Targeted Therapies: a New Way to Treat Cancer

By Sheryl Riley, RN, OCN, CMCN
Objectives:

- Define Targeted therapies, names and development
- Explain how targeted therapies are being utilized in cancer care
- Discuss how targeted therapies have changed cancer cost and outcomes
Questions in regard to Targeted Therapy:

• The cost of testing can be in the thousands, but if we can predict how a patient’s cancer will respond or return, is it worth it?

• What is a human life worth in regards to cost of treatment - $33,000 or $50,000?

• How much would you be willing to pay for 2 more months of life? How about 2 more years?
Targeted Therapies in Cancer

- Targeted therapies: a category of cancer therapy drugs or other substances that block the growth and spread of cancer by interfering with specific molecules ("molecular targets") that are involved in the growth, progression, and spread of cancer.
How are targets for targeted cancer therapies identified?

The development of targeted therapies requires the **identification of good targets**

- **Protein Targets:**
  - Compare the amount of individual proteins in cancer cells with those in normal cells.
  - Identify which proteins are present in cancer cells but not normal cells
  - Proteins that are more abundant in cancer cells would be potential targets, especially if they are known to be involved in cell growth or survival.

**Example: HER-2**
- Human Epidermal Growth Factor Receptor-2 protein is a differentially expressed target
- HER2 is expressed on high levels on the surface of some cancer cells (*this makes the cancer more aggressive*)
- Herceptin®, also known as trastuzumab, is a target therapy medication used specifically for cancers involving HER-2
- *Treatment 6-month, 12 or 24 cost $70,000 per year*
How are targets for targeted cancer therapies identified?

- Mutants: (alternative proteins)
  - Determine whether cancer cells produce mutant (altered) proteins that drive cancer progression.
  - Mutant proteins can be translated from damaged DNA
  - Especially damaging when cell growth signaling is dysregulated
  - Cancerous cells can grow out of control

Example: BRAF Cell Growth Signaling Protein

- In cancer cells, cell growth signaling protein BRAF is present in an altered form
- Known as BRAF V600E in many melanomas.
- Vemurafenib (Zelboraf®) targets this mutant form of the BRAF protein and is approved to treat patients with inoperable or metastatic melanoma that contains this altered BRAF protein.
- Extends life, Vemurafenib, the first drug in this class, costs $13,000 per month ($207,000 for a patient with median survival of 8 months). Sep 8, 2014
How are targets for targeted cancer therapies identified?

Chromosomal Abnormalities:
- Researchers identify chromosomes (genomic material) that show abnormalities
- These abnormal features are present in cancer cells, and absent in normal cells
- At times, the abnormalities in the genes lead to the creation of a fusion gene
- Fusion genes incorporate fragments of two different genes, and may result in cancer development
- These fusion genes make great targets

Example: **BCR-ABL** fusion protein

- Imatinib mesylate (Gleevec®), specifically targets BCR-ABL
- BCR-ABL is a gene fusion found in leukemia cells
- BCR-ABL promotes the growth of the leukemic cells
- Approximately $120,000 per year

![BCR-ABL Fusion Protein Structure](image)

![Imatinib Mechanism of Action](image)
How Are Targeted Therapies Different from Standard Chemotherapy?

<table>
<thead>
<tr>
<th>Chemotherapy</th>
<th>Targeted Therapies</th>
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<tbody>
<tr>
<td>• Standard chemotherapy agents are cytotoxic, they kill tumor cells</td>
<td>• Targeted therapies block tumor cell proliferation (rapid cell reproduction)</td>
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<tr>
<td>• Standard chemotherapies act on all rapidly dividing normal and cancerous cells</td>
<td>• Targeted therapies act on specific molecular targets that are associated with cancer</td>
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<td>• Standard chemotherapies were identified because they kill cells</td>
<td>• Targeted therapies are currently the focus on anticancer drug development.</td>
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<td>• Targeted therapies are deliberately chosen or designed to interact with their target</td>
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</table>
How Are Targeted Therapies Different from Standard Chemotherapy?

While both chemotherapy and targeted therapies have complex activity on the cellular/molecular level, the mechanisms by which the proteins act are different.

Just like there are multiple routes to take when driving to Minneapolis, there are multiple channels through which the end-goal (cellular death) can be reached.

