The Johns Hopkins Guide for Patients and Families:

Hereditary Nonpolyposis Colorectal Cancer

JOHNS HOPKINS

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INTRODUCTION

This booklet is written for individuals with Hereditary Nonpolyposis Colorectal Cancer (HNPCC) and their families. The information provided is intended to add to, and is not a substitute for, discussions with doctors, genetic counselors, nurses and other members of the health care team. We encourage you to read the entire booklet in the order in which it is written since each section is built on information in preceding sections. We want to emphasize the need for regularly scheduled, thorough medical examinations for persons who already have HNPCC. More importantly, relatives at risk for this condition need to have regular examinations beginning at an early age. Names of support groups and additional publications concerning this condition are found at the end of the booklet.

The information included in this booklet can also be found on the Johns Hopkins Heredity Colorectal Cancer website, www.hopkins-gi.nts.jhu.edu. Please visit that site to find the most current information on HNPCC.

WHAT IS HEREDITARY NONPOLYPOSIS COLORECTAL CANCER (HNPCC)?

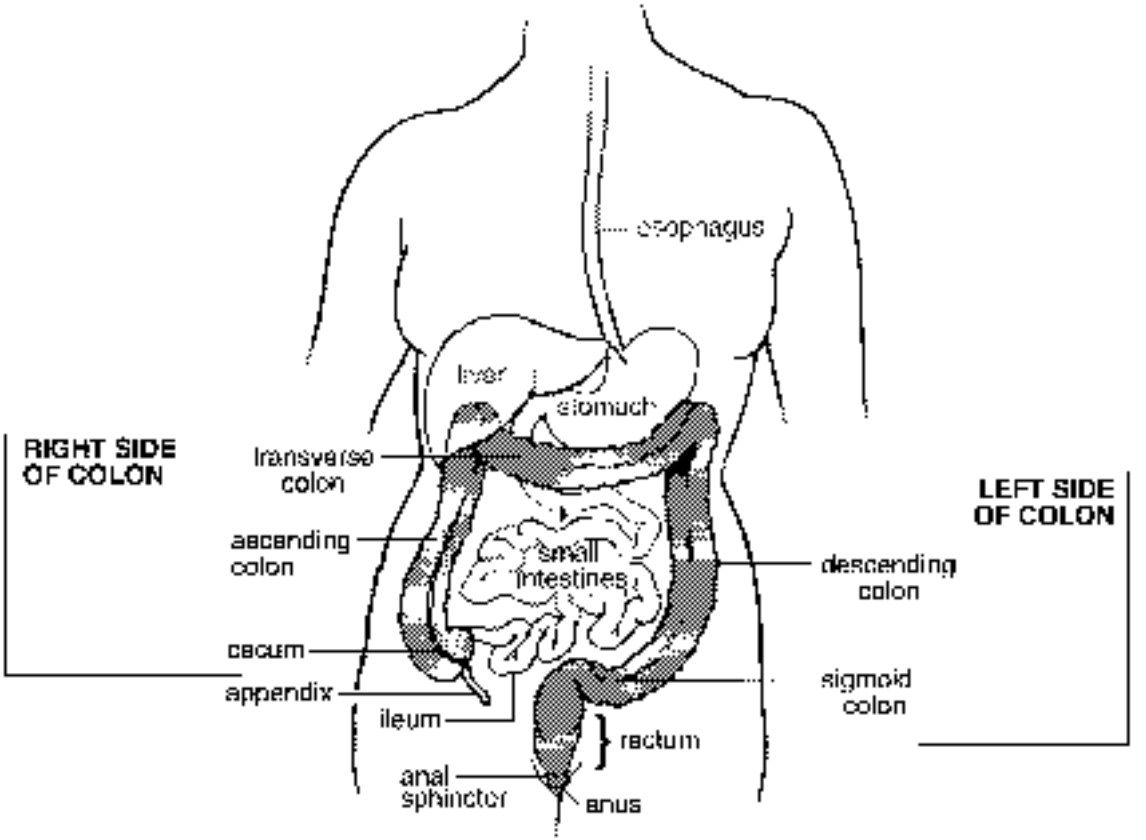
HNPCC is a condition in which the tendency to develop colon or rectal cancer is inherited (it is hereditary). Some of the genes (basic units of heredity) that cause HNPCC are known. Nonpolyposis means that colorectal cancer can occur when only a small number of polyps is present (or polyps are not present at all). The characteristics of HNPCC include multiple family members affected with colon cancer, colon cancer in multiple generations, and an earlier age of onset than often seen in the general population (before age 50 years). In HNPCC, colorectal cancer occurs primarily on the right side of the colon (see diagram p. 3). Sometimes other cancers can occur in families with HNPCC. They include cancer of the uterus, ovary, stomach, urinary tract, small bowel, and bile ducts. Other names for HNPCC are Lynch syndrome and cancer family syndrome.

