Pap Test

Key Points

- A Pap test and pelvic exam are important parts of a woman's routine health care because they can detect cancer or abnormalities that may lead to cancer of the cervix (see Question 3).
- Women should have a Pap test at least once every 3 years, beginning about 3 years after they begin to have sexual intercourse, but no later than age 21 (see Question 6).
- If the Pap test shows abnormalities, further tests and/or treatment may be necessary (see Question 11).
- Human papillomavirus (HPV) infection is the primary risk factor for cervical cancer (see Question 13).
- Women who have been vaccinated against HPVs still need to have Pap tests (see Question 16).

1. What is a Pap test?

The Pap test (sometimes called a Pap smear) is a way to examine cells collected from the cervix (the lower, narrow end of the uterus). The main purpose of the Pap test is to detect cancer or abnormal cells that may lead to cancer. It can also find noncancerous conditions, such as infection and inflammation.

2. What is a pelvic exam?

In a pelvic exam, the uterus, vagina, ovaries, fallopian tubes, bladder, and rectum are felt to find any abnormality in their shape or size. During a pelvic exam, an instrument called a speculum is used to widen the vagina so that the upper portion of the vagina and the cervix can be seen.

3. Why are a Pap test and pelvic exam important?

A Pap test and pelvic exam are important parts of a woman's routine health care because they can detect abnormalities that may lead to invasive cancer of the cervix. These

abnormalities can be treated before cancer develops. Most invasive cancers of the cervix can be prevented if women have Pap tests regularly. Also, as with many types of cancer, cancer of the cervix is more likely to be treated successfully if it is detected early.

4. Who performs a Pap test?

Doctors and other specially trained health care professionals, such as physician assistants, nurse midwives, and nurse practitioners, may perform Pap tests and pelvic exams. These individuals are often called clinicians.

5. How is a Pap test done?

A Pap test can be done in a doctor's office, a clinic, or a hospital. While a woman lies on an exam table, the clinician inserts a speculum into her vagina to widen it. A sample of cells is taken from the cervix with a wooden scraper and/or a small cervical brush. The specimen (or smear) is placed on a glass slide and preserved with a fixative, or is rinsed in a vial of fixative, and is sent to a laboratory for examination.

6. How often should a woman have a Pap test?

Women should talk with their clinician about when and how often they should have a Pap test. Current general guidelines recommend that women have a Pap test at least once every 3 years, beginning about 3 years after they begin to have sexual intercourse, but no later than age 21. Experts recommend waiting about 3 years after the start of sexual activity to avoid overtreatment for common, temporary abnormal changes. It is safe to wait 3 years, because cervical cancer usually develops slowly. Cervical cancer is extremely rare in women under age 25.

Women ages 65 to 70 who have had at least three normal Pap tests and no abnormal Pap tests in the last 10 years may decide, after talking with their clinician, to stop having Pap tests. Women who have had a hysterectomy (surgery to remove the uterus and cervix) do not need to have a Pap test, unless the surgery was done as a treatment for precancer or cancer.

7. When should the Pap test be done?

A woman should have this test when she is not menstruating; the best time is between 10 and 20 days after the first day of the last menstrual period. If her period starts on the day of the test, she should call the doctor right away and reschedule the appointment. For about 2 days before a Pap test, she should avoid douching or using vaginal medicines or spermicidal foams, creams, or jellies (except as directed by a physician). These may wash away or hide abnormal cells. Also, a woman should not have sexual intercourse for 1 to 2 days before a Pap test, because this may cause unclear results. After the test, she can go back to her normal activities and return to work right away.

8. How are the results of a Pap test reported?

Most laboratories in the United States use a standard set of terms called the Bethesda System to report test results. Under the Bethesda System, Pap test samples that have no cell abnormalities are reported as "negative for intraepithelial lesion or malignancy." Samples with cell abnormalities are divided into the following categories:

- *ASC*—atypical squamous cells. Squamous cells are the thin flat cells that form the surface of the cervix. The Bethesda System divides this category into two groups:

    1. *ASC–US*—atypical squamous cells of undetermined significance. The squamous cells do not appear completely normal, but doctors are uncertain about what the cell changes mean. Sometimes the changes are related to human papillomavirus (HPV) infection (see Question 13). ACS–US are considered mild abnormalities.