*Let’s take a closer look at the cellular level of action of both monoclonal antibodies and small molecule therapies…*
Therapeutic Monoclonal Antibodies

- Target-specific: meaning they bind to only certain antigens—namely transmembrane receptors or growth factors on outer region of cell
  
  (example: when hitting a baseball, you must connect with a certain part of the bat just right to get the ball to go over the fence or to pull it to the right or the left)

- Mono. Antibodies can have radio-isotopes/therapeutic toxins bound to them—leading to very cell-specific delivery of treatment

[Diagram: Antigen-specific delivery of Radium-223 for bone cancer cell]
Small Molecules

- Due to their small size and other physical properties, these molecules can pass through the membrane of a cell

  (example: a fast ball or a change up can get past the batter into the catcher’s glove, keeping the batter from getting on base)

- Once inside the cell, the small molecule can target an enzyme pathway

- The enzymatic activity is interrupted, inhibiting processes that would allow cancerous cells to grow in number
Some Specific Examples of these Targeted Therapies

Monoclonal Antibodies (FDA Approved)

• **Bevacizumab** – humanized monoclonal antibody (colon)

• **Cetuximab** – chimeric monoclonal antibody (tumor target is EGFR) (colorectal, lung and head/neck)

• **Ipilimumbad** – (fully human ab with immune system target CTLA-4) (melanoma in CT for NSCL, SCL bladder and refractory prostate)

Small Molecules (FDA Approved)

• **Bortezomib** – a small molecule proteasome inhibitor (multiple myeloma and mantel cell lymphoma)

• **Imanitib** – a small molecule tyrosine kinase inhibitor (5 year survival for chronic myeloid leukemia nearly doubled and gastrointestinal stromal tumors, (GIST) is nearly 5 years compared to 9 to 20 months in the pre-imatinib-era)

• **Seliciclib** – a small molecule cyclin-dependent kinase inhibitor (NSCLC, leukemia)
# Targeted Therapies for Specific Cancer Treatments

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<thead>
<tr>
<th></th>
<th>Breast Cancer</th>
<th>Lung Cancer</th>
<th>Colon Cancer</th>
<th>Ovarian Cancer</th>
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<tbody>
<tr>
<td><strong>Ado-trastuzumab emtansine</strong> <em>(Kadcyla)</em>&lt;br&gt;FDA Approved; HER2+ Target</td>
<td>Afatinib <em>(Gilotrif)</em>&lt;br&gt;FDA Approved; EFGR and HER2 targets</td>
<td>Bevacizumab <em>(Avastin)</em>&lt;br&gt;FDA Approved; Targets VEGF ligand</td>
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<td><strong>Lapatinib</strong> <em>(Tykerb)</em>&lt;br&gt;FDA Approved; targets HER2, EGFR, VEGFR</td>
<td>Crizotinib <em>(Xalkori)</em>&lt;br&gt;FDA Approved; Targets ALK, MET, ROS1</td>
<td>Cetuximab <em>(Erbitux)</em>&lt;br&gt;FDA Approved; Targets EGFR <em>(HER1/ERBB1)</em></td>
<td>Olaparib <em>(Lynparza)</em>&lt;br&gt;FDA Approved; Targets PARP <em>(O.C. with BRCA mutation)</em></td>
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<td><strong>Everolimus</strong> <em>(Afinitor)</em>&lt;br&gt;FDA Approved; targets mTOR</td>
<td>Ceritinib <em>(Zykadia)</em>&lt;br&gt;FDA Approved; Targets ALK</td>
<td>Ramucirumab <em>(Cyramza)</em>&lt;br&gt;FDA Approved; Targets VEGF2</td>
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<td><strong>Tratuzumab</strong> <em>(Herceptin)</em>&lt;br&gt;FDA Approved; HER2 <em>(ERBB2/neu)</em></td>
<td>Bevacizumab <em>(Avastin)</em>&lt;br&gt;FDA Approved; Targets VEGF ligand</td>
<td>Regorafenib <em>(Stivarga)</em>&lt;br&gt;FDA Approved; Targets KIT, PDGFRβ, RAF, RET, VEGFR1/2/3</td>
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## Cancers That Have Targeted Therapies