WHAT ARE POLYPS?

Polyps are abnormal, mushroom-like growths. When found in the gastrointestinal tract, they occur most commonly inside the colon (large intestine, large bowel). Polyps vary in size from less than one-tenth of an inch to 1-2 inches. They may be so large as to block part of the intestine. In some people polyps may be inherited, while in others they are not inherited. Certain types of polyps can turn into colon cancer or rectal cancer.

WHAT IS THE GASTROINTESTINAL TRACT?

The gastrointestinal digestive tract is a hollow tube which begins at the mouth and ends at the anus. It has several parts including the esophagus, stomach, small intestine and colon (large intestine). Its total length is about 28 feet. The last 5-6 feet of the intestine is called the colon (large intestine, large bowel). The last 5 or 6 inches of the colon is the rectum. After food is digested, solid wastes move through the colon and rectum to the anus, where they are passed out of the body.



HOW IS HNPCC INHERITED?

HNPCC is an autosomal dominant condition. This means that people with HNPCC have a 50% chance of passing the HNPCC gene mutation (change) to each of their children (see diagram p. 5). The gene mutation can be passed on even if the parent has had surgery to remove his or her own colon. Individuals who do not inherit the gene mutation cannot pass it to their own children. The vast majority of individuals with HNPCC develop cancer.

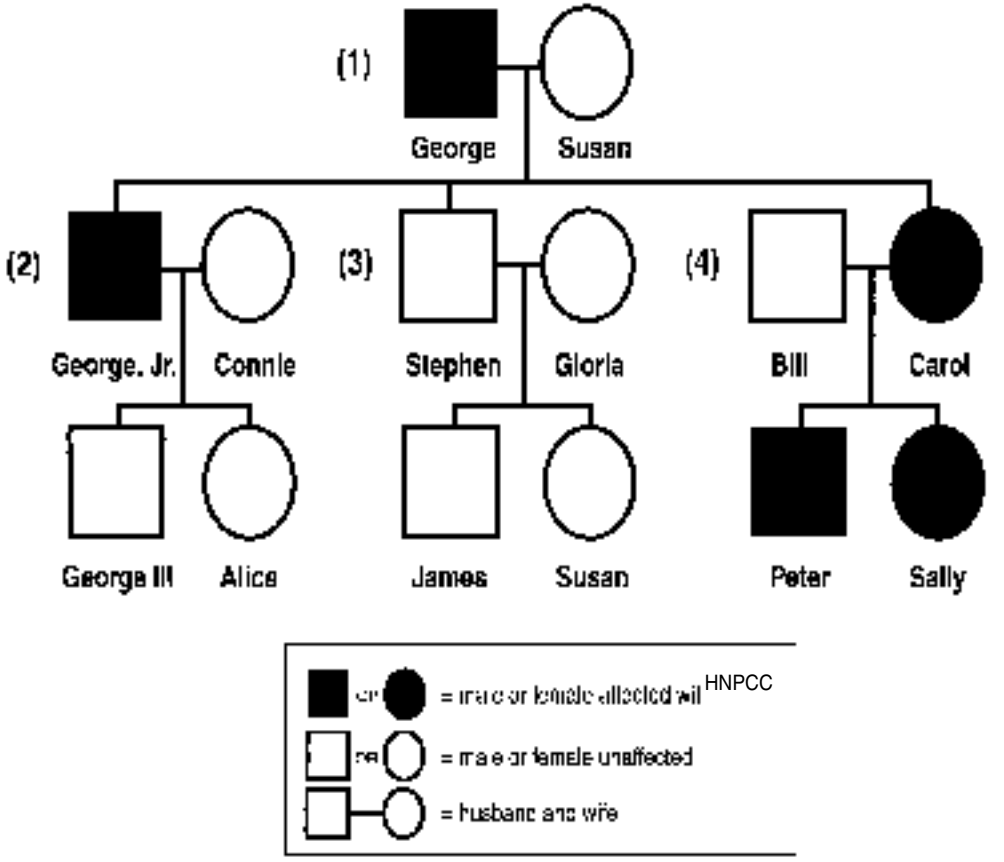
Some individuals with HNPCC do not have an affected parent. These individuals, who are the first in the family to have the condition, are referred to as having a new mutation (newly altered gene). They can, however, pass this HNPCC gene mutation to their children.

