Major Research Advances in Cancer Treatment, Prevention, and Screening

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A MESSAGE FROM ASCO’S PRESIDENT

For the third year, the American Society of Clinical Oncology (ASCO) is publishing Clinical Cancer Advances: Major Research Advances in Cancer Treatment, Prevention, and Screening, an annual review of the most significant cancer research presented or published over the past year.

ASCO publishes this report to demonstrate the important progress being made on the front lines of clinical cancer research today. The report is intended to give all those with an interest in cancer care—the general public, cancer patients and organizations, policymakers, oncologists, and other medical professionals—an accessible summary of the year’s most important cancer research advances.

These pages report on the use of MRI for breast cancer screening, the association between hormone replacement therapy and breast cancer incidence, the link between human papillomavirus (HPV) and head and neck cancers, and the use of radiation therapy to prevent lung cancer from spreading. They also report on effective new targeted therapies for cancers that have been historically difficult to treat, such as liver cancer and kidney cancer, among many others. A total of 24 advances are featured in this year’s report.

These advances and many more over the past several years show that the nation’s long-term investment in cancer research is paying off. But there are disturbing signs that progress could slow. We are now in the midst of the longest sustained period of flat government funding for cancer research in history. The budgets for the National Institutes of Health and the National Cancer Institute (NCI) have been unchanged for four years. When adjusted for inflation, cancer research funding has actually declined 12 percent since 2004.

These budget constraints limit the NCI’s ability to fund promising cancer research. In the past several years the number of grants that the NCI has been able to fund has significantly decreased; this year, in response to just the threat of a 10 percent budget cut, the nation’s Clinical Trials Cooperative Groups reduced the number of patients participating in clinical trials by almost 2,000; and senior researchers report that many of the brightest young minds no longer see the promise of a career in science, choosing other careers instead.

It’s time to renew the nation’s commitment to cancer research. Without additional support, the opportunity to build on the extraordinary progress to date will be lost or delayed.

This report demonstrates the essential role that clinical cancer research plays in finding new and better ways to care for the more than 1.4 million people expected to be diagnosed with cancer this year. I want to thank the Editorial Board members, the Specialty Editors, and the ASCO Cancer Communications Committee for their dedicated work to develop this report. I hope you find it useful.

Sincerely,

Nancy E. Davidson, MD
President
American Society of Clinical Oncology (ASCO)
Clinical Cancer Advances is an independent annual review of the top advances in cancer treatment, prevention, and screening across all cancer types, conducted by the American Society of Clinical Oncology (ASCO).

Over the past three decades, investment in clinical cancer research, prevention, and screening has reduced cancer incidence and death rates, increased survival rates, and significantly reduced the symptoms and side effects of cancer and its treatment. The latest statistics show that cancer death rates decreased by 2.1 percent per year from 2002 to 2004, almost twice the annual decline of 1.1 percent per year from 1993 to 2002. Today, there are more than 10 million cancer survivors in the United States.

This report documents 24 of the most significant advances on the front lines of cancer research over the past year, including six that the editors of this report consider major advances. This year, major advances can be grouped into two categories:

- **Prevention and Screening**: Studies on screening and preventing cancer from forming and spreading, including: research and guidelines on the appropriate use of magnetic resonance imaging for breast cancer screening; studies identifying a link between declines in use of hormone replacement therapy and breast cancer incidence; research linking HPV infection and head and neck cancers; and a study of radiation therapy to prevent the spread of lung cancer to the brain.

- **Targeted Therapies**: Studies of effective new targeted therapies for hard-to-treat cancers such as liver cancer and kidney cancer.

While much progress has been made, cancer still takes a tremendous toll, and new, more effective prevention and treatment strategies are urgently needed. The United States is currently in the midst of the longest sustained period of flat government funding for cancer research in the country’s history. When adjusted for inflation, the budget of the National Cancer Institute (NCI) has actually declined 12 percent since 2004. Without additional support, the opportunity to build on the extraordinary progress to date will be lost or delayed.

**SUMMARY OF FINDINGS**

Following is a summary of the major clinical research advances in 2007:

**PREVENTION AND SCREENING ADVANCES**

Several studies helped expand knowledge about how to best screen for certain cancers, and how to prevent cancer from both forming and spreading.

**Role of MRI for Breast Cancer Screening**

The use of magnetic resonance imaging (MRI) to detect breast cancer has generated significant debate. While some studies have suggested that MRI may be better able to detect some breast cancers compared with mammography, the cost, high rate of false-positives, and inconsistent standards for performing MRIs have made broad use impractical. This year, new guidelines and findings from several studies provided additional guidance about how MRI should be used for breast imaging:

- The American Cancer Society released guidelines stating for the first time that evidence supported routine MRI screening for women at high risk of developing the disease—those with a 20 percent or greater risk of developing breast cancer over their lifetime, including women with strong family histories of breast cancer, certain genetic mutations, and other known risk factors.
A study suggested that patients recently diagnosed with cancer in one breast may benefit from MRI of the other breast to increase the chance of detecting additional cancers that may have been missed by mammography or clinical examination, since women who have had cancer in one breast are at increased risk for developing cancer in the other.

A second study found that MRI is significantly more sensitive than mammography for detecting ductal carcinoma in situ (a noninvasive, precancerous condition in which abnormal cells are found in the lining of a breast duct). MRI was particularly effective at finding those tumors that are more likely to be biologically aggressive and have the potential to turn into invasive breast cancer.

It is important to note that despite the benefits of breast MRIs for women in high-risk groups, MRI is not yet recommended for the majority of women as a screening tool for breast cancer because of the cost, lack of standards, and high rate of false-positives, which can lead to unnecessary biopsies. Mammograms are still considered the best screening tool for women who are at normal risk for breast cancer.

Role of HPV Infection in Head and Neck Cancers

Two studies shed light on the role that human papillomavirus (HPV, the virus present in virtually all cervical cancers) plays in the development of head and neck cancers. The studies suggest a possible role for the recently approved HPV vaccine in preventing head and neck cancers.

The first study found that oral HPV infection is strongly associated with certain types of head and neck cancer, regardless of whether patients used tobacco and alcohol (established risk factors for these types of cancer). The researchers found that one of the strains of HPV most commonly associated with cervical cancer was detected in 72 percent of oral cancer tumors.

The second study evaluated the link between HPV infection, treatment response, and survival outcome for patients with certain head and neck cancers. It found that patients with HPV-positive tumors may have a better prognosis than patients with HPV-negative tumors. Patients with the virus had a lower risk that their disease would spread and a reduced risk of death. Researchers believe it is possible that the HPV infection causes cancers that are biologically different from other cancers.
ABOUT THIS REPORT

The American Society of Clinical Oncology—the leading medical society representing more than 25,000 oncologists and other professionals worldwide who care for people with cancer—has developed this report to demonstrate the important progress being made in clinical cancer research and to highlight emerging trends in the field.