<table>
<thead>
<tr>
<th>Cancer Type</th>
<th>Non-small cell lung cancer</th>
<th>Squamous non-small cell lung cancer</th>
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<tbody>
<tr>
<td>Breast Cancer (HER2+)</td>
<td>EGR del/exon 19 del/exon 21 del</td>
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<td>With ALK fusion</td>
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<td>ROS gene alteration</td>
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<tr>
<td>Renal Cell Carcinoma</td>
<td>Cervical Cancer</td>
<td>Thyroid Cancer</td>
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<tr>
<td>Melanoma</td>
<td>Colorectal Cancer</td>
<td>GI Stromal Tumor (KIT+)</td>
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<tr>
<td>→ With BRAF V600E or V600K mutation</td>
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<tr>
<td>B-Cell Chronic Lymphocytic Leukemia</td>
<td>Fallopian Tube Cancer</td>
<td>Dermatofibrosarcoma Protuberans</td>
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<td>Glioblastoma</td>
<td>Ovarian Cancer</td>
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<tr>
<td></td>
<td>Multiple hematologic malignancies</td>
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<td></td>
<td>→ Philadelphia chromosome positive</td>
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<td></td>
<td>→ ALL and CML</td>
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<tr>
<td>Peritoneal Cancer</td>
<td>Multiple Myeloma</td>
<td>Cutaneous T-Cell Lymphoma</td>
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<td>Mantle Cell Lymphoma</td>
<td>Chronic Myelogenous Leukemia</td>
<td>Gastroesophageal Junction Adenocarcinoma</td>
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<tr>
<td></td>
<td>→ Philadelphia chromosome positive</td>
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<tr>
<td>Hodgkin Lymphoma</td>
<td>Anaplastic Large Cell Lymphoma</td>
<td>Prostate Cancer</td>
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<tr>
<td>Medullary Thyroid Cancer</td>
<td>Squamous Cell Cancer of the Head &amp; Neck</td>
<td>Basal Cell Carcinoma</td>
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<tr>
<td>Acute lymphoblastic Leukemia</td>
<td>Waldenstrom’s Macroglobulinemia</td>
<td>Peripheral T-Cell Lymphoma</td>
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<tr>
<td>→ Philadelphia Chromosome positive</td>
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<tr>
<td>Follicular B-Cell Non-Hodgkin Lymphoma</td>
<td>Small Lymphocytic Lymphoma</td>
<td>Hepatocellular Carcinoma</td>
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*Caris Health*
What types of targeted therapies are available?

- **Hormone therapies** slow or stop the growth of tumors that is dependent on hormones.
  - Hormone therapies act by preventing the body from producing the hormones or by interfering with the action of the hormones. (breast cancer and prostate cancer).

- **Signal transduction inhibitors** block activity of molecules that participate in signal transduction (responses).
  - Malignant cells may be stimulated to divide continuously without being prompted to do so by external growth factors.
  - Signal transduction inhibitors interfere with this inappropriate signaling.

- **Gene expression modulators** modify protein functions that control gene expression.

- **Apoptosis inducers** cause cancer cells to undergo controlled cell death—apoptosis.
  - Apoptosis is one method the body uses to get rid of unneeded or abnormal cells, but cancer cells have strategies to avoid apoptosis.
  - Apoptosis inducers can get around these strategies to cause the death of cancer cells.
What types of targeted therapies are available?

- **Angiogenesis inhibitors** block growth of new blood vessels to tumors (a process called tumor angiogenesis).
  - A blood supply is necessary for tumors to grow beyond a certain size. Treatments that interfere with angiogenesis may block tumor growth.

- **Immunotherapies** trigger the immune system to destroy cancer cells. Some immunotherapies are monoclonal antibodies that recognize specific molecules on the surface of cancer cells.
  - Binding of the monoclonal antibody to the target molecule results in the immune destruction of cells that express that target molecule.

- **Monoclonal antibodies that deliver toxic molecules** can cause the death of cancer cells specifically. Once the antibody has bound to its target cell, the toxic molecule that is linked to the antibody — such as a radioactive substance or a poisonous chemical — is taken up by the cell, ultimately killing that cell. The toxin will not affect cells that lack the target for the antibody — i.e., the vast majority of cells in the body.