    2. *ASC–H*—atypical squamous cells cannot exclude a high-grade squamous intraepithelial lesion. The cells do not appear normal, but doctors are uncertain about what the cell changes mean. ASC–H may be at higher risk of being precancerous.

- *AGC*—atypical glandular cells. Glandular cells are mucus-producing cells found in the endocervical canal (opening in the center of the cervix) or in the lining of the uterus. The glandular cells do not appear normal, but doctors are uncertain about what the cell changes mean.

- *AIS*—endocervical adenocarcinoma in situ. Precancerous cells are found in the glandular tissue.

- *LSIL*—low-grade squamous intraepithelial lesion. Low-grade means there are early changes in the size and shape of cells. The word lesion refers to an area of abnormal tissue. Intraepithelial refers to the layer of cells that forms the surface of the cervix. LSILs are considered mild abnormalities caused by HPV infection.

- *HSIL*—high-grade squamous intraepithelial lesion. High-grade means that there are more marked changes in the size and shape of the abnormal (precancerous) cells, meaning that the cells look very different from normal cells. HSILs are more severe abnormalities and have a higher likelihood of progressing to invasive cancer.

9. How common are Pap test abnormalities?

About 55 million Pap tests are performed each year in the United States. Of these, approximately 3.5 million (6 percent) are abnormal and require medical follow-up.

10. What do abnormal results mean?

A physician may simply describe Pap test results to a patient as "abnormal." Cells on the surface of the cervix sometimes appear abnormal but are very rarely cancerous. It is important to remember that abnormal conditions do not always become cancerous, and some conditions are more likely to lead to cancer than others. A woman may want to ask her doctor for specific information about her Pap test result and what the result means.

There are several terms that may be used to describe abnormal results.

- **Dysplasia** is a term used to describe abnormal cells. Dysplasia is not cancer, although it may develop into very early cancer of the cervix. The cells look abnormal under the microscope, but they do not invade nearby healthy tissue. There are four degrees of dysplasia, classified as mild, moderate, severe, or **carcinoma in situ**, depending on how abnormal the cells appear under the microscope. Carcinoma in situ means that abnormal cells are present only in the layer of cells on the surface of the cervix. However, these abnormal cells may become cancer and spread into nearby healthy tissue.

- **Squamous intraepithelial lesion (SIL)** is another term that is used to describe abnormal changes in the cells on the surface of the cervix. The word squamous describes thin, flat cells that form the outer surface of the cervix. The word lesion refers to abnormal tissue. An intraepithelial lesion means that the abnormal cells are present only in the layer of cells on the surface of the cervix. A doctor may describe SIL as being low-grade (early changes in the size, shape, and number of cells) or high-grade (precancerous cells that look very different from normal cells).

- **Cervical intraepithelial neoplasia (CIN)** is another term that is sometimes used to describe abnormal tissue findings. Neoplasia means an abnormal growth of cells. Intraepithelial refers to the layer of cells that form the surface of the cervix. The term CIN, along with a number (1 to 3), describes how much of the thickness of the lining of the cervix contains abnormal cells.

- **Atypical squamous cells** are findings that are unclear, and not a definite abnormality.

Cervical cancer, or invasive cervical cancer, occurs when abnormal cells spread deeper into the cervix or to other tissues or organs.

11. What if Pap test results are abnormal?

If the Pap test shows an ambiguous or minor abnormality, the physician may repeat the test to determine whether further follow-up is needed. Many times, cell changes in the cervix go away without treatment. In some cases, doctors may prescribe estrogen cream for women who have ASC–US and are near or past menopause. Because these cell

changes are often caused by low hormone levels, applying an estrogen cream to the cervix for a few weeks can usually help to clarify the cause of the cell changes.
If the Pap test shows a finding of ASC–H, LSIL, or HSIL, the physician may perform a colposcopy using an instrument much like a microscope (called a colposcope) to examine the vagina and the cervix. The colposcope does not enter the body. During a colposcopy, the physician may coat the cervix with a dilute vinegar solution that causes abnormal areas to turn white. If the colposcopy finds abnormal tissue, the physician may perform endocervical curettage or a biopsy. Biopsy is the removal of cells or tissues from the abnormal area for examination under a microscope. Endocervical curettage is a type of biopsy that involves scraping cells from inside the endocervical canal with a small spoon-shaped tool called a curette.