The report is also intended to fill a gap in cancer literature. It is the only published report to highlight the major advances in clinical cancer research and care each year, and it is written for everyone with an interest in cancer care: the general public, cancer patients and organizations, policymakers, oncologists, and other medical professionals.

This report, now in its third year, was developed under the guidance of a 21-person editorial board made up of leading oncologists and other cancer specialists, including specialty editors for each of the disease-specific and issue-specific sections. The editors reviewed research published in peer-reviewed scientific journals and the early results of research presented at major scientific meetings over a one-year period (October 2006-September 2007). Only studies that significantly altered the way a cancer is understood or had an important impact on patient care were included. Research in each section is divided into “major advances” and “other notable research,” depending on the impact of the advance on patient care and survival.

While important research is underway in all cancer types, advances that met the above criteria were not demonstrated in all types of cancer over the past year. Studies included in this year’s report are grouped as follows:

- Blood and lymphatic cancers
- Breast cancer
- Central nervous system tumors
- Gastrointestinal cancers
- Genitourinary cancers
- Gynecological cancers
- Head and neck cancers
- Lung cancer
- Pediatric cancers
- Sarcoma
- Cancer prevention
- Cancer survivorship

The research considered for this report covers the full range of clinical cancer issues:

- Epidemiology (populations at greatest or increasing risk)
- Prevention (lifestyle changes and chemopreventive agents)
- Screening/early detection
- Treatment with traditional therapies (surgery, chemotherapy, and radiation therapy) as well as newer, more targeted therapies (monoclonal antibodies, kinase inhibitors, angiogenesis inhibitors, and epidermal growth factor receptor inhibitors)
- Access to high-quality care
- Survivorship

Decreasing Use of Hormone Replacement Therapy Linked to Declines in Breast Cancer Cases

Two studies this year reported that the recent significant reduction in breast cancer incidence appears to be associated with the declining use of hormone replacement therapy (HRT) in menopausal women. The use of HRT declined beginning in 2002, following a report from the National Institutes of Health-sponsored Women’s Health Initiative that linked the use of estrogen plus progestin during and after menopause with a number of adverse effects, including an increased risk for invasive breast cancer. While other factors that could have played a role in the decreased incidence (e.g., recent declines in mammography screening rates and changes in diet) could not be completely ruled out as contributors, the association with HRT was strong.

Preventive Radiation Therapy Improves Survival for Patients with Small Cell Lung Cancer

Researchers reported for the first time that radiation therapy to the head for patients with advanced small cell lung cancer cuts the risk that the cancer will spread to the brain by about two-thirds, and as a result extends patients’ lives. In this study, radiation prevented the deterioration of physical and psychological functioning that can occur when cancer spreads to the brain. Previous studies have showed that radiation therapy to the head can extend survival in patients with earlier stage small cell lung cancer, but this was the first
study to evaluate the treatment in patients with advanced disease who have a higher likelihood of developing brain metastases and have lower survival rates.

**TARGETED THERAPIES EFFECTIVE IN HARD-TO-TREAT CANCERS**

Two studies of anti-cancer therapies that target specific molecular defects of cancer cells stood out as advances that have the potential to change the standard of care for some liver and kidney cancers, which have proven particularly hard to treat.

**Sorafenib Improves Survival in Liver Cancer**

Primary liver cancer (cancer starting in the liver rather than spreading to the liver from other organs or sites) is the third leading cause of cancer death globally, often resulting in death within a year of diagnosis. In a significant advance in the treatment of the disease, a large study found that patients who took the targeted therapy sorafenib (Nexavar) for hepatocellular carcinoma (the most common type of liver tumor) lived about 44 percent longer than patients who did not receive the anti-cancer drug. Sorafenib is currently approved by the U.S. Food and Drug Administration (FDA) for treating a form of advanced kidney cancer and is being evaluated in patients with other cancers as well.

**Bevacizumab Improves Treatment of Advanced Kidney Cancer**

A large multicenter study showed adding bevacizumab (Avastin) to interferon-α2a (an older kidney cancer drug) as a first-line treatment for advanced kidney cancer improves progression-free survival—the length of time during and after treatment that the cancer does not grow. Adding bevacizumab nearly doubled progression-free survival, from 5.4 months to 10.2 months. Bevacizumab is approved by the FDA for the treatment of metastatic colorectal cancer and non-small cell lung cancer. Historically, there have been very few effective treatments for renal cell carcinoma, the most common type of kidney cancer. In the past two years, however, three targeted therapies have proven effective at either increasing survival or increasing progression-free survival and have received FDA approval—sorafenib, sunitinib (Sutent), and temsirolimus (Torisel). Future trials are expected to either compare bevacizumab to these drugs or evaluate it in combination with these new therapies.
CANCER TYPES

CANCERS OF THE BLOOD AND LYMPHATIC SYSTEM

Cancers of the blood and lymphatic system (also called "hematologic" cancers) include leukemias, lymphomas, multiple myeloma, and myelodysplastic syndromes. A number of promising advances for hematologic cancers were made in the past year, including treatments for multiple myeloma and two types of leukemia—acute promyelocytic leukemia and chronic myelogenous leukemia.

NOTABLE RESEARCH

Arsenic Trioxide Improves Leukemia Survival
Arsenic has historically been known as a potent poison, but its use in traditional Chinese medicine led to its development as a treatment for leukemia. Arsenic trioxide (Trisenox) was approved by the U.S. Food and Drug Administration (FDA) in 2000 for the treatment of patients with acute promyelocytic leukemia (APL) for whom standard treatment was not effective. It is now considered the standard of care as a second-line treatment for APL.

In 2007 a study showed that the drug is more effective than standard therapy when added to treatment for patients newly diagnosed with APL as well. A multi-institutional phase III clinical trial found that the addition of arsenic trioxide to standard therapy significantly increases survival among adult patients with newly diagnosed APL. In this trial, overall survival was 86 percent in the arsenic trioxide arm versus 77 percent in the standard arm (which involves three stages of treatment known as induction, consolidation, and maintenance therapy).1

Dasatinib Active as a First-Line Treatment for Chronic Myelogenous Leukemia
Results of a phase II trial showed that dasatinib (Sprycel) results in high hematologic and cytogenetic response rates when used as a first-line treatment for early-stage chronic myelogenous leukemia (CML). This is the first study to look at dasatinib as a first-line treatment in patients newly diagnosed with the most common stage of CML, called chronic phase. The patients in the study received dasatinib orally every day. After three months, complete hematologic response, defined as normal blood counts and no enlargement of the spleen, occurred in 81 percent of patients. Complete cytogenetic response, defined as no evidence of the "Philadelphia" chromosome (which encodes the BCR-ABL protein implicated in CML) in the bone marrow, occurred in 73 percent of patients. After six months, 95 percent of patients had complete cytogenetic response.