- **Cancer vaccines and gene therapy** are sometimes considered targeted therapies because they interfere with the growth of specific cancer cells.
Skip Burris, MD, discusses how precision medicine is changing cancer treatment

Skip Burris, MD, President, Clinical Operations, Sarah Cannon Research Institute, discusses how precision medicine is changing cancer treatment

https://youtu.be/oq34vIFT-hM
Precision Medicine:

• Targeted therapies are a cornerstone of precision medicine, a form of medicine that uses information about a person’s genes and proteins to prevent, diagnose, and treat disease.

  • Molecularly targeted drugs or molecularly targeted therapies
  • Personalized medicine
  • Immunotherapies
Precision Medicine

• Approach to patient care that allows doctors to select treatments that are most likely to help patients based on a genetic disease profile

• This may also be called personalized medicine.

• Booming field in biomedical research

• Goal is for treatments to be tailored to the changes in each person’s cancer.

• Patients would receive drugs that their tumors are most likely to respond to and will be spared from receiving drugs that are not likely to help.

• Research studies currently investigating personalized drug activity effectiveness based on patient’s illness profile.
Paying for Precision Medicine

Insurance coverage:

- Testing for genetic changes requires the use of complex technology and requires the services of people with specialized training. This testing can be expensive.

- Testing for genetic changes in your cancer is part of routine care if the cancer types with the genetic change can be treated with an approved drug.

- Being part of a precision medicine clinical trial, the cost of testing for genetic changes may be covered by the organization sponsoring the trial.

- If there is not an approved targeted drug for your type of cancer and you are not in a clinical trial using precision medicine, your insurance company will probably not cover the costs of having your cancer tested for genetic changes.

- Treatment using precision medicine can also be expensive. It takes many years, sometimes decades, of research to develop drugs that target the changes that cause cancer to develop, grow, and spread. So, by the time these drugs are available on the market, they are often very expensive.
Development of Monoclonal Antibody Targeted Therapy

• Animals (namely mice) are injected with a pure solution containing target proteins

• The mouse’s immune system produces an assortment of antibodies to combat the target proteins

• These antibodies are harvested, and tested to find the antibodies that are specific in target binding

• Prior to use in humans, the mouse antibody portions are replaced as completely as possible with human antibody components.

• “Humanizing” the antibodies prevent the immune system from attacking the monoclonal antibody; as an antibody from another animal would be seen as a foreign body by immune system

• This allows the antibodies to operate on the target protein as intended.
Development of Small Molecule Targeted Therapy

• Small molecule candidates are identified via "high-throughput screens."

• Thousands of test molecules are examined for their activity on specific target proteins

• Lead compounds, or those that affect the target proteins, are chemically modified

• This chemical modification produces many close copies of the lead compound

• Effective compounds (most target-specific) are sorted from less effective.
DNA &
the Role it Plays

• Cancer cells have more genetic changes than normal cells.
• Cancer is a genetic disease, caused by certain changes to genes that control the way our cells function, especially how they grow and divide. These changes include mutations in the DNA that makes up our genes.

• Genetic changes that increase cancer risk can be inherited from our parents (familiar)

• Genetic changes that occur after we are born are called (acquired) changes. They can arise at any time during a person’s life, as the result of errors that occur as cells divide during a person’s lifetime or exposure to substances, such as certain chemicals in tobacco smoke, and radiation, such as ultraviolet rays from the sun, that damage DNA.

• Each person’s cancer has a unique combination of genetic alterations. Some of these changes may be the result of cancer, rather than the cause. As the cancer continues to grow, additional changes will occur. Even within the same tumor, cancer cells may have different genetic changes.
Targeted Therapies for Cancer

• Targeted therapy uses drugs to stop cancer from growing and spreading. It does this with less harm to normal cells than other treatments.

• Standard chemotherapy works by killing cancer cells and some normal cells

• Targeted treatment zeroes in on specific targets (molecules) in or on cancer cells.

• These targets play a role in how cancer cells grow and survive.

• Using these targets, the drug disables the cancer cells so they cannot spread.
How does targeted therapy work?

**Target therapies may:**

- Turn off the process in cancer cells that causes them to grow and spread
- Kill cancer cells directly
- People with the same type of cancer may have different targets in their cancer cells.
- If your cancer does not have a specific target, the drug will not work to stop it. Not all therapies work for all people with cancer. At the same time, different cancers may have the same target.

