

Cancer Association of South Africa (CANSA)

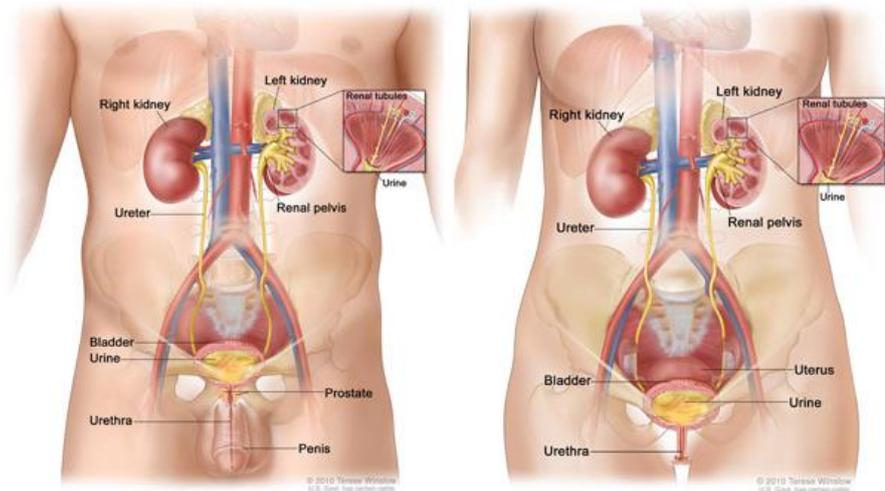


Research • Educate • Support

Fact Sheet on Wilms' Tumour and Other Childhood Kidney Tumours

Introduction

The body produces several kinds of wastes, including sweat, carbon dioxide gas, faeces, and urine. These wastes exit the body in different ways. Sweat is released through pores in the skin. Water vapour and carbon dioxide are exhaled from the lungs. And undigested food materials are formed into faeces in the intestines and excreted from the body as solid waste in bowel movements.



[Picture Credit: Urinary System]

Urine, which is produced by the kidneys, contains the by-products of metabolism - salts, toxins, and water - that end up in the blood. The kidneys and urinary tract (which includes the kidneys, ureters, bladder, and urethra) filter and eliminate these waste substances from the blood. Without the kidneys, waste products and toxins would soon build up in the blood to dangerous levels.

In addition to eliminating wastes, the kidneys and urinary tract also regulate many important body functions. For example, the kidneys monitor and maintain the body's balance of water, ensuring that the tissues receive enough water to function properly and be healthy.

When doctors take a urine sample, the results reveal how well the kidneys are working. For example, blood, protein, or white blood cells in the urine may indicate injury, inflammation, or infection of the kidneys, and glucose in the urine may be an indication of diabetes.

Kidney Cancer

Kidney cancer, also known as renal cell cancer (RCC), is a disease in which cancer cells form in the tiny tubes (tubules) or tissues of the kidneys. Kidney cancer generally grows as one tumour within the kidney, however, a kidney may contain more than one tumour, or tumours may be found in both kidneys. Another form of kidney cancer is Wilms' tumour, a paediatric cancer that accounts for 95 percent of childhood kidney cancer cases.

Wilms' Tumour and other kidney tumours are diseases in which malignant (cancer) cells are found in the kidney. In Wilms' tumour one or more tumours may be found in one or both kidneys.

“Other childhood kidney tumours, which are diagnosed and treated in different ways, include:

- Clear cell sarcoma of the kidney is a type of kidney tumour that may spread to the lung, bone, brain, and soft tissue
- Rhabdoid tumour of the kidney is a type of kidney cancer that occurs mostly in infants and young children. It is often advanced at the time of diagnosis. Rhabdoid tumour of the kidney grows and spreads quickly, often to the lungs and brain
- Neuroepithelial tumours of the kidney are rare and usually occur in young adults. They grow and spread quickly
- Desmoplastic small round cell tumour of the kidney is a rare soft tissue sarcoma
- Cystic partially differentiated nephroblastoma is a very rare type of Wilms' tumour made up of cysts
- Renal cell carcinoma is a rare cancer in children or in adolescents younger than 15 years of age. However, it is much more common in adolescents between 15 and 19 years of age. Renal cell carcinomas can spread to the lungs, bones, liver, and lymph nodes
- Congenital mesoblastic nephroma is a tumour of the kidney that is usually diagnosed within the first year of life and can usually be cured. One type of congenital mesoblastic nephroma may appear on an ultrasound exam before birth or may occur within the first 3 months after the child is born. Congenital mesoblastic nephroma occurs more often in males than females
- Primary renal synovial sarcoma is a rare tumour of the kidney and is most common in young adults
- Anaplastic sarcoma of the kidney is a rare tumour that is most commonly found in children or adolescents younger than 15 years of age. Anaplastic sarcoma of the kidney often spreads to the lungs, liver, or bones. There is no standard treatment for anaplastic sarcoma”

Vokukl, C. 2019.