Dasatinib was approved by the FDA in 2006 as a second-line treatment for CML patients who have developed resistance to imatinib (Gleevec), the standard first-line treatment. Both drugs are targeted therapies that bind to and inhibit BCR-ABL, the mutated protein that causes CML. Imatinib binds to the protein only when it is in its "closed" form, while dasatinib binds to the protein in both its closed and "open" forms.2

Lenalidomide and Bortezomib More Effective Together for Myeloma
Multiple myeloma, a cancer of the bone marrow, has historically been very difficult to treat. A phase I clinical trial found that the combination of two drugs designed to treat multiple myeloma may be more effective together than when the drugs are used individually. The trial tested the drugs bortezomib (Velcade) and lenalidomide (Revlimid)
in myeloma patients whose disease had recurred and was progressing despite prior treatment with other therapies. The researchers found that 58 percent of patients responded to lenalidomide and bortezomib, including 6 percent who had complete remission. The median duration of remission was six months, with some patients experiencing remission for up to two-and-a-half years.

Bortezomib, which was approved by the FDA in 2003, interferes with the ability of myeloma cells to break down and dispose of certain proteins, a process they need to grow and spread. Lenalidomide, approved by the FDA for myeloma in 2006, disrupts the way tumor cells interact with surrounding tissue in the bone marrow.\(^3\)

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2. Atallah EL, et al. Dasatinib is safe and effective in patients with previously untreated chronic myelogenous leukemia (CML) in chronic phase (CML-CP). Presented at the 43rd Annual Meeting of the American Society of Clinical Oncology, June 2007; Chicago, IL.
BREAST CANCER

Over the past few decades, improvements in early detection and the development of more effective treatments have led to significant declines in breast cancer deaths and improved outlook for women living with the disease. Increasingly, breast cancer is being treated as a group of diseases rather than as a single disease. The molecular characteristics of each person’s tumor cells are taken into account when treatment options are considered. For example, identifying whether specific hormone receptors are present in a patient’s cancer cells can help determine whether therapies targeted at those receptors will help an individual patient. Improved prognostic methods also help determine how aggressive a patient’s treatment should be.

This year, magnetic resonance imaging (MRI) was recommended for breast cancer screening in specific groups of patients. In addition, a decline in breast cancer incidence rates was linked to a reduction in the use of hormone replacement therapy. Another large trial looked at the best way to deliver radiation therapy to patients after they have had surgery for early-stage disease.

MAJOR ADVANCES

MRI for Breast Cancer Detection

The use of MRI to detect breast cancer has generated significant debate. While some studies have suggested that MRI may be better able to detect some breast cancers compared with mammography, the cost, high rate of false-positives, and inconsistent standards for performing MRIs have limited its potential usefulness. This year, findings from several studies led to new guidelines about the use of MRI for breast imaging:

- The American Cancer Society (ACS) released guidelines recommending routine MRI screening for women with a 20 percent or greater risk of developing breast cancer over their lifetime. The ACS said that in addition to mammography, annual screening using MRI is recommended for women who:
  - Have a BRCA 1 or 2 mutation
  - Have a first-degree relative with a BRCA 1 or 2 mutation, but who are untested themselves
  - Have a lifetime risk of breast cancer of 20 to 25 percent or more using standard risk assessment models
  - Received radiation treatment to the chest between ages 10 and 30, such as for Hodgkin’s disease
  - Carry, or have a first-degree relative who carries, a genetic mutation in the TP53 or PTEN genes (Li-Fraumeni syndrome and Cowden and Bannayan-Riley-Ruvalcaba syndromes).

- A study suggested that patients recently diagnosed with cancer in one breast may benefit from MRI of the other breast to increase the chance of detecting additional cancers that may have been missed by mammography or clinical examination.

- Another study found that MRI is significantly more sensitive than mammography for detecting ductal carcinoma in situ (a noninvasive, precancerous condition in which abnormal cells are found in the lining of a breast duct), especially those tumors that are more likely to be biologically aggressive.

Despite the benefits of breast MRIs for women in high-risk groups, however, MRI is not yet recommended for the majority of women as a screening tool for breast cancer because of the cost and inconsistent standards for performing MRI. MRIs are also highly sensitive and not very specific, resulting in a high rate of false-positives, which can lead to unnecessary biopsies. It has not yet been shown that MRI screening improves overall survival or other outcomes.
Decreasing HRT Use Linked to Declines in Breast Cancer Incidence

Two studies this year reported a link between the recent reduction in breast cancer incidence and the decline in the use of hormone replacement therapy (HRT) in menopausal women. HRT use declined beginning in 2002, following a report from the National Institutes of Health (NIH)-sponsored Women’s Health Initiative that linked the use of estrogen plus progesterin during and after menopause with a number of adverse effects, including an increased risk for invasive breast cancer.

In 2007 one large study found that rates of breast cancer declined by 13 percent from 2001 to 2003. Both studies found that declines in breast cancer occurred only in women aged 50 years or older, and were more significant in breast cancers that are estrogen receptor-positive, the type of cancer whose growth could be fueled by the use of additional hormones.

Both studies analyzed large databases of patients and examined other factors that could have played a role in the decreased incidence, such as mammography screening rates and changes in diet. While those factors could not be completely ruled out as additional contributors, the association with HRT was strong, warranting further study.5,6

OTHER NOTABLE RESEARCH
Less Radiation Appears to Be as Effective as Standard Dose in Early-Stage Cancer

In an effort to reduce radiation exposure and side effects, a multicenter phase III clinical trial found that a type of therapy called hypofractionated radiation (fewer, larger doses of radiation) appears to be as effective as conventional radiation in reducing the risk of cancer recurrence among women with early breast cancer, with no greater detrimental effects to healthy breast tissue. The study—called the START Trial, for Standardisation of Breast Radiotherapy—was the largest to date to explore the safety and efficacy of this approach in women with early-stage disease.

Conventional radiation therapy for women with early breast cancer is typically given at a consistent dose, delivered in 25 installments ("fractions"), five days a week over a period of five weeks. Physicians hypothesized that it may be possible to reduce the overall radiation dose and the treatment period without compromising the safety or effectiveness of therapy. This trial comprised two different studies that looked at different variations in radiation dose. After an average follow-up of five to six years, the incidence of local recurrence remained very low among all patients in both trials (3.4 percent of patients had local relapse with no significant difference between radiation regimens).7

REFERENCES

CENTRAL NERVOUS SYSTEM CANCERS

Treating tumors of the central nervous system and the brain in particular represents a unique clinical challenge. Although clinical trials over the past 25 years have evaluated a variety of drugs and treatment delivery systems, the prognosis for people with brain tumors has remained largely unchanged. This year a clinical trial showed for the first time that a combination of drugs shrinks gliomas, the most common form of brain cancer, which has been particularly difficult to treat. Another study showed that radiation therapy can benefit elderly patients with glioblastoma.