If the testing shows abnormal cells that have a high chance of becoming cancer, further treatment is needed. Without treatment, these cells may turn into invasive cancer. Treatment options include the following:

- **LEEP** (loop electrosurgical excision procedure) is surgery that uses an electrical current which is passed through a thin wire loop to act as a knife.

- **Cryotherapy** destroys abnormal tissue by freezing it.

- **Laser therapy** is the use of a narrow beam of intense light to destroy or remove abnormal cells.

- **Conization** removes a cone-shaped piece of tissue using a knife, a laser, or the LEEP technique.

12. How do terms for Pap test abnormalities compare, and which tests and treatment options may be appropriate?

Pap Test Result	Abbreviation	Also Known As	Tests and Treatments May Include
Atypical squamous cells–undetermined significance	ASC–US		• HPV testing • Repeat Pap test • Colposcopy and biopsy • Estrogen cream
Atypical squamous cells–cannot exclude HSIL	ASC–H		• Colposcopy and biopsy
Atypical glandular cells	AGC		• Colposcopy and biopsy and/or endocervical curettage

Pap Test Result	Abbreviation	Also Known As	Tests and Treatments May Include
Endocervical adenocarcinoma in situ	AIS		• Colposcopy and biopsy and/or endocervical curettage
Low-grade squamous intraepithelial lesion	LSIL	• Mild dysplasia • Cervical intraepithelial neoplasia–1 (CIN–1)	• Colposcopy and biopsy
High-grade squamous intraepithelial lesion	HSIL	• Moderate dysplasia • Severe dysplasia • CIN–2 • CIN–3 • Carcinoma in situ (CIS)	• Colposcopy and biopsy and/or endocervical curettage • Further treatment with LEEP, cryotherapy, laser therapy, conization, or hysterectomy

13. How are human papillomaviruses associated with the development of cervical cancer?

Human papillomaviruses (HPVs) are a group of more than 100 viruses. Some types of HPV cause the common warts that grow on hands and feet. Over 30 types of HPV can be passed from one person to another through sexual contact. Some of these sexually transmitted HPVs cause wart-like growths on the genitals but do not lead to cancer. About 15 sexually transmitted HPVs are referred to as "high-risk" because they are more likely to lead to the development of cancer.

HPV infection is the primary risk factor for cervical cancer. About 6 million new genital HPV infections occur each year in the United States. However, although HPV infection is very common, only a very small percentage of women with untreated HPV infections develop cervical cancer.

14. Who is at risk for HPV infection?

HPV infection is more common in younger age groups, particularly among women in their late teens and twenties. Because HPVs are spread mainly through sexual contact, risk increases with number of sexual partners. Women who become sexually active at a young age, who have multiple sexual partners, and whose sexual partners have other partners are at increased risk. Women who are infected with the human immunodeficiency virus (HIV) are also at higher risk for being infected with HPVs and for developing cervical abnormalities. Nonsexual transmission of HPVs is rare. The virus often disappears but sometimes remains detectable for years after infection.

15. Does infection with a cancer-associated type of HPV always lead to a precancerous condition or cancer?

No. Most HPV infections appear to go away on their own without causing any kind of abnormality. However, persistent infection with cancer-associated HPV types increases the risk that mild abnormalities will progress to more severe abnormalities or cervical cancer. With regular follow-up care by trained clinicians, women with precancerous cervical abnormalities can be treated before cancer develops.

16. Do women who have been vaccinated against HPVs still need to have Pap tests?

Yes. Pap tests continue to be essential to detect cervical cancers and precancerous changes, even in women who have been vaccinated against HPVs.