“Pediatric kidney tumors are rare and account for about 6% of all childhood malignancies. By far the most common tumors are nephroblastomas. This review presents rare childhood renal tumors. Mesoblastic nephroma, as tumors of the low risk group, as well as the clear-cell sarcomas of the kidney and malignant rhabdoid tumors, as tumors of the high-risk group, and the so-called anaplastic sarcomas of the kidney will be discussed. Due to the significantly divergent therapy, a correct

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; Dip Genetic Counselling; Dip Audiometry and Noise Measurement; Diagnostic Radiographer]

Approved by Ms Elize Joubert, Chief Executive Officer [BA Social Work (cum laude); MA Social Work]

June 2021

diagnosis is important. Due to the often overlapping morphology, pathologic diagnosis is often difficult. In addition to the typical morphologic features, the specific immunohistochemical aspects as well as the known molecular changes will be presented.”

Incidence of Childhood Kidney Cancer in South Africa

The outdated National Cancer Registry (2017), known for under-reporting does not provide information regarding the different types of kidney cancer in children under 19 years of age. The frequency of histologically diagnosed cases of kidney cancer in children under 19 years of age in South Africa for 2017 were as follows (National Cancer Registry, 2017):

Group - Males 2017	0 - 4 Years	5 - 9 Years	10 - 14 Years	15 - 19 Years
All males	31	14	2	2
Asian males	0	2	0	0
Black males	24	8	2	1
Coloured males	3	1	0	0
White males	4	3	0	1

Group - Females 2017	0 - 4 Years	5 - 9 Years	10 - 14 Years	15 - 19 Years
All females	35	15	4	1
Asian females	0	1	0	0
Black females	30	10	4	1
Coloured females	1	1	0	0
White females	4	4	0	0

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.

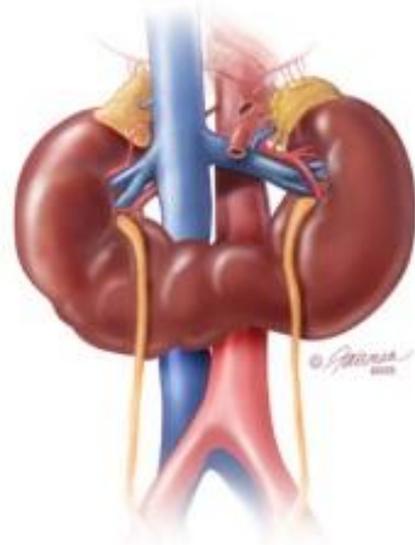
“The South African experience is that Wilms’ tumour is the most common form of kidney cancer in children and is also known as nephroblastoma. It has a female predominance and a higher incidence in black children. Seventy eight per cent of children are diagnosed at 1 - 5 years of age, with a peak incidence at 3 - 4 years. Wilms’ tumour usually occurs sporadically, but in 1% of cases it is familial. Congenital abnormalities occur in 12 - 15% of cases. These include genito-urinary abnormalities (e.g. horseshoe kidney, hypospadias, undescended testes), congenital aniridia, WAGR syndrome (aniridia, mental retardation, genito-urinary abnormalities), congenital hemihypertrophy, Beckwith Wiedemann syndrome, and Denys-Drash syndrome (renal disease, pseudo-hermaphroditism). Wilms’ tumour is mostly unilateral, but is bilateral in 5% of cases. An abdominal mass is the most common presenting sign in 60% of cases. It may be noticed by parents or it may be an incidental finding on examination. Hypertension, which is seen in 25% of patients, is caused by renin production by tumour cells. Haematuria may be macroscopic, but is generally microscopic, and occurs in 15% of patients. It may lead to iron deficiency anaemia. Rarely Wilms’ tumour may present with acquired von Willebrand’s disease and a bleeding diathesis, polycythaemia, weight loss, urinary infection, diarrhoea or constipation.”