Genetic counseling is available, and recommended, for families affected with HNPCC. Genetic counselors are trained to explain hereditary conditions and the advantages and disadvantages of genetic testing. Counseling services are available through genetics and oncology departments in many hospitals. Also, it is recommended that families with HNPCC contact local registries (see Resources p. 13) for access to resources and for help with identification of family members at risk.

IS THERE A BLOOD TEST (DNA OR GENE TEST) FOR HNPCC?

Mutations (alterations) of one of five genes are now known to be responsible for most cases of HNPCC. These genes are called hMSH2, hPMS1, MSH6 (all on chromosome 2), hMLH1 (chromosome 3), and hPMS2 (chromosome 7). Other genes, presently undiscovered, may also cause HNPCC. Gene tests for HNPCC are available for selected individuals from families who have HNPCC. A family member affected with colon cancer should be tested first, whenever possible.

The test requires a small blood sample. The gene tests results will influence the future management of individuals who are at risk for HNPCC. For example, if the test shows that a person does not have the gene mutation known in the family, he or she can avoid many unnecessary colon examinations. If the test shows that a person does have the gene mutation, then the physician will need to be alerted to schedule annual colonoscopies and follow the guidelines for people with a positive gene test on page 6.



(1) George Jones has colorectal cancer. His wife, Susan, is unaffected. They have three children, George, Jr., Stephen and Carol. All were at 50% risk of developing HNPCC. Subsequently, George, Jr. developed colorectal cancer and Carol developed uterine cancer.

(2) George, Jr., and his wife Connie have two children. Although both children had a 50% chance of inheriting the HNPCC gene, neither did.

(3) Stephen and his wife, Gloria have two children. Since Stephen is unaffected there was no risk of HNPCC to his children.

(4) Carol and Bill Smith have two children. Both had a 50% chance of inheriting the gene for HNPCC, and both subsequently developed colorectal cancer.

WHAT IS MSI AND IHC TESTING?

Microsatellite instability (MSI) and Immunohistochemistry (IHC) testing are used as screening tests to evaluate the likelihood that a person's cancer was caused by one of the genes associated with HNPCC. These tests are usually done as a first step on families that do not meet clinical criteria for HNPCC to guide additional genetic testing. This analysis is usually done on colon tumor tissue that is removed and stored as part of the normal process when a person has surgery for colon cancer. These tests are screening tests and, therefore, will not provide a positive mutation test result; rather, they provide clues as to which HNPCC gene appears to have a mutation.

Regarding MSI testing, if the tumor tissue tests "MSI-positive", it is considered more likely that the cancer is due to one of the HNPCC gene mutations currently known. People who have a positive MSI test have the option to pursue the genetic blood test. If the tumor tissue tests "MSI-negative", however, it is unlikely that current genetic testing will be helpful for the affected person's family. Because it is a screening test, an MSI negative test result does not rule out the diagnosis of HNPCC.

Regarding IHC testing, if the tumor tissue reveals abnormal protein production for one of the HNPCC genes, a mutation in this gene is possible. Therefore, individuals with an abnormal IHC test result have the option to pursue the genetic blood test for a specific HNPCC gene. If the IHC test result shows normal protein production from all HNPCC genes, it is unlikely that current genetic testing will be helpful for the affected person's family. Again, a normal IHC test result does not rule out the diagnosis of HNPCC.

EXAM GUIDELINES FOR PEOPLE WHO HAVE HAD HNPCC GENE TESTING

The following three outcomes are possible:

Positive gene test - An HNPCC gene mutation was found in a person's blood sample.