NOTABLE RESEARCH
**Bevacizumab Effective against Gliomas**
A phase II clinical trial found that for patients with advanced, recurrent glioma, combining the targeted therapy bevacizumab (Avastin) with irinotecan (Camptosar) shrank tumors or restricted their growth for three months longer than existing treatments. Responses were seen in 63 percent of patients. This is the first time that bevacizumab, a drug that targets the blood vessels that feed tumors, has been tested against brain tumors.1

**Radiotherapy Improves Survival of Elderly Patients with Glioblastoma**
A study found that patients 70 years of age or older with glioblastoma (a fast-growing, often fatal type of brain tumor) who received radiotherapy in addition to supportive care to relieve symptoms lived 53 percent longer than those who received supportive care alone. Median survival for the radiotherapy group was 29 weeks, versus 17 weeks for the group that received supportive care alone. There were no severe side effects related to the radiation treatments, and the quality of life and cognitive functions did not differ between those receiving radiation and those receiving supportive care alone. The study is significant because there is currently no standard treatment for patients in this age range.2

REFERENCES

**GASTROINTESTINAL CANCERS**

Gastrointestinal cancers include those of the esophagus, stomach, liver, pancreas, biliary tract, colon, rectum, and anus. The ability to effectively treat these cancers varies significantly. For example, while many colorectal cancers can be diagnosed in their early, more curable stages using colonoscopy, no such screening tests exist for less common cancers of the digestive tract—such as those of the pancreas—which are often diagnosed when they are advanced and difficult to treat effectively. In 2007, research investigated the use of targeted therapies to treat a variety of gastrointestinal cancers. In addition, a large study found a link between diets high in fat and an increased risk of recurrence and death in patients with colorectal cancer that had spread to the lymph nodes.

**MAJOR ADVANCE**

**Sorafenib Improves Survival in Liver Cancer**

Primary liver cancer (cancer arising in the liver rather than spreading to the liver from other organs or sites) is the third leading cause of cancer death globally, often resulting in death within a year of diagnosis. In a significant advance in the treatment of the disease, a phase III study found that patients who took the targeted therapy sorafenib (Nexavar) for hepatocellular carcinoma (the most common type of liver tumor) lived about 44 percent longer compared with patients who did not receive the anti-cancer drug. Sorafenib, a tablet that is taken orally, is currently approved by the FDA for treating a form of advanced kidney cancer, and is being evaluated in patients with other cancers.

In this study, patients who received sorafenib lived a median of 10.7 months compared with 7.9 months for those who received a placebo. Time to cancer progression was also significantly longer in the treatment group: 5.5 versus 2.8 months. The study was terminated early due to the positive results.

**NOTABLE RESEARCH**

**Use of Cetuximab in Colon Cancers**

A phase III clinical trial involving patients with advanced colorectal cancer showed that adding the targeted therapy cetuximab (Erbitux) to a standard first-line chemotherapy combination called FOLFIRI [5-fluorouracil (5-FU), irinotecan (Camptosar), and leucovorin] reduced the risk of further colorectal cancer growth or spread by 15 percent. Significantly more patients (46.9 percent) responded to cetuximab plus FOLFIRI than FOLFIRI alone (38.7 percent). Overall, the number of patients able to undergo surgery to completely remove their tumors was three times higher in the cetuximab arm. In addition, more than twice as many patients with liver metastases were able to have their tumors completely removed in the cetuximab plus FOLFIRI group.

The study was the first to evaluate this combination, providing a new treatment option and enabling more patients to have their tumors surgically removed. Cetuximab is currently approved by the FDA as second-line or third-line therapy, meaning it is used to treat advanced colorectal cancer that has continued to grow despite previous therapy.

**High-Fat Diets Linked to Recurrence of Colon Cancer**

A large observational study of patients with stage III colorectal cancer (cancer that has spread to the lymph nodes) found that some dietary patterns were linked to a higher risk of disease recurrence and death following surgery than others. The study was designed to evaluate the benefits of two forms of adjuvant chemotherapy (additional treatment given after the primary treatment for disease). Because both treatments resulted in identical outcomes, researchers were able to study the entire study population as a single group. The investigators compared the likelihood...
of recurrence among those who ate a more traditional “Western” diet, characterized by high intakes of meat, fat, refined grain, and dessert to those who ate a “prudent” diet, in which patients consumed large quantities of fruits, vegetables, poultry, and fish. Patients on the Western diet were 3.25 times more likely to have their cancer return or to die compared with the patients on the prudent diet. Further research is needed to determine which specific nutrients or food types may have the strongest link to patient outcome.\(^3\)

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GENITOURINARY CANCERS

Genitourinary cancers include cancers of the prostate, kidneys, testicles, and bladder/urethra. The most significant research finding this year identified a new potential treatment for kidney cancer. Research showed that bevacizumab, a drug that has been approved by the FDA for the treatment of metastatic colorectal cancer and non-small cell lung cancer, was also effective against renal cell carcinoma. Historically, there have been very few effective treatments for renal cell carcinoma, the most common type of kidney cancer. In the past two years, however, three targeted therapies have proven effective in increasing survival and have received FDA approval—sorafenib, sunitinib, and temsirolimus.

MAJOR ADVANCE

Bevacizumab for Renal Carcinoma

A large multicenter study showed adding bevacizumab to interferon-α2a (an older kidney cancer drug) as a first-line treatment for advanced kidney cancer nearly doubles progression-free survival—the length of time during and after treatment that the cancer does not grow. This was the first randomized phase III trial to confirm its activity in the first-line treatment of kidney cancer. In the study, patients with metastatic kidney cancer who had had surgery to remove their tumors were randomized to receive either bevacizumab or a placebo in addition to interferon. Adding bevacizumab nearly doubled progression-free survival, from 5.4 months to 10.2 months. The tumor response rate was 31 percent for the bevacizumab group versus 13 percent for the placebo group.

Bevacizumab targets a protein called vascular endothelial growth factor (VEGF), which stimulates new blood vessel formation. When bevacizumab binds to VEGF, the protein cannot stimulate the growth of blood vessels, cutting off oxygen and other nutrients the tumor needs to grow. Future studies are likely to test bevacizumab as a single agent for first-line treatment of kidney cancer by directly comparing it against sorafenib, sunitinib, and temsirolimus as well as evaluating it in combination with those and other drugs.