**To see if a targeted therapy might work for you, your health care provider may:**

- Take a tiny sample of your cancer
- Test the sample for the specific targets (molecules)
- If the right target is present in your cancer, then you will receive
- Some targeted therapies are given as pills. Others are injected into a vein (intravenous, or IV).
Who May Get Targeted Therapies?

Current targeted therapies that can treat certain types of these cancers:

- Leukemia and lymphoma
- Breast cancer
- Colon cancer
- Skin cancer
- Lung cancer
- Prostate cancer

- Other cancers that may be treated with targeted therapies include brain, bone, kidney, lymphoma, stomach, and many others.
- Your provider will decide whether targeted therapies may be an option for your type of cancer.
- In most cases, you may receive targeted therapy along with surgery, chemotherapy, hormonal therapy, or radiation therapy.
- Patients may receive these drugs as part of your regular treatment, or as part of a clinical trial.
Side Effects from Treatments:

• Doctors thought that targeted therapies might have fewer side effects than other cancer treatments— but that turned out to be untrue.

Possible side effects from targeted therapies include:

• Diarrhea
• Liver problems
• Skin problems such as rash, dry skin, and nail changes
• Problems with blood clotting and wound healing
• High blood pressure

• As with any treatment, you may or may not have side effects. They may be mild or severe. Fortunately, they usually go away after treatment ends.
• It is a good idea to talk with your provider about what to expect. Your provider may be able to help prevent or lessen some side effects.
Side Effects from Treatments:

- Certain side effects of some targeted therapies have been linked to better patient outcomes:
  - For example, patients who develop acneiform rash (skin eruptions that resemble acne) while being treated with erlotinib (Tarceva®) or gefitinib (Iressa®), both of which target the epidermal growth factor receptor have tended to respond better to these drugs than patients who do not develop the rash.

- Similarly, patients who develop high blood pressure while being treated with angiogenesis inhibitor bevacizumab generally have had better outcomes.
Limitations of Targeted Therapies:

- Targeted therapies are promising new treatments, but they have limitations.
- Cancer cells can become resistant to these drugs.
- The target sometimes changes, so the treatment no longer works.
- The cancer may find a different way to grow and survive that does not depend on the target.
- Drugs can be difficult to develop for some targets.
- Targeted therapies are newer and cost more to make. So they are more expensive than other cancer treatments.
Effectiveness of Targeted Therapies:

- **Targeted cancer therapies work...**
  
  - Two-thirds of all US cancer patients, most of them taking intravenous or oral targeted drugs, survive at least 5 years after diagnosis.

  - Such therapies “now dominate anticancer drug spending,” according to a new study, published on May 18, 2015 as an Early Release article in the *Journal of Clinical Oncology*.

  - Patients with advanced NSCLC have many more treatment choices and **substantially improved outcomes**.

  - In some cases, patients can be maintained on new oral therapies for years before seeing progression that requires chemotherapy.

  - The newest wave of targeted agents and immunotherapies now in clinical testing are extending this responsive period. With each passing month, strategies evolve, survival improves – and medical decision-making becomes more complex.
Breast Cancer & Herceptin

• Herceptin is a breast cancer blockbuster medication with sales last year of $5.5 billion.

• Approximately one quarter of patients with breast cancer tumors which generate HER2, a protein which makes the disease much more aggressive, are treated with Herceptin.

The latest data from the Phase III HERA trial demonstrated that two years of treatment on Herceptin made no difference to patients’ disease-free survival times - how long women lived without the cancer coming back.

After being followed up for an average of eight years, the trial showed that disease-free survival improvements and overall survival for those on Herceptin was statistically significant when compared to patients on just observation.

"Herceptin has changed the lives of many people with HER2-positive early breast cancer by increasing their chance of cure. HERA is one of the largest and longest-running breast cancer trials and demonstrates our commitment to people with this aggressive disease. These results answer an important question and support current medical practice, where Herceptin treatment for one year is recommended and approved for people with early-stage HER2-positive breast cancer."

*One Year On Herceptin For Breast Cancer Ideal
-Christieand NordqvistPublished: Monday 1 October 2012

45% of tumors destroyed by adding Herceptin to chemo

Herceptin improves the long term survival for breast cancer patients
Case study

- Marge Halford, a 65-year-old nurse who lives in Taylorville, Ill., and has been taking Gleevec since 2009.

