies have been developed to help ensure that research involving people is conducted according to strict scientific and ethical principles. In these regulations and policies, people who participate in research are usually referred to as "human subjects."

Informed Consent

Informed consent is a process through which people learn the important facts about a clinical trial to help them decide whether or not to take part in it, and continue to learn new information about the trial that helps them decide whether or not to continue participating in it.

During the first part of the informed consent process, people are given detailed information about a trial, including information about the purpose of the trial, the tests and other procedures that will be required, and the possible benefits and harms of taking part in the trial. Besides talking with a doctor or nurse, potential trial participants are given a form, called an informed consent form, that provides information about the trial in writing. People who agree to take part in the trial are asked to sign the form. However, signing this form does not mean that a person must remain in the trial. Anyone can choose to leave a trial at any time—either before it starts or at any time during the trial or during the follow-up period. It is important for people who decide to leave a trial to get information from the research team about how to leave the trial safely.

The informed consent process continues throughout a trial. If new benefits, risks, or side effects are discovered during the course of a trial, the researchers must inform the participants so they can decide whether or not they want to continue to take part in the trial. In some cases, participants who want to continue to take part in a trial may be asked to sign a new informed consent form.

New interventions are often studied in a stepwise fashion, with each step representing a different “phase” in the clinical research process. The following phases are used for cancer treatment trials:

Phases of a Clinical Trial

Phase 0. These trials represent the earliest step in testing new treatments in humans. In a phase 0 trial, a very small dose of a chemical or biologic agent is given to a small number of people (approximately 10-15) to gather preliminary information about how the agent is processed by the body (pharmacokinetics) and how the agent affects the body (pharmacodynamics). Because the agents are given in such small amounts, no information is obtained about their safety or effectiveness in treating cancer. Phase 0 trials are also called micro-dosing studies, exploratory Investigational New Drug (IND) trials, or early phase I trials. The people who take part in these trials usually have advanced disease, and no known, effective treatment options are available to them.

Phase I (also called phase 1). These trials are conducted mainly to evaluate the safety of chemical or biologic agents or other types of interventions (e.g., a new radiation therapy technique). They help determine the maximum dose that can be given safely (also known as the maximum tolerated dose) and whether an intervention causes harmful side effects. Phase I trials enrol small numbers of people (20 or more) who have advanced cancer that cannot be treated effectively with standard (usual) treatments or for which no standard treatment exists. Although evaluating the effectiveness of interventions is not a primary goal of these trials, doctors do look for evidence that the interventions might be useful as treatments.

Phase II (also called phase 2). These trials test the effectiveness of interventions in people who have a specific type of cancer or related cancers. They also continue to look at the safety of interventions. Phase II trials usually enrol fewer than 100 people but may include as many as 300. The people who participate in phase II trials may or may not have been treated previously with standard therapy for their type of cancer. If a person has been treated previously, their eligibility to participate in a specific trial may depend on the type and amount of prior treatment they received. Although phase II trials can give some indication of whether or not an intervention works, they are almost never designed to show whether an intervention is better than standard therapy.

Phase III (also called phase 3). These trials compare the effectiveness of a new intervention, or new use of an existing intervention, with the current standard of care (usual treatment) for a particular type of cancer. Phase III trials also examine how the side effects of the new intervention compare with those of the usual treatment. If the new intervention is more effective than the usual treatment and/or is easier to tolerate, it may become the new standard of care.

Phase III trials usually involve large groups of people (100 to several thousand), who are randomly assigned to one of two treatment groups, or “trial arms”: (1) a control group, in which everyone in the group receives usual treatment for their type of cancer, or 2) an investigational or experimental group, in which everyone in the group receives the new intervention or new use of an existing intervention. The trial participants are assigned to their individual groups by random assignment, or randomisation. Randomisation helps ensure that the groups have similar characteristics. This balance is necessary so the researchers

can have confidence that any differences they observe in how the two groups respond to the treatments they receive are due to the treatments and not to other differences between the groups.

Randomisation is usually done by a computer program to ensure that human choices do not influence the assignment to groups. The trial participants cannot request to be in a particular group, and the researchers cannot influence how people are assigned to the groups. Usually, neither the participants nor their doctors know what treatment the participants are receiving.

People who participate in phase III trials may or may not have been treated previously. If they have been treated previously, their eligibility to participate in a specific trial may depend on the type and the amount of prior treatment they received.

In most cases, an intervention will move into phase III testing only after it has shown promise in phase I and phase II trials.

Phase IV (also called phase 4). These trials further evaluate the effectiveness and long-term safety of drugs or other interventions. They usually take place after a drug or intervention has been approved by the medicine regulatory office for standard use. Several hundred to several thousand people may take part in a phase IV trial. These trials are also known as post-marketing surveillance trials. They are generally sponsored by drug companies.

Sometimes clinical trial phases may be combined (e.g., phase I/II or phase II/III trials) to minimize the risks to participants and/or to allow faster development of a new intervention.

Although treatment trials are always assigned a phase, other clinical trials (e.g., screening, prevention, diagnostic, and quality-of-life trials) may not be labelled this way.