REFERENCES

GYNECOLOGICAL CANCERS

Gynecologic cancers include cancers of the cervix, uterus, ovaries, fallopian tubes, vulva, and vagina. Endometrial cancer, which makes up about 95 percent of all uterine cancers diagnosed, is the most common gynecologic cancer in the United States, affecting about 39,000 women each year.

NOTABLE RESEARCH

External Beam Radiation Therapy Does not Improve Outcomes in Endometrial Cancer

External beam radiation therapy (EBRT) is widely used to treat early-stage endometrial cancer in the United States, despite the lack of evidence of its efficacy. A definitive study found that combining EBRT with surgery does not extend survival or reduce the risk of recurrence in women with early-stage endometrial cancer, but doubles the incidence of side effects. The trial was the largest to date to evaluate the effectiveness of EBRT. These findings confirm prior studies showing that EBRT is not effective, and will likely end any debate about continued use of EBRT for these patients.

About half of the women received EBRT after surgery and half did not. After a median follow-up of more than four years, neither overall survival nor likelihood of recurrence differed significantly between the two groups. However, the incidence of side effects in the radiation therapy group was nearly double that in the surgery group: 61 percent compared with 31 percent. The most common side effects were fatigue, diarrhea, and increased urinary frequency.¹

REFERENCES

Cancers of the head and neck—those affecting the nose, mouth, throat, tongue, and larynx, as well as the thyroid gland—are usually treated with a combination of surgery, chemotherapy, and/or radiation therapy. In the past year, there were two major findings that explored the link between head and neck cancers and human papillomavirus (HPV), the virus that causes the majority of cervical cancer cases. In addition, targeted therapies showed promise for a number of different types of head and neck cancer.

**MAJOR ADVANCE**

**Role of HPV Infection in Head and Neck Cancers**
Two studies expanded understanding of the effect of HPV infection on head and neck cancers. While one study showed that HPV may cause some head and neck cancers, another found that HPV-positive head and neck cancers may be easier to treat.

- A study found that oral HPV infection is strongly associated with certain types of head and neck cancer, regardless of whether patients used tobacco and alcohol (established risk factors for this type of cancer). The researchers studied 100 patients with newly diagnosed oropharyngeal cancer—cancer of the tonsils, back of the throat, or the base of the tongue. They found that DNA from HPV-16, one of the strains of HPV most commonly associated with cervical cancer, was detected in 72 percent of the tumor specimens. In addition, 64 percent of patients with cancer had antibodies for cancer-related proteins commonly found in HPV-16. While it cannot be stated definitively that HPV causes oropharyngeal cancer, the association is strong and warrants further study to determine if the recently approved HPV vaccine could prevent some head and neck cancers, in addition to cervical cancer.¹

- A phase II clinical trial evaluated the link between HPV infection and treatment response and survival outcome for patients with head and neck squamous cell carcinoma (HNSCC). It found that patients with HPV-positive HNSCC may have a better prognosis than patients with HPV-negative tumors. Patients with newly diagnosed, advanced HNSCC were treated with a combination of chemotherapy and radiation therapy. After a median follow-up of about 39 months, patients infected with HPV had a risk of progression that was 72 percent lower and a risk of death that was 79 percent lower than those who were uninfected. The researchers suggested that it is possible that the HPV infection causes cancers that are biologically different from other cancers.²

**OTHER NOTABLE RESEARCH**

**Cetuximab with Chemotherapy as First-Line Therapy Prolongs Survival in Head and Neck Cancer**
A multicenter phase III study found that for patients with head and neck cancer, adding the targeted therapy cetuximab to standard chemotherapy significantly prolongs survival for patients with cancer that has recurred or spread. The researchers compared overall survival between patients with squamous cell carcinoma of the head and neck who received cetuximab plus the standard treatment or the standard treatment alone. Most patients had cancers of the larynx or pharynx. The median overall survival was significantly longer in the cetuximab group (10.1 months) compared with the control group (7.4 months). This is the first time the effectiveness
of cetuximab has been demonstrated in a large group of patients with this disease when used as first-line treatment.\(^3\)

**Axitinib Shows Activity Against Advanced Thyroid Cancer**

The standard treatment for thyroid cancer is surgery and/or radioactive iodine, which cures a large percentage of patients. But there are currently few treatments for patients who do not respond to those therapies. This year, the first phase II clinical trial to evaluate the experimental drug axitinib in patients with advanced thyroid cancer showed that the drug has substantial antitumor activity. In this study, 22 percent of patients experienced tumor shrinkage, which lasted from one to 16 months. In another 50 percent of patients, tumors stopped growing. All of the patients had thyroid cancer that had advanced despite other treatments. Axitinib, which is given orally as a pill, inhibits receptors of vascular endothelial growth factor (VEGF), which plays a role in tumor formation by promoting the growth of blood vessels that feed tumors.\(^4\)

**REFERENCES**


3. Vermorken JB, et al. Erbitux extends survival of patients with recurrent or metastatic SCCHN when added to first line platinum based therapy - Results of a randomized phase III (Extreme) study. Presented at the 43rd Annual Meeting of the American Society of Clinical Oncology; June 2007; Chicago, IL.

LUNG CANCER

Lung cancer incidence and mortality have slowly but steadily declined in recent years, due to a decrease in cigarette smoking over the past several decades, particularly among men. However, the disease remains the leading cause of cancer deaths in the United States, and is expected to kill more than 160,000 people in 2007.

Progress has also been made in lung cancer treatment. Some targeted therapies are proving effective against lung cancer, and research has shown conclusively that giving chemotherapy after surgery can extend patients’ lives. Researchers are learning that specific characteristics of an individual’s tumor may help predict prognosis and response to treatment—a treatment approach known as personalized medicine.

In 2007, research showed that, in addition to early-stage cancer, patients with advanced small cell lung cancer benefit from preventive radiation therapy to the head to decrease the spread of cancer to the brain and prolong survival. Small cell lung cancer is difficult to cure and is diagnosed in nearly 30,000 people (or about 15 percent of all patients with lung cancer) in the United States each year.

MAJOR ADVANCE
Preventive Radiation Therapy Decreases Brain Metastases, Prolongs Survival, for Patients with Advanced Lung Cancer

Researchers reported for the first time that radiation therapy to the head given to patients who respond to chemotherapy for advanced small cell lung cancer cuts the risk that the cancer will spread to the brain by about two-thirds, and as a result extends patients’ lives.