Risk Factors for Childhood Kidney Cancer

Risk factors for kidney cancer include:

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; Dip Genetic Counselling; Dip Audiometry and Noise Measurement; Diagnostic Radiographer]
 Approved by Ms Elize Joubert, Chief Executive Officer [BA Social Work (cum laude); MA Social Work]
 June 2021

- Smoking
- Obesity
- High blood pressure
- Family history of kidney cancer
- Advanced kidney disease and long-term kidney dialysis
- Misuse of pain medications, including over-the-counter medications
- A diet high in red meat or dairy
- Diabetes – kidney cancer risk is around 40% higher in diabetics compared with non-diabetics, meta analyses have shown. However, excess body weight may largely explain this association. Among diabetics, kidney cancer risk may be higher in insulin users than non-users, but metformin use is not associated with increased risk
- Genetic syndromes. Kidney cancer is a feature of several genetic syndromes:
 - Von Hippel Lindau disease - the risk of someone with von Hippel Lindau disease developing clear-cell RCC increases with age, reaching 97% by age 60
 - Hereditary papillary renal cell carcinoma (HPRCC) - HPRCC is characterised by occurrence of type 1 papillary RCC as well as tumours in other organs
 - Hereditary leiomyomatosis renal cell cancer (HLRCC) - individuals with HLRCC develop benign skin and uterine leiomyomas and, in some cases, highly aggressive type-2 papillary RCC
 - Birt-Hogg-Dubé (BHD) syndrome - BHD syndrome is characterised by an increased risk of a number of different types of renal cancer
- Horseshoe kidney - a horseshoe kidney is an uncommon birth defect in which the tissue forming the kidneys does not divide into 2 separate kidneys. Instead, one large, U-shaped kidney is formed, usually joined at the bottom. Different types of kidney cancer have been reported in people with this defect.



[Picture Credit: Horseshoe Kidney]

PDQ Pediatric Treatment Editorial Board. 2020.

Renal cell cancer may be related to the following conditions:

- Von HippelLindau Disease (an inherited condition that causes abnormal growth of blood vessels). Children with Von Hippel-Lindau disease should be checked yearly for renal cell cancer with an ultrasound of the abdomen or an MRI (magnetic resonance imaging) beginning at age 8 to 11 years.
- Tuberous sclerosis (an inherited disease marked by noncancerous fatty cysts in the kidney).
- Familial renal cell cancer (an inherited condition that occurs when certain changes in the genes that cause kidney cancer are passed down from the parent to the child).
- Renal medullary cancer (a rare kidney cancer that grows and spreads quickly).
- Hereditary Leiomyomatosis (an inherited disorder that increases the risk of having cancer of the kidney, skin, and uterus).

Prior chemotherapy or Radiation therapy for childhood cancer, such as neuroblastoma, soft tissue sarcoma, leukaemia, or Wilms tumour may also increase the risk of renal cell cancer.

Signs and Symptoms of Childhood Kidney Cancer

Kidney cancer may not produce any noticeable symptoms in its early stages. However, as the tumour grows, symptoms may begin to appear. For that reason, kidney cancer is often not diagnosed until it has begun to spread.

Symptoms of kidney cancer can include:

- Blood in the urine (a condition called haematuria)
- A lump or mass in the kidney area
- Tiredness
- A general feeling of poor health (malaise)
- Loss of appetite and/or weight
- Low-grade fever
- Sweats
- Pain or discomfort in the side of back of the abdomen (loin pain)
- Bone pain
- A general sense of not feeling well
- Anaemia (a condition that results from not having enough red blood cells)
- Some renal cell tumours produce abnormal amounts of certain hormones. This can lead to problems such as:
 - A high blood calcium level which can cause various symptoms, such as increased thirst, feeling sick, tiredness, and constipation.
 - Too many red blood cells being made (polycythaemia).
 - High blood pressure.