The U.S. Food and Drug Administration (FDA) recently approved Gardasil®, a vaccine that is highly effective in preventing infection with four types of HPV. Two of these four HPVs cause about 70 percent of cervical cancers, and the other two HPVs cause about 90 percent of genital warts (1). Another promising vaccine, Cervarix™, is being tested but is not yet approved by the FDA. These vaccines do not protect against all HPV types that cause cervical cancer. In addition, they do not protect or treat women who are already infected with HPV. Therefore, it is important for vaccinated women to continue to undergo cervical cancer screening as is recommended for women who have not been vaccinated.

17. Have any studies been done to examine HPV testing and treatment options for mild Pap test abnormalities?

The National Cancer Institute (NCI), a component of the National Institutes of Health (NIH), funded and organized the ASCUS/LSIL Triage Study (ALTS), a major clinical trial (research study with people). Findings of the trial indicate that performing an HPV test on cervical samples from women with ASC–US is more efficient than performing an immediate colposcopy or a repeat Pap test for identifying which ASC-US abnormalities need treatment. In women with ASC-US, a negative HPV test can provide reassurance that cancer or a precancerous condition is not present.

18. What are false positive and false negative results?

The Pap test is a screening test and, like any such test, it is not 100 percent accurate. Although false positive and false negative results do not occur very often, they can cause anxiety and can affect a woman's health.

A false positive Pap test means that a patient is told she has abnormal cells, but the cells are actually normal. A false negative Pap test occurs when a specimen is called normal, but the woman has a significant abnormality that was missed. A false negative Pap test may delay the diagnosis and treatment of a precancerous condition. However, regular

screening helps to compensate for the false negative result. If abnormal cells are missed at one time, chances are good that the cells will be detected the next time.

19. What methods are being developed to improve the accuracy of Pap tests?

In April 1996, the Consensus Development Conference on Cervical Cancer, which was convened by the NIH, concluded that about half of false negative Pap tests are due to inadequate specimen collection. The other half are due to a failure to identify or interpret the specimens correctly. Although the conventional Pap test is effective in the majority of cases, the conference made it clear that new methods of collecting and reading specimens are needed to reduce the number of false negatives.

The Bethesda System requires laboratories to determine whether there are enough cervical cells in the specimen to make a proper evaluation. This requirement helps improve the quality of samples and sample collection. The Bethesda System requires a sample to be categorized as "satisfactory for evaluation" or "unsatisfactory for evaluation."

One new method of collecting and analyzing samples is called *liquid-based thin-layer slide preparation*. This method may make it easier to screen for abnormal cells. Cervical cells are collected with a brush or other collection instrument. The instrument is rinsed in a vial of liquid preservative. The vial is sent to a laboratory, where an automated thin-layer slide device prepares the slide for viewing. Results of this method suggest that it is comparable to, or more sensitive than, standard Pap tests for the detection of significant abnormalities.

Computer automated readers are also being used to improve the reading of Pap tests. This technology uses a microscope that conveys a cellular image to a computer, which analyzes the image for the presence of abnormal cells.

Selected Reference

1. Koutsky LA, Ault KA, Wheeler CM, et al. A controlled trial of a human papillomavirus type 16 vaccine. *New England Journal of Medicine* 2002; 347(21):1645–1651.

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Related NCI materials and Web pages:

- National Cancer Institute Fact Sheet 3.20, *Human Papillomaviruses and Cancer: Questions and Answers* (http://www.cancer.gov/cancertopics/factsheet/Risk/HPV)

- National Cancer Institute Fact Sheet 4.21, *Human Papillomavirus (HPV) Vaccines: Questions and Answers* (http://www.cancer.gov/cancertopics/factsheet/Prevention/HPV-vaccine)
- *Understanding Cervical Changes: A Health Guide for Women* (http://www.cancer.gov/cancertopics/understandingcervicalchanges)
- *What You Need To Know About™ Cancer of the Cervix* (http://www.cancer.gov/cancertopics/wyntk/cervix)

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