This is important because when cancer spreads to the brain, it leads to the deterioration of physical and psychological functioning. Previous studies showed that radiation therapy to the head can extend survival in patients with earlier stage small cell lung cancer, but this was the first study to evaluate the treatment in patients with advanced disease, who have an even higher risk of developing brain metastases. After one year, the radiation therapy group had significantly fewer brain metastases-causing symptoms (15 percent) than the control group (40 percent). Moreover, 27 percent of the patients in the radiation therapy group were alive after one year, compared with only 13 percent of patients who did not receive the treatment.1,2

REFERENCES

PEDIATRIC CANCERS

Significant progress has been made over the past several decades in treating childhood cancer, with overall five-year survival now at nearly 80 percent, compared with 58 percent about 30 years ago. This is due, in part, to the fact that most childhood cancer patients are treated in clinical trials, where they have access to cutting-edge therapies, and are closely monitored.

However, long-term side effects of cancer treatment continue to be a problem. This year, a large international trial found that the intensity of treatment for the rare childhood cancer neuroblastoma can be greatly reduced, maintaining high survival rates while lowering major side effects such as organ damage and hearing loss.

Another study looked at programs for improving childhood cancer treatment in low- and middle-income countries and found that relatively small monetary investments aimed at the specific needs of each country can improve the treatment of children with cancer.

NOTABLE RESEARCH

Less Intense Treatment for Children with Advanced Neuroblastoma Achieves High Survival Rates

Neuroblastoma is a relatively rare pediatric cancer of the sympathetic nervous system that typically begins in one of the adrenal glands. Although survival rates are generally high, the standard treatment can have long-lasting side effects, including kidney and heart damage and hearing loss.

A large phase III clinical trial showed that infants and children with neuroblastoma can be treated with significantly less aggressive chemotherapy than has been typically used and still achieve high survival rates. The study was conducted by the Children's Oncology Group, a cooperative organization of physicians and institutions in the United States, Canada, Australia, and New Zealand. Patients in the trial received fewer rounds of chemotherapy over a shorter total treatment time compared with the current standard treatment. In addition, researchers substituted cisplatin, one of the drugs normally used to treat neuroblastoma, with another drug called carboplatin.

Cisplatin has been associated with high rates of long-term side effects, especially hearing loss. With an average follow-up time of three years, the overall survival rate for all patients in the study was 96 percent. While the study did not directly compare the less intense treatment with standard therapy, the survival rate was equivalent to or better than that seen in large studies of the standard treatment. In this study, major side effects to the heart, kidney, liver, and hearing were all less than 2 percent, significantly lower than those experienced with standard therapy.

Small Investments Can Improve Childhood Cancer Treatment in Low- and Middle-Income Countries

Initial results of a program to fight childhood cancer in low- and middle-income countries show that relatively small monetary investments in a range of different projects can help improve treatment for children with cancer. The program, My Child Matters, was created by the Geneva-
SARCOMA

Sarcomas are rare tumors that can occur in any site of the human body, although about half occur in the limbs. There are more than 50 different types of soft tissue sarcomas, which originate in tissues such as fat, muscles, nerves, tendons, and blood and lymph vessels. Sarcomas in the bone are known as osteosarcomas.

Because these tumors vary greatly in their tissue of origin, treatments also vary. About 15 percent of soft tissue sarcomas occur in the abdominal region, and many of those tumors are known as gastrointestinal stromal tumors (GIST). The targeted therapy imatinib is approved by the FDA for patients with inoperable or advanced GIST. In 2007, research indicated that the drug may also provide benefit when given as treatment after surgery to remove a single localized tumor (adjuvant therapy).

NOTABLE RESEARCH

Imatinib Increases Recurrence-Free Survival in Patients with GIST

An NCI-sponsored study found that giving imatinib after surgery increases recurrence-free survival when administered following the complete removal of GIST lesions larger than three centimeters. After undergoing surgery, patients took imatinib or a placebo for one year and were screened frequently for tumor recurrence. At the end of the first year of treatment, 97 percent of patients in the imatinib group had not experienced recurrence, compared with 83 percent in the placebo group. The differences were most notable in patients with tumors larger than 10 centimeters. No differences in the overall survival rates were noted with this short follow-up. Based on the findings, the study was stopped early and any patients still taking placebo were offered imatinib.

REFERENCES

CANCER PREVENTION

Cancer prevention research examines lifestyle changes to reduce the risk of developing cancer (such as smoking cessation, exercise, following a healthy diet, and maintaining a healthy weight), as well as certain drugs, vaccines, and dietary supplements that may lower the risk of developing cancer. It also includes research on interventions to reduce environmental causes of cancer. The most significant advances in cancer prevention in 2007 evaluated the use of aspirin as a “chemopreventive” agent to reduce the risk of cancer, especially colorectal cancer.

NOTABLE RESEARCH

Aspirin Use Promising for Prevention of Colorectal Cancer

Three studies found that long-term aspirin use was associated with a reduced risk of colorectal cancer, and possibly other cancers as well.

- One study found that daily use of adult-strength aspirin for five or more years significantly reduced the chance of developing cancer. Out of 100,000 people, the study estimated that 1,858 men and 1,083 women developed cancer, compared with 2,163 men and 1,163 women who did not take aspirin.1

- An analysis of several large randomized controlled trials and observational studies found that use of 300 mg or more of aspirin per day for approximately five years was effective for the prevention of colorectal cancer. However, this effect was only seen after a period of 10 years, and follow-up from other trials will be necessary to establish the effects of lower and less frequent doses of aspirin.2

- An analysis of two large cohort studies found that regular use of aspirin was associated with a reduced risk of colorectal cancers that overexpress COX-2 (an enzyme that plays a role in inflammation) but not of colorectal cancers with weak or absent expression of COX-2.3

While these studies are promising, at this time aspirin is not recommended for colorectal cancer prevention for the general public because of its side effects, which include stomach pain, heart burn, nausea, and vomiting and possibly serious health risks including gastrointestinal bleeding.

REFERENCES

Several studies in 2007 examined the long-term health problems of survivors of pediatric cancers. There are more than 10 million cancer survivors in the United States, and more than 250,000 of them were first diagnosed when they were under the age of 21. Today about 80 percent of children diagnosed with cancer will be alive at least five years after diagnosis, and many of them will be considered cured. However, cancer therapies such as chemotherapy and radiation—especially in children who are still growing at the time of treatment—can result in long-term health problems known as late effects. To study late effects, the NCI initiated the Childhood Cancer Survivor Study (CCSS) in 1993. In the past year the group published several important studies on a variety of late effects, as did a multi-institutional European research group.