Diagnosis of Childhood Kidney Cancer

The following tests and procedures may be used:

- Physical examination and history - an exam of the body to check general signs of health, including checking for signs of disease, such as lumps or anything else that seem unusual. A history of the patient's health habits and past illnesses and treatments will also be taken
- Complete blood count (CBC) - a procedure in which a sample of blood is drawn and checked for the following:
 - The number of red blood cells, white blood cells, and platelets
 - The amount of haemoglobin (the protein that carries oxygen) in the red blood cells
 - The portion of the blood sample made up of red blood cells
- Blood chemistry studies - a procedure in which a blood sample is checked to measure the amounts of certain substances released into the blood by organs and tissues in the body. An unusual (higher or lower than normal) amount of a substance can be a sign of disease in the organ or tissue that makes it. This test is done to check how well the liver and kidneys are working

- Liver function test - a procedure in which a blood sample is checked to measure the amounts of certain substances released into the blood by the liver. A higher than normal amount of a substance can be a sign that the liver is not working as it should
- Renal function test - a procedure in which blood or urine samples are checked to measure the amounts of certain substances released into the blood or urine by the kidneys. A higher or lower than normal amount of a substance can be a sign that the kidneys are not working as they should
- Urinalysis - a test to check the colour of urine and its contents, such as sugar, protein, blood, and bacteria
- Ultrasound exam - a procedure in which high-energy sound waves (ultrasound) are bounced off internal tissues or organs and make echoes. The echoes form a picture of body tissues called a sonogram. An ultrasound of the abdomen is done to diagnose a kidney tumour
- CT scan (CAT scan) - a procedure that makes a series of detailed pictures of areas inside the body, such as the chest, abdomen, and pelvis, taken from different angles. The pictures are made by a computer linked to an x-ray machine. A dye may be injected into a vein or swallowed to help the organs or tissues show up more clearly. This procedure is also called computed tomography, computerised tomography, or computerised axial tomography
- Abdominal X-ray - an x-ray is taken of the organs inside the abdomen. An X-ray is a type of energy beam that can go through the body and onto film, making a picture of areas inside the body
- Biopsy - the removal of cells or tissues so they can be viewed under a microscope by a pathologist to check for signs of cancer. Whether a biopsy is done depends on one or more of the following:
 - Cancer is in one or both kidneys
 - Imaging tests clearly show the cancer
 - The patient is on a clinical trial

A biopsy may be done before treatment, after surgery to remove the tumour, or after chemotherapy to shrink the tumour.

Treger, T.D., Chowdhury, T., Pritchard-Jones, K. & Behiati, S. 2019.

“Wilms tumour is the most common renal malignancy of childhood. The disease is curable in the majority of cases, albeit at considerable cost in terms of late treatment-related effects in some children. However, one in ten children with Wilms tumour will die of their disease despite modern treatment approaches. The genetic changes that underpin Wilms tumour have been defined by studies of familial cases and by unbiased DNA sequencing of tumour genomes. Together, these approaches have defined the landscape of cancer genes that are operative in Wilms tumour, many of which are intricately linked to the control of fetal nephrogenesis. Advances in our understanding of the germline and somatic genetic changes that underlie Wilms tumour may translate into better patient outcomes. Improvements in risk stratification have already been seen through the introduction of molecular biomarkers into clinical practice. A host of additional biomarkers are due to undergo clinical validation. Identifying actionable mutations has led to potential new targets, with some novel compounds undergoing testing in early phase trials. Avenues that warrant further exploration include targeting Wilms tumour cancer genes with a non-redundant role in nephrogenesis and targeting the fetal renal transcriptome.”

Factors that May Affect Prognosis

The prognosis (chance of recovery) and treatment options often depend on the following:

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; Dip Genetic Counselling; Dip Audiometry and Noise Measurement; Diagnostic Radiographer]

Approved by Ms Elize Joubert, Chief Executive Officer [BA Social Work (cum laude); MA Social Work]

June 2021

- How different the tumour cells are from normal kidney cells
- The stage of the cancer
- The type and size of the tumour
- The age of the child
- Whether the tumour can be completely removed during surgery
- Whether the cancer has just been diagnosed or has recurred (come back)
- Whether there are any abnormal chromosomes or genes
- Whether the patient is treated by paediatric experts with experience in treating patients with Wilms' tumour and other kidney tumours

Treatment of Childhood Kidney Cancer

Surgery - surgery is often the first treatment a child has for a kidney tumour.

Chemotherapy - chemotherapy means giving medicines that go throughout the child's body to kill cancer cells.

Radiation - radiation therapy uses high-energy X-rays to kill cancer cells.

Ambalavanan, M. & Geller, J.I. 2019.

Background: Pediatric renal cell carcinoma (pRCC) is the second most common renal malignancy of childhood; however, treatment data for advanced disease is lacking.