Persons with a positive gene test should have a colonoscopy every year and follow the exam guidelines listed on page 7. In addition, other ways to prevent cancer, including surgeries such as colectomy, hysterectomy and oophorectomy, may be considered.

Negative gene test - No HNPCC gene mutation was found in a person's blood sample and an affected family member has had a positive gene test.

Persons with a negative gene test require careful evaluation by their doctor and a genetic counselor to determine the best screening guidelines to follow.

Inconclusive gene test - Either of the following two outcomes is an inconclusive test result:

No mutation found - No HNPCC gene mutation was found in a person's blood sample and no affected family member has had a positive gene test.
Variant of unknown significance - It it unknown whether the genetic mutation that was found is a true disease-causing mutation.

Persons with either of these two outcomes should follow screening guidelines for persons with a family history of colorectal cancer, available through the Johns Hopkins Hereditary Colorectal Cancer Registry or a www.hopkins-coloncancer.org.

At this time, the available gene tests cannot detect all HNPCC-causing gene mutations. Advances in technology may provide more sensitive testing methods. A genetic counselor or physician will assist in finding a laboratory that provides the best testing.

EXAM GUIDELINES FOR PEOPLE AT RISK

These guidelines are for a person with a positive gene test or for a person who has not been gene tested but comes from a family which appears to have HNPCC.

1. Colonoscopy every 1-2* years starting by age 20-25 years or 5 to 10 years before the age of earliest colorectal cancer diagnosed in the family, whichever is younger. At age 40 begin annual colonoscopy.
2. Annual history and physical, urinalysis/cytology, and blood tests (CBC, comprehensive metabolic panel including function tests starting when colonoscopy begins).
3. For women: yearly pelvic exam with Pap test, transvaginal ultrasound of the uterus and ovaries, and Pipel biopsy starting at age 25 and continuing annually.
4. Consider annual upper endoscopy in families with gastric cancer.

**Colonoscopy is recommended every year for a person with a positive gene test.*
If colon polyps or cancer is found, follow the treatment guidelines on page 9.

WHAT ARE THE SYMPTOMS OF HNPCC?

Most patients develop polyps and cancer of the colon and rectum without symptoms. However, the following symptoms *may* occur:

1. Bright red blood in the stool
2. Periods of diarrhea or constipation not explained by diet or flu

3. Crampy pain in the stomach region
4. Pencil-thin stools
5. Frequent feeling of distention (or bloating) in the abdominal or bowel region
6. Weight loss-persistent and unexplained
7. Unusual and continuing lack of energy

It should be emphasized that there is *no safety in simply waiting for symptoms to develop.* It is vital that persons at risk make every effort to have examinations starting by age 20-25 or 5 to 10 years before the age of the earliest colorectal cancer diagnosed in the family, even if they do not have symptoms.

HOW IS HNPCC DIAGNOSED?

Persons at risk for HNPCC usually have a family history of two successive generations of colon cancer or at least one generation with colon cancer and one generation with polyps. Men and women at risk for HNPCC need examinations of the entire colon. Women at risk should also have yearly endometrial and ovarian screening. Tests, such as colonoscopy and barium enema with flexible sigmoidoscopy, are available to tell whether cancer or polyps are present in the colon. For patients at risk for HNPCC, colonoscopy is the preferred method of screening.

1. *Colonoscopy* is an examination by means of a flexible, lighted tube, slightly larger in diameter than an enema tube, that is inserted into the colon. Tiny amounts of tissue may be removed from any part of the colon for microscopic study during this procedure. Before a person undergoes a colonoscopy a sedative is given; many persons sleep through the whole procedure and feel little or no discomfort. During this procedure it is sometimes necessary for the doctor to insert some air into the colon. Occasionally, air will cause the same kind of discomfort as a gas pain.

2. *Barium enema* is a test in which a white liquid called barium is inserted as an enema into the colon. This test allows the colon to be outlined when an x-ray picture is taken. If cancer or polyps are present they can be seen on the x-ray. The barium enema feels much like an ordinary enema, causing a feeling of fullness. When screening for HNPCC, barium enema should not be used as the only colon examination. Flexible sigmoidoscopy should be done as well.