**NOTABLE RESEARCH**

**Long-term Health Problems of Cancer Survivors**

Two studies addressed the rates of long-term health problems in survivors of childhood cancer. A Dutch study found that almost 75 percent of survivors had one or more health problems (including second cancers, coronary artery disease, lung problems, and endocrine disorder) and 24.6 percent had five or more health problems, after a median follow-up of 17 years. The most severe effects were found in survivors of bone tumors and the least severe were found in survivors of leukemia and Wilm’s tumor. Another study from CCSS determined that 62.3 percent of survivors had at least one chronic health condition, while 27.5 percent had a severe or life-threatening condition, with an average time between cancer diagnosis and completion of the survey of 17.5 years.\(^1\)\(^,\)\(^2\)

**Survivors of Childhood Leukemia and Brain Tumors Have Elevated Stroke Risk**

A report from the CCSS found that long-term survivors of childhood leukemia and brain tumors are at increased risk of stroke years after their cancer treatment has been completed, especially those who were treated with a particular type of radiation therapy. Although the two diseases are very different, both leukemia and brain tumors require therapy of the central nervous system, usually with moderate or high-dose radiation therapy to the skull. For leukemia survivors, the rate of stroke was low—0.8 percent—but significantly higher than the control group of siblings who had not had cancer (0.2 percent). For brain tumor survivors, the rate of stroke was 3.4 percent, and as high as 6.5 percent for patients who had been treated with both cranial radiation and alkylating chemotherapy agents.\(^3\)

**Most Survivors of Childhood Cancer Don’t Get Recommended Follow-Up Care**

Another report from the CCSS found that even though survivors of childhood cancer are known to be at higher risk for long-term health problems, the majority of them do not receive specialized medical care over the long term. It was the first study to look in detail at long-term health care utilization among childhood cancer survivors. The study focused particularly on screening for cardiac problems and breast cancer, two conditions known to be common in certain survivors. Among patients at increased risk for cardiac problems or breast cancer, only 28 percent and 49 percent reported having received an echocardiogram or mammogram, respectively.\(^4\)

**REFERENCES**

As this report demonstrates, significant advances have been made in the understanding and management of cancer. Much of the progress in recent years can be attributed to a better understanding of basic biology and the role of genes in the origin and progression of disease.

However, much more must be done to ensure that discoveries made in the laboratory translate into advances that benefit patients. Federal funding for both the NIH and the NCI has been flat for four years—the longest period of flat funding in the nation’s history. When adjusted for inflation, cancer research funding has declined 12 percent since 2004.

These budget constraints limit the NCI’s ability to fund promising cancer research:

- NCI is currently able to fund just 20 percent of the grant applications it receives.

- The NCI Clinical Trials Cooperative Groups receive most of their funding from the NCI and are a critical link in the nation’s clinical cancer research system—enrolling more than 30,000 patients per year in clinical trials. This year, the Cooperative Groups reduced the number of patients participating in clinical trials by almost 2,000, the first time there has ever been a reduction in accrual. The cooperative groups involve more than 1,700 research and health care institutions, and have completed more than 4,000 trials over the past 50 years. These trials have resulted in improvements in the standard of care and survival for virtually every type of cancer. Yet funding for the groups has declined since 2002, from $160 million to less than $150 million annually.

- The Cooperative Groups also report a 50 percent reduction in new protocol concepts—i.e., ideas for new research projects. In addition, the number of trials being conducted outside the United States to pursue Food and Drug Administration approval for new drugs is increasing—suggesting that many researchers may not see a vibrant and viable future for U.S. clinical cancer research and may be turning to other fields or moving research overseas.

Flat funding and threatened cuts also have led to Cooperative Groups’ closure of research programs in brain cancer, melanoma, sarcoma, and pediatric cancers, among others, and a decrease in NCI funding for genetic, epidemiological, behavioral, social, applied, and surveillance cancer research programs.

To accelerate the pace of cancer research, ASCO makes two primary recommendations for the coming year:

1. INCREASE FUNDING FOR CANCER RESEARCH

Congress’ doubling of the NIH budget between 1998 and 2003 yielded major new discoveries in all areas of biomedical research, including cancer. However, flat NIH funding since 2003 is eroding the extraordinary progress that has been made over the past decade, at a time when the scientific potential has never been greater.

Cancer research funding increases are urgently needed to reverse the effects of flat funding, keep pace with medical research inflation, and maintain the nation’s world-class research infrastructure. ASCO has called for increases in the NIH budget that keep pace with the increasing cost of conducting medical research. ASCO is working with its membership and partners in the medical research community to advocate for the largest increase possible to take advantage of the extraordinary scientific potential for advancing cancer care.
2. PROVIDE EVERY POSSIBLE INCENTIVE FOR PATIENTS TO PARTICIPATE IN CLINICAL TRIALS

Data suggest that only about 5 percent of cancer patients currently participate in research trials. This is despite the fact that trial participation allows patients to have access to potentially effective new treatments before they are widely available and helps others who may benefit in the future as a result of that research. Because more than 60 percent of cancer diagnoses occur among people over age 65, it is especially important that older Americans are able to participate in clinical cancer research.

Patients and physicians report that private insurers don’t always cover participation in clinical trials, because trials are classified as "experimental." Cancer trials can represent a patient’s best chance for effective therapy, however. Some states already have passed legislation or established agreements requiring that health plans pay the costs of routine medical care that patients receive while participating in clinical trials, and other states are considering similar plans. ASCO is a long-time advocate for coverage of clinical trials participation. ASCO supports these state initiatives and urges Medicare to continue to cover trial participation in order to remove barriers that make it difficult for patients to participate.
SECTION III

CANCER STATISTICS

CANCER INCIDENCE AND MORTALITY; SURVIVAL TRENDS

### CANCER INCIDENCE & MORTALITY, 2007

<table>
<thead>
<tr>
<th>Cancer Type</th>
<th>Estimated Deaths</th>
<th>Estimated New Cases</th>
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<tbody>
<tr>
<td>All sites</td>
<td>559,650</td>
<td>1,444,920</td>
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<tr>
<td>Lung and bronchus</td>
<td>160,390</td>
<td>213,380</td>
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<td>Colorectal</td>
<td>52,180</td>
<td>153,760</td>
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<td>Breast</td>
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<td>Prostate</td>
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<td>Non-Hodgkin lymphoma</td>
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<td>Liver</td>
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<td>Brain</td>
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<td>Stomach</td>
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<td>19,900</td>
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<td>Acute myeloid leukemia</td>
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<td>Melanoma</td>
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<td>Soft tissue</td>
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<td>Other oral cavity</td>
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<td>Childhood cancers</td>
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<td>Bones &amp; joints</td>
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<td>Small intestine</td>
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<td>Penis</td>
<td>290</td>
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<tr>
<td>Eye</td>
<td>220</td>
<td>2,340</td>
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### FIVE-YEAR SURVIVAL RATES, 1975-2002 (Select Cancers)