Methods: A retrospective analysis of pRCC patients (age < 21 years at diagnosis) treated between 2000 and 2015 at Cincinnati Children's Hospital Medical Center was undertaken, with specific focus on medical therapies, accompanied by a detailed literature review.

Results: Twenty-four patients (median age = 15 years) were identified; 11 were female. Past history of kidney pathology (4) and prior hematologic/oncologic diagnoses (5) were common associated findings. Translocation morphology RCC (tRCC) was the most common subtype (16; 64%), followed by papillary (6; 24%), clear cell renal cell carcinoma (ccRCC) (1), and chromophobe (1). The TNM stage distribution was I (8; 33%), II (2; 8%), III (3; 13%), and IV (11; 46%). Eleven patients with stage IV disease all had tRCC and received medicinal anticancer therapies, the most common being antiangiogenic (10), conventional chemotherapy (8), mTOR inhibition (7), and immunotherapy (3). Four patients also received small-port radiotherapy. The mean time to progression (TTP) was longest for axitinib (n = 2; TTP = 7.8 m; range 5.5-10 m) and sunitinib (n = 6; TTP = 4.7 m; range 0.3-12 m). Overall, 20 cases of pediatric RCC who received RCC-directed medicinal therapy with outcome data have been previously reported.

Conclusions: For patients with unresectable pRCC requiring systemic therapy, available data are scarce. Data herein support an increased TTP with antiangiogenic therapy in tRCC supporting a formal study of antiangiogenic therapies through multicenter-cooperative-group collaboration.

About Clinical Trials

Clinical trials are research studies that involve people. They are conducted under controlled conditions. Only about 10% of all drugs started in human clinical trials become an approved drug.

Clinical trials include:

- Trials to test effectiveness of new treatments
- Trials to test new ways of using current treatments
- Tests new interventions that may lower the risk of developing certain types of cancers

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; Dip Genetic Counselling; Dip Audiometry and Noise Measurement; Diagnostic Radiographer]

Approved by Ms Elize Joubert, Chief Executive Officer [BA Social Work (cum laude); MA Social Work]

June 2021

- Tests to find new ways of screening for cancer

The [South African National Clinical Trials Register](#) provides the public with updated information on clinical trials on human participants being conducted in South Africa. The Register provides information on the purpose of the clinical trial; who can participate, where the trial is located, and contact details.

For additional information, please visit: www.sanctr.gov.za/

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 situation. Users should seek appropriate advice before taking or refraining from taking any action in reliance on any information contained in this Fact Sheet. So far as permissible by law, the Cancer Association of South Africa (CANSA) does not accept any liability to any person (or his/her dependants/estate/heirs) relating to the use of any information contained in this Fact Sheet.

Whilst CANSA has taken every precaution in compiling this Fact Sheet, neither it, nor any contributor(s) to this Fact Sheet can be held responsible for any action (or the lack thereof) taken by any person or organisation wherever they shall be based, as a result, direct or otherwise, of information contained in, or accessed through, this Fact Sheet.



Sources and References Consulted or Utilised

Ambalavanan, M. & Geller, J.I. 2019. Treatment of advanced pediatric renal cell carcinoma. *Pediatr Blood Cancer*, 66 (8), e27766. Aug 2019.

Atlas of Genetics and Cytogenetics in Oncology and Haematology

<http://atlasgeneticsoncology.org/Kprones/VHLKpr10010.html>

Canadian Cancer Society

http://www.cancer.ca/en/cancer-information/cancer-type/kidney/risks/?region=on#Horseshoe_kidney

Cancer.Net

<http://www.cancer.net/cancer-types/kidney-cancer/risk-factors-and-prevention>

Cancer Research UK

<http://www.cancerresearchuk.org/cancer-info/cancerstats/types/kidney/riskfactors/kidney-cancer-risk-factors>

<http://www.cancerresearchuk.org/cancer-help/about-cancer/cancer-questions/wilms-tumour>

Cleveland Children's Clinic

<http://my.clevelandclinic.org/childrens-hospital/health-info/diseases-conditions/cancer/hic-wilms-tumor-and-other-childhood-kidney-tumors.aspx>

Counsyl

<https://www.counsyl.com/services/family-prep-screen/diseases/bloom-syndrome/>

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; Dip Genetic Counselling; Dip Audiometry and Noise Measurement; Diagnostic Radiographer]