Use of Placebos

The use of placebos as comparison or “control” interventions in cancer treatment trials is rare. If a placebo is used by itself, it is because no standard treatment exists. In this case, a trial would compare the effects of a new treatment with the effects of a placebo. More often, however, placebos are given along with a standard treatment. For example, a trial might compare the effects of a standard treatment plus a new treatment with the effects of the same standard treatment plus a placebo.

Possible benefits of taking part in a clinical trial

The benefits of participating in a clinical trial include the following:

- Trial participants have access to promising new interventions that are generally not available outside of a clinical trial.
- The intervention being studied may be more effective than standard therapy. If it is more effective, trial participants may be the first to benefit from it.
- Trial participants receive regular and careful medical attention from a research team that includes doctors, nurses, and other health professionals.
- The results of the trial may help other people who need cancer treatment in the future.
- Trial participants are helping scientists learn more about cancer (e.g., how it grows, how it acts, and what influences its growth and spread).

Potential harms associated with taking part in a clinical trial

The potential harms of participating in a clinical trial include the following:

- The new intervention being studied may not be better than standard therapy, or it may have harmful side effects that doctors do not expect or that are worse than those associated with standard therapy.
- Trial participants may be required to make more visits to the doctor than they would if they were not in a clinical trial and/or may need to travel farther for those visits.

Correlative research studies, and how they are related to clinical trials

In addition to answering questions about the effectiveness of new interventions, clinical trials provide the opportunity for additional research. These additional research studies, called correlative or ancillary studies, may use blood, tumour, or other tissue specimens (also known as 'biospecimens') obtained from trial participants before, during, or after treatment. For example, the molecular characteristics of tumour specimens collected during a trial might be analysed to see if there is a relationship between the presence of a certain gene mutation or the amount of a specific protein and how trial participants responded to the treatment they received. Information obtained from these types of studies could lead to more accurate predictions about how individual patients will respond to certain cancer treatments, improved ways of finding cancer earlier, new methods of identifying people who have an increased risk of cancer, and new approaches to try to prevent cancer.

Clinical trial participants must give their permission before biospecimens obtained from them can be used for research purposes.

When a clinical trial is over

After a clinical trial is completed, the researchers look carefully at the data collected during the trial to understand the meaning of the findings and to plan further research. After a phase I or phase II trial, the researchers decide whether or not to move on to the next phase or stop testing the intervention because it was not safe or effective. When a phase III trial is completed, the researchers analyse the data to determine whether the results have medical importance and, if so, whether the tested intervention could become the new standard of care.

The results of clinical trials are often published in peer-reviewed scientific journals. Peer review is a process by which cancer research experts not associated with a trial review the study report before it is published to make sure that the data are sound, the data analysis was performed correctly, and the conclusions are appropriate. If the results are particularly important, they may be reported by the media and discussed at a scientific meeting and by patient advocacy groups before they are published in a journal. Once a new intervention has proven safe and effective in a clinical trial, it may become a new standard of care.
(National Cancer Institute).

Medical Disclaimer

This Fact Sheet is intended to provide general information only and, as such, should not be considered as a substitute for advice, medically or otherwise, covering any specific condition or situation. Readers of this document should seek appropriate medical advice prior to taking or refraining from taking any action resulting from the contents of this Fact Sheet. As far as permissible by South African law, the Cancer Association of South Africa (CASNA) accepts

no responsibility or liability to any person (or his/her dependants/estate/heirs) as a result of using any information contained in this Fact Sheet.

The Cancer Association of South Africa (CANSA) has taken every precaution in preparing this Fact Sheet. Neither CANSA, nor any contributor(s) to this Fact Sheet shall be held responsible for any action (or the lack of any action) taken by any person or organisation wherever they shall be based, as a result, directly or indirectly, of information contained in, or accessed through, this Fact Sheet.

Sources and References

American Cancer Society
http://www.cancer.org/cancer/ewingfamilyoftumors/detailedguide/ewing-family-of-tumors-staging

Bone Cancer Research Trust
http://www.bcrt.org.uk/bci_symptoms_of_ewings_sarcoma.php

Cancerindex.org
http://www.cancerindex.org/ccw/faq/ewings.htm#q20

Ewing's Sarcoma
https://www.google.co.za/search?q=ewing%27s+sarcoma+in+adults&espv=2&biw=1034&bih=619&source=lnms&tbm=isch&sa=X&ved=0CAYQ_AUoAWoVChMIkcHP98eWxwIVzPEUCh0cXQOQ&dpr=1#imgrc=cj12avjJJqbbOM%3A

Johns Hopkins Medicine
http://www.hopkinsmedicine.org/healthlibrary/conditions/bone_disorders/ewing_sarcoma_in_adults_85,P00116/

Medpage Today
http://www.medpagetoday.com/MeetingCoverage/ASTRO/28890

National Cancer Institute
http://www.cancer.gov/clinicaltrials/learningabout/what-are-clinical-trials
http://www.cancer.gov/about-cancer/treatment/clinical-trials

WebMD
http://www.webmd.com/cancer/ewings-sarcoma?page=2#1
http://www.webmd.com/cancer/ewings-sarcoma?page=3#1