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<th>1984-86</th>
<th>1996-2002</th>
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<tr>
<td>All Cancers</td>
<td>50%</td>
<td>53%</td>
<td>66%</td>
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<tr>
<td>Prostate</td>
<td>69%</td>
<td>76%</td>
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<tr>
<td>Thyroid</td>
<td>93%</td>
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<tr>
<td>Testis</td>
<td>83%</td>
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<td>96%</td>
</tr>
<tr>
<td>Melanoma</td>
<td>62%</td>
<td>86%</td>
<td>92%</td>
</tr>
<tr>
<td>Breast</td>
<td>75%</td>
<td>79%</td>
<td>89%</td>
</tr>
<tr>
<td>Hodgkin lymphoma</td>
<td>73%</td>
<td>79%</td>
<td>86%</td>
</tr>
<tr>
<td>Endometrial</td>
<td>87%</td>
<td>83%</td>
<td>84%</td>
</tr>
<tr>
<td>Bladder</td>
<td>73%</td>
<td>78%</td>
<td>82%</td>
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<tr>
<td>Cervical</td>
<td>70%</td>
<td>68%</td>
<td>73%</td>
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<tr>
<td>Kidney</td>
<td>51%</td>
<td>56%</td>
<td>66%</td>
</tr>
<tr>
<td>Rectum</td>
<td>49%</td>
<td>57%</td>
<td>66%</td>
</tr>
<tr>
<td>Larynx</td>
<td>66%</td>
<td>66%</td>
<td>65%</td>
</tr>
<tr>
<td>Colon</td>
<td>51%</td>
<td>59%</td>
<td>65%</td>
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<tr>
<td>Non-Hodgkin lymphoma</td>
<td>48%</td>
<td>53%</td>
<td>63%</td>
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<tr>
<td>Ovar&quot;</td>
<td>53%</td>
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<td>60%</td>
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<tr>
<td>Leukemia</td>
<td>35%</td>
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<td>37%</td>
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<td>24%</td>
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<td>26%</td>
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<td>33%</td>
</tr>
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<td>Stomach</td>
<td>16%</td>
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</tr>
<tr>
<td>Lung</td>
<td>13%</td>
<td>13%</td>
<td>16%</td>
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<tr>
<td>Esophagus</td>
<td>5%</td>
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<td>16%</td>
</tr>
<tr>
<td>Liver</td>
<td>4%</td>
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<td>10%</td>
</tr>
<tr>
<td>Pancreas</td>
<td>2%</td>
<td>3%</td>
<td>5%</td>
</tr>
</tbody>
</table>

**Notes**

1. Incidence and mortality figures for all sites include cancers not listed in table, including nonepithelial skin cancers; other digestive, respiratory, oral and endocrine cancers; other types of leukemia; and unspecified primary sites.
3. Other skin cancers—including squamous cell and basal cell skin cancers—are diagnosed in more than 1 million people in the United States each year, and are not included in this table.
4. Oral cancers include those of the nose, mouth, tongue, throat, and pharynx.

CANCER MORTALITY TRENDS

Cancer Death Rates,* for Men, US, 1930-2003

*Age-adjusted to the 2000 US standard population.


*Age-adjusted to the 2000 US standard population.
†Uterus cancer death rates are for uterine, cervix, and uterine corpus combined.

FDA APPROVALS OF ANTI-CANCER AGENTS
NOVEMBER 2006-OCTOBER 2007

NEWLY APPROVED AGENTS

<table>
<thead>
<tr>
<th>Generic Name</th>
<th>Trade Name</th>
<th>Indication(s)</th>
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<td>lapatinib ditosylate</td>
<td>Tykerb</td>
<td>Breast cancer²</td>
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<tr>
<td>temsirolimus</td>
<td>Torisel</td>
<td>Advanced renal cell carcinoma</td>
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<td>ixabepilone for injection</td>
<td>Ixempra</td>
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<td>nilotinib</td>
<td>Tasigna</td>
<td>Chronic Myelogenous Leukemia (CML)³</td>
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EXPANDED INDICATIONS FOR EXISTING AGENTS

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<thead>
<tr>
<th>Generic Name</th>
<th>Trade Name</th>
<th>Indication(s)</th>
<th>Date of Approval</th>
</tr>
</thead>
<tbody>
<tr>
<td>trastuzumab</td>
<td>Herceptin</td>
<td>Adjuvant treatment for patients with HER2-positive, node-positive breast cancer (in combination with doxorubicin, cyclophosphamide, and paclitaxel)⁴</td>
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<td>raloxifene</td>
<td>Evista</td>
<td>Reducing the risk of breast cancer in postmenopausal women with osteoporosis and in postmenopausal women at high risk for invasive breast cancer⁴</td>
<td>9/17/2007</td>
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<td>alemtuzumab</td>
<td>Campath</td>
<td>Treatment of B-cell chronic lymphocytic 5 leukemia (B-CLL)</td>
<td>9/19/2007</td>
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<td>cetuximab</td>
<td>Erbitux</td>
<td>Treatment of patients with EGFR-expressing metastatic colorectal cancer (mCRC) after failure of irinotecan- and oxaliplatin-based chemotherapy regimens</td>
<td>10/2/2007</td>
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MOLECULAR PROGNOSTIC TEST

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<thead>
<tr>
<th>Generic Name</th>
<th>Trade Name</th>
<th>Indication(s)</th>
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<tr>
<td>MammaPrint</td>
<td></td>
<td>Breast cancer prognosis⁶</td>
<td>2/6/2007</td>
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REFERENCES

1. Approved in combination with capecitabine (Xeloda) for the treatment of patients with advanced or metastatic breast cancer whose tumors overexpress HER2 and who have received prior therapy including an anthracycline, a taxane, and trastuzumab.
2. Approved in combination with capecitabine for the treatment of patients with metastatic or locally advanced breast cancer resistant to treatment with an anthracycline and a taxane, or whose cancer is taxane resistant and for whom further anthracycline therapy is contraindicated; also indicated as single-agent for the treatment of metastatic or locally advanced breast cancer in patients whose tumors are resistant or refractory to anthracyclines, taxanes, and capecitabine.
3. Approved for the treatment of chronic phase (CP) and accelerated phase (AP) Philadelphia chromosome positive chronic myelogenous leukemia (CML) in adult patients resistant or intolerant to prior therapy that included imatinib.
4. FDA approved trastuzumab in 1998 for metastatic breast cancer.
5. FDA approved raloxifene in 1997 to prevent osteoporosis and in 1999 to treat osteoporosis, both in postmenopausal women.
6. A DNA microarray-based in vitro diagnostic test that measures the activity of 70 genes, providing information about the likelihood of tumor recurrence.