Approved by Ms Elize Joubert, Chief Executive Officer [BA Social Work (cum laude); MA Social Work]

June 2021

Dana-Farber Cancer Institute

<http://www.dana-farber.org/Adult-Care/Treatment-and-Support/Kidney-Cancer/About-Kidney-Cancer.aspx>

Genetics Home Reference

<http://ghr.nlm.nih.gov/condition/simpson-golabi-behmel-syndrome>

Healthline

<http://www.healthline.com/health/hemihypertrophy-hemihyperplasia#Overview1>

KidsHealth

http://kidshealth.org/parent/general/body_basics/kidneys_urinary.html

Mayo Clinic

<http://www.mayoclinic.org/diseases-conditions/undescended-testicle/basics/definition/con-20037877>

<http://www.mayoclinic.org/diseases-conditions/hypospadias/basics/definition/con-20031354>

MedicineNet.com

<http://www.medterms.com/script/main/art.asp?articlekey=26380>

MedlinePlus

<http://www.nlm.nih.gov/medlineplus/ency/article/001186.htm>

Medscape

<http://emedicine.medscape.com/article/1208379-overview>

<http://emedicine.medscape.com/article/943103-overview>

National Cancer Institute

<http://www.cancer.gov/cancertopics/pdq/treatment/wilms/Patient/page1>

<http://www.cancer.gov/cancertopics/pdq/treatment/wilms/Patient/page1#Keypoint5>

<http://www.cancer.gov/clinicaltrials/learningabout/what-are-clinical-trials>

National Human Genome Research Institute

<http://www.genome.gov/26023527>

Orphanet

[http://www.orpha.net/consor/cgi-bin/Disease_Search.php?lng=EN&data_id=3474&Disease\(s\)/group%20of%20diseases=Perlman-syndrome&title=Perlman-syndrome&search=Disease_Search_Simple](http://www.orpha.net/consor/cgi-bin/Disease_Search.php?lng=EN&data_id=3474&Disease(s)/group%20of%20diseases=Perlman-syndrome&title=Perlman-syndrome&search=Disease_Search_Simple)

Patient.co.uk

<http://www.patient.co.uk/health/kidney-cancer>

PDQ Pediatric Treatment Editorial Board. 2020. Wilms Tumor and other childhood kidney tumors treatment (PDQ®).

Physiopedia

http://www.physio-pedia.com/Wilms_Tumor

Poole, J.E. 2010. Wilms' Tumour (Nephroblastoma). CME 28(7):324-326, July.

Seattle Children's Hospital

<http://www.seattlechildrens.org/medical-conditions/cancer-tumors/kidney-tumors-treatment/>

Sotos Syndrome Support Association

<http://sotosyndrome.org/>

Staging

https://www.google.co.za/search?q=childhood+cancer+wilms&source=lnms&tbm=isch&sa=X&ei=IhOkU7KKEaje7Ab6joDgCQ&ved=0CAYQ_AUoAQ&biw=1517&bih=714&dpr=0.9#facrc=_&imgdii=_&imgrc=kEoQBjexkcUnOM%253A%3BZDejkFN9TeXYPM%3Bhttp%253A%252F%252Fwww.physio-pedia.com%252Fimages%252F8%252F8d%252FWilms-tumor.jpg%3Bhttp%253A%252F%252Fwww.physio-pedia.com%252FWilms_Tumor%3B600%3B560

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; Dip Genetic Counselling; Dip Audiometry and Noise Measurement; Diagnostic Radiographer]

Approved by Ms Elize Joubert, Chief Executive Officer [BA Social Work (cum laude); MA Social Work]

June 2021

Treger, T.D., Chowdhury, T., Pritchard-Jones, K. & Behiati, S. 2019. The genetic changes of Wilms tumour. *Nat Rev Nephrol*, 15 (4), 240-251. Apr 2019.

University of California San Francisco Medical Center

http://www.ucsfhealth.org/conditions/kidney_cancer/signs_and_symptoms.html

Urinary System

<http://www.dana-farber.org/Adult-Care/Treatment-and-Support/Kidney-Cancer/About-Kidney-Cancer.aspx>

Urology Care Foundation

<http://www.urologyhealth.org/urology/index.cfm?article=25>

Vokuhl, C. 2019. Rare childhood kidney tumors. *Pathologe*, 40 (6), 600-608. Nov 2019