3. *Flexible sigmoidoscopy* is an examination of the inside of the colon much like colonoscopy. It is done with a flexible, lighted tube, called a sigmoidoscope, which is inserted into the anus. It permits the doctor to see whether cancer or polyps are present and allows bits of tissue to be removed for examination under the microscope. Flexible sigmoidoscopy differs from colonoscopy in two ways. A sigmoidoscope allows the doctor to see only the lower part of the colon, and patients are not given a sedative prior to the exam. Most patients feel little or no discomfort during this examination.

For all of these tests of the colon, the patient must undergo a preparation before examination. The preparation, which includes a liquid diet and laxatives, clears stool from the colon so that all areas of the colon can be inspected. Exact instructions will be provided by the doctor before the examination.

A blood test for the HNPCC gene will tell at-risk family members if they have inherited the gene mutation identified in the family. However, gene tests do not reveal the presence of polyps or cancer.

WHAT IS THE TREATMENT?

If a polyp is found, removal through the colonoscope may be sufficient, although surgery may be recommended for some patients. If cancer is found at examination, the doctor will recommend colon surgery. Removing the entire colon is the only way to completely prevent the development of colon cancer or to treat existing cancer.

Several different operations are currently available for treatment of colorectal cancer and/or polyps in patients with HNPCC. The most commonly performed operation is colectomy with ileorectostomy (ileorectal anastomosis). This operation involves removal of most of the colon. After a complete discussion of treatment options, the patient and surgeon together can decide which one is best. Colon surgery is sometimes considered by patients with an HNPCC gene mutation before they are affected with polyps or colorectal cancer (prophylactic surgery). Women with HNPCC may also consider surgical removal of the uterus, ovaries, and Fallopian tubes. Illustrations of surgical options can be found at our website, www.hopkins-coloncancer.org.

In some cases, after colon removal, a person may have an ileostomy. An ileostomy is an opening on the abdomen through which stool leaves the body. An ileostomy

can be temporary or permanent. In most cases it is necessary to wear an appliance called an ileostomy bag to collect body wastes.

An ileostomy should not be considered a handicap, although it is an inconvenience. With proper care, there should be no odor or uncleanliness. Thousands of people of every age and of both sexes have had ileostomy surgery. After surgery, people can be just as busy, successful, and involved in daily routines as before surgery; in fact, they may be more active because of improved health.

SEXUAL FUNCTION AND CHILDBIRTH AFTER SURGERY

Sexual function is not impaired after surgery or ileostomy. It is important that both marital partners understand the surgery, by talking with the surgeon or the family physician. There is usually no need for change in established sex practices or in one's capacity to enjoy sexual intercourse. It is also possible to have successful pregnancies. However, a woman who plans to become pregnant should consult her physician before becoming pregnant. Physicians usually recommend that a woman wait about a year after a colon operation before becoming pregnant. This delay gives plenty of time for abdominal scars to heal soundly and for the woman's health to return to normal. An ileostomy should not harm the baby or endanger the mother during childbirth.

FOLLOW-UP CARE AFTER SURGERY

Early diagnosis of HNPCC in many patients has led to early surgery, resulting in prevention or cure of colon cancer and increased life span. However, other complications of this hereditary condition may still occur. For example, individuals with HNPCC appear to be at an increased risk for cancer of the endometrium (uterus), ovary, stomach, urinary tract, small bowel, and bile ducts. If you have had surgery for HNPCC, follow the guidelines below.

EXAM GUIDELINES FOR PEOPLE WITH HNPCC WHO HAVE HAD SURGERY

1. Sigmoidoscopy every year (depending on type of surgery).
2. Annual stool occult blood test, urinalysis/cytology, and blood tests for liver function.

3. Annual physical exam.
4. For women: annual gynecological exam with PAP test, including endometrial screening with biopsy (consider transvaginal ultrasound, vacuum curettage or Pipel biopsy).
5. Consider annual upper endoscopy in families with gastric cancer.

SUPPORT GROUPS FOR INDIVIDUALS AND FAMILIES

1. *IMPACC*
   (Intestinal Multiple Polyposis And Colorectal Cancer)
   Mrs. Ann Fagan, Administrator
   P.O. Box 11
   Conyngham, Pennsylvania 18219
   570-788-1818 or 788-3712
   Fax: 570-788-4046
   Email: impacc@epix.net

   A support group for families with FAP and/or hereditary colon cancer.

2. *UNITED OSTOMY ASSOCIATION, INC.*
   National Headquarters
   19772 Macarthur Blvd., Suite 200
   Irvine, California 92612
   800-826-0826

   The United Ostomy Association is a national organization of individuals with ostomies who work together for the benefit of all. More than 500 chapters are made up of people with ostomies whose goal is to provide mutual aid, moral support, and education to those who have had colostomy or ileostomy surgery. Individuals who have undergone this surgery may want to take the training course offered by the Ostomy Association so that they might help others who have had a similar operation. Check the telephone directory for your local chapter.

RESOURCES

1. *THE AMERICAN CANCER SOCIETY*
   National Headquarters
   1599 Clifton Road, N.E.
   Atlanta, Georgia 30329
   800-ACS-2345

   The ACS can offer assistance if cancer should occur. Check the telephone directory for your local chapter.

2. *STATE VOCATIONAL REHABILITATION SERVICE*

   This service offers training for another vocation if one should be physically unable to return to the same kind of work performed prior to surgery. Check your telephone directory for your state services.

3. *GENERATION TO GENERATION*

This newsletter is for people concerned about hereditary colon cancer and polyposis. It is free to all individuals with these conditions and their families and features articles on new research, the genetics of cancer, treatment and quality of life among many other topics. The editors welcome suggestions, questions and personal stories from readers. This publication may be obtained by contacting Editor, Generation to Generation, Dept. of Behavioral Science, Box 243, M.D. Anderson Cancer Center, 1515 Holcombe Blvd., Houston, TX 77030.

4. *POLYPOSIS AND HEREDITARY COLON CANCER REGISTRIES*

   Registries may be contacted for the names of experts in the management of FAP. Registries can also help to identify relatives at risk for the disorder. Further information concerning Polyposis Registries may be obtained by contacting:
   Coordinator, Hereditary Colorectal Cancer Registry
   The Johns Hopkins Hospital
   550 North Broadway, Suite 108
   Baltimore, MD 21205-2011
   Phone 888-77-COLON (772-6566), 410-955-3875, Fax 410-614-9544
   Email hccregistry@jhmi.edu
   Web Site www.hopkins-gi.nts.jhu.edu

5. *CANCER INFORMATION SERVICE (CIS)*
Toll Free: 1-800-4-CANCER

The Cancer Information Service is a national toll-free telephone inquiry system that provides information about cancer and cancer-related resources to the general public, patients and their families, as well as health professionals. Most CIS offices are associated with Comprehensive Cancer Centers or community hospitals. CIS offices do not diagnose or recommend treatment for individuals. They provide support, understanding and rapid access to the latest information, as well as referral to local services and resources. Telephone information may be supplemented by printed materials. All calls are kept confidential, and individuals do not need to give their name.

6. *THE NATIONAL SOCIETY OF GENETIC COUNSELORS, INC. (NSGC)*
233 Canterbury Drive
Wallingford, PA 19086-6617
610-972-7608
www.nsgc.org

The National Society of Genetic Counselors is the professional membership association for the genetic counseling profession. NSGC has developed a resource link to assist consumers in locating genetic counseling services.

7. *INTERNET RESOURCES*
www.hopkins-gi.nts.jhu.edu

The official site of the Johns Hopkins Hereditary Colorectal Cancer Registry. This site contains information on topics of interest to both patients and professionals and includes a special *Kids/Teens FAP Site.*

www.cancer.org

The American Cancer Society web site.

PUBLICATIONS

Contact the suppliers of the publications listed below for prices and/or mailing charges before ordering.

- *Ileal Pouch Pull-Through,* Lee Elton Smith, M.D. Washington Hospital Center, 110 Irving St. N.W., Suite 3B-31, Washington, D.C. 20010.
- *Managing Your Ileostomy and Managing Your Colostomy* (English), *Managing Your Ostomy* (Spanish), Hollister, Inc., 2000 Hollister Drive, Libertyville, Illinois 60048.
- *The Ostomy Book,* B.D. Mullen and K.A. McGuinn. Bruce Medical Supply, 411 Waverly Oaks Road, Waltham, Massachusetts 02254.
- *Understanding DNA Testing: A Basic Guide for Families,* National Center for Education in Maternal and Child Health, 38th and R St., N.W., Washington, D.C. 20057.

The following publications, and many others, may be obtained from the United Ostomy Association, Inc. 19772 Macarthur Blvd., Suite 200, Irvine, California 92612. 800-826-0826. Send for their publication brochure for a complete list.

- *Ostomy Quarterly.*
- *Ileostomy, A Guide, L. Gross.*

GLOSSARY

Adenoma – A benign polyp that may be precancerous.

Anus – Outlet of the rectum.

At risk – A person at risk has the possibility of developing the condition which is present in his/her family.

Barium enema – A test in which a chalky liquid which is resistant to x-rays is inserted into the large intestine, making it visible on x-ray film and permitting the doctor to see any defects, obstructions or masses.

Biopsy – Removal of a small bit of tissue for examination under the microscope.

CAT scan – (Computerized Axial Tomography) – a form of x-ray that shows the size and shape of body organs layer by layer.

Cecum – The first part of the large intestine (colon).

Chromosome – The carrier of the genetic material of a cell (genes). The normal number of chromosomes in a human cell is 46 (23 pairs).

Colectomy – The surgical removal of the colon (large intestine).

Colon – (Large intestine, large bowel), The last portion of the intestine. It comprises the cecum, ascending colon, transverse colon, descending colon and sigmoid colon, and is 5-6 feet in length.

Colonoscopy – A test in which a flexible tube, about 5 feet in length, is used to examine the inside of the entire colon. The tube has a light source, a magnifying eyepiece, and an open channel through which air can be passed and a biopsy taken.

DNA – (*D*eoxyribo*N*ucleic *A*cid). The molecule that contains the code for the genetic blueprint. It is found in the nucleus of cells.

Duodenum – The first part of the small intestine. It is 12-15 inches in length.

Endometrium – The mucous membrane comprising the inner layer of the uterine wall.

Esophagogastroduodenoscopy (EGD, Upper Endoscopy) – A test in which a flexible tube is used to examine the interior of the upper GI tract (esophagus, stomach, and duodenum). The tube has a light source, a magnifying eyepiece, and an open channel through which a biopsy can be taken.

ET – Enterostomal Therapist; a specialist, often a nurse, who assists individuals who wear an external abdominal appliance to collect body waste.

FAP (Familial adenomatous polyposis) – An inherited disorder of the gastrointestinal tract in which there are 100 or more precancerous polyps.

Flexible sigmoidoscopy – A test in which a flexible tube about 2 1/2 feet in length is used to examine the rectum and lower part of the large bowel. The tube has a light source, a magnifying eyepiece, and an open channel through which air can be passed and a biopsy taken.

GI (gastrointestinal) tract – The digestive system, consists of the esophagus, stomach, small intestine (22-25 feet in length), and large intestine (5-6 feet in length).

Gene – The basic unit of heredity, each one occupying a certain place on a chromosome.

Hemoccult test – A test using specially treated cardboard slides to check for hidden blood in the stool.

Hereditary – Genetically transmitted from parent to children.

hMLH1, hMSH2, hPMS1, hPMS2, MSH6 – The abbreviated names of the genes that, when abnormal, cause HNPCC. They are located on chromosomes 2, 3, and 7.

HNPCC (Hereditary Nonpolyposis Colorectal Cancer) – A condition in which the tendency to develop colon or rectal cancer is inherited (it is hereditary).

Hysterectomy – Surgical removal of the uterus.

Ileoanal pull-through (pelvic pouch procedure, ileoanal anastomosis procedure) – An operation removing the colon and the lining of the rectum, leaving the underlying anal muscles, or sphincters. The last part of the small intestine is joined to the anus and an internal pelvic pouch is created.

Ileorectal anastomosis – An operation that removes the colon and joins the last part of the small intestine (ileum) to the rectum.

Ileostomy (proctocolectomy) – An operation that removes the colon, rectum, and anus. An opening is then made from the ileum through the abdominal wall.

Ileum – The last part of the small intestine, 12-15 feet long.

Jejunum – The middle part of the small intestine, 8-10 feet long.

Karyotype – A picture of the chromosomes.

Lynch Syndrome I & II – Another name for the inherited condition, HNPCC.

Marker – A physical abnormality that may indicate the presence of, or may predict the future occurrence of a specific disorder in an individual.

Metastasis – Spread of cancer by the lymphatics or bloodstream to other sites in the body.

Mutation – A change in a gene which may result in a specific disorder.

Oophorectomy – Removal of the ovary.

Ostomate – A person with an ileostomy (or colostomy).

Pedigree – family tree; genealogy.

Polyposis – See FAP above.

Propositus/Proposita – (Proband; Index case). The first individual to be identified in a family that has a specific hereditary disorder.

Stoma – Artificially created opening in the abdomen.

Syndrome – A collection of abnormal physical characteristics occurring in an individual (Example: Gardner syndrome with epidermoid cysts, osteomas, and sclerotic jaw lesions, in addition to polyposis).

APPENDIX: GUIDELINES FOR EARLY DETECTION OF CANCER IN PEOPLE NOT AT RISK FOR HNPCC

The American Cancer Society recommends the following guidelines for early detection of cancer in people without symptoms:

Age 20-40 ***Cancer-related checkup every 3 years***

Should include the procedures listed below plus health counseling (such as tips on quitting cigarettes) and examinations for cancers of the thyroid, testes, prostate, oral region, ovaries, skin and lymph nodes. Some people are at higher risk for certain cancers and may need to have tests more frequently.

Breast

- Exam by doctor every 3 years
- Self-exam every month

Higher risk for breast cancer: Personal or family history of breast cancer, never had children, first child after 30.

Female Reproductive System

- Pelvic exam every 1-3 years with PAP test. Includes women age 18 and over.
- Pap test – after 3 initial negative tests 1 year apart, test should be done at the discretion of the physician, includes women who are, or who have been, sexually active, or have reached age 18.

Higher risk for cervical cancer: Early age at first intercourse, multiple sex partners.

Age 40 & over ***Cancer-related checkup every year***

Should include the procedures listed below plus health counseling (such as tips on quitting cigarettes) and examinations for cancers of the thyroid, testes, prostate, oral region, ovaries, skin and lymph nodes. Some people are at higher risk for certain cancers and may need to have tests more frequently.

Breast	• Exam by doctor every year • Self-exam every month • Breast x-ray every year *Higher risk for breast cancer: Personal or family history of breast cancer, never had children, first child after 30.*
Female Reproductive System	• Pelvic exam every year • Pap test – after 3 initial negative tests 1 year apart test should be done at the discretion of the physician • Endometrial tissue sample at menopause if at risk *Higher risk for cervical cancer: Early age at first intercourse, multiple sex partners.* *Higher risk for endometrial cancer: Infertility, obesity, failure of ovulation, abnormal uterine bleeding, estrogen therapy.*
Colon/ Rectum	For family members *not* at risk for HNPCC. All exams should begin at age 50. • Fecal occult blood test every year • Flexible sigmoidoscopy and digital rectal exam every 5 years, *or* Colonoscopy and digital rectal exam every 10 years, *or* Double-contrast barium enema and digital rectal exam every 5-10 years *Higher risk for colorectal cancer: Personal or family history of colon or rectal cancer, personal or family history of polyps in the colon or rectum, personal history of chronic inflammatory bowel disease.*
Prostate	• Prostate-specific antigen (PSA) every year beginning age 50 • Digital rectal exam every year beginning age 50 *Higher risk for prostate cancer: Strong family history of prostate cancer, African-American heritage.*

The cancer-related checkup guidelines are not rules and only apply to people without symptoms

*If you have any of the **Seven Warning Signals** listed below, see your doctor or go to your clinic without delay.*

CANCER'S SEVEN WARNING SIGNALS

1. Change in bowel or bladder habits
2. A sore that does not heal
3. Unusual bleeding or discharge
4. Thickening or lump in breast or elsewhere
5. Indigestion or difficulty in swallowing
6. Obvious change in wart or mole
7. Nagging cough or hoarseness

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To order copies of this booklet, please contact the Coordinator, Hereditary Colorectal Cancer Registry, The Johns Hopkins Hospital, 550 North Broadway, Suite 108, Baltimore, MD 21205-2011, 888-77-COLON (772-6566), hccregistry@jhmi.edu