- The amount patients pay can vary widely depending on their insurance plan,
  - Halford’s cost started at $500 a month, but within a year the drug she needs to say alive was costing her more than $800. She and her husband considered divorce, hoping her single income was low enough to qualify for financial aid. But when they did the math, she still made too much money to get help.

- About a year ago, sick of watching a whole paycheck disappear to pay for her pills every month and hoping to reduce the nausea and vomiting that are a side effect of the drug, Halford persuaded her doctor to put her on a cheaper, lower dose of Gleevec.

- Halford likes to say she is blessed — her kids are grown, her house is paid for and she has been able to find the money to pay for her medicine. But she is worried about retirement.

- “The drug is so stinking expensive, and I don’t know what will happen,” Halford said. “The drug is a godsend. The price is not.”
BRAF-V600: Mutated Melanoma

• The updated analysis had a median follow-up of 14.2 months. At this time, the investigator-assessed median progression-free survival was 12.3 months for patients assigned to cobimetinib and vemurafenib compared with 7.2 months for vemurafenib alone ($P < .0001$). Overall survival was also significantly better in patients assigned to the combination treatment (22.3 vs 17.4 months; $P = .005$).

• “Moreover, the estimated landmark 2-year overall survival shows sustained benefit of the combination of cobimetinib and vemurafenib vs vemurafenib plus placebo,” the researchers wrote.

• Seventy percent of patients assigned cobimetinib and vemurafenib had an objective response compared with 50% of patients on vemurafenib alone.

• “The proportion of patients who achieved an overall response at the updated analysis were similar to those at the primary analysis; however, the proportions of patients achieving a complete response were higher at the updated analysis than at the primary analysis, indicating that some patients had an improved response with continued treatment,” the researchers wrote.

• According to the study, the safety profile for cobimetinib and vemurafenib was manageable and tolerable, with no new safety signals observed with the longer follow-up period.

*Cobimetinib, Vemurafenib Improved Survival in BRAF V600–Mutated Melanoma
News | August 04, 2016 | MelanomaBy Leah Lawrence Journal of Oncology
Costs of Targeted Therapies:

• In 2011, targeted therapies accounted for 63 percent of all chemotherapy expenditures in the United States.

• In the ten years from 2001 to 2011, insurance payments per patient in the first year of treatment increased by more than $14,000.

• Out of pocket spending for cancer drugs steadily rose, to about $200 per patient per month for oral drugs and to $900 per month for targeted intravenous anti-cancer therapy.

• Total annual insurance payments, by 2010, reached around $65,000 per patient.

• The use of targeted therapies grew steadily over this period, from about 13 percent in 2001 to 43 percent in 2011. Costs increased almost as rapidly, from 22 percent of cancer spending for this group of patients in 2001, to 63 percent in 2011.

• Cost per patient, however, changed little for targeted intravenous drugs, holding steady at around $7,000 per patient per month, or $65,000 per year.

• For targeted oral drugs, however, prices went up consistently, more than doubling from about $3,400 per patient per month in 2001 to almost $7,400 in 2011.
Costs of Targeted Therapies:

- Researchers studied and disaggregated trends in use of insurance and out-of-pocket payments per patient per month during the first year of chemotherapy.
- They found a large increase in the use of targeted intravenous anticancer medications and a gradual increase in targeted oral anticancer medication.
- Substitution toward targeted therapies and growth in drug prices both at launch and post-launch contributed to payer spending growth.
- Out-of-pocket spending for targeted oral anticancer medications was half of the amount for targeted intravenous anticancer medications. Targeted therapies now dominate anticancer drug spending.
- Targeted therapies are increasingly used in cancer care, but they are imposing a growing financial burden on privately insured patients with cancer and their insurers.
- The results demonstrate a large increase in the use of tIVAMs from 2001 to 2011.
- Per-patient payments for tIVAMs remained at a constant high level of approximately $7,000 per month and $65,000 annually by 2010.
- By contrast, use rates for tOAMs rose only gradually, remaining half the rate of tIVAMs by 2011, but payments PPPM and annual payments per patient more than doubled over 10 years. Accordingly, total drug expenditures for patients receiving either type of targeted therapy rose to 63% of all anticancer drug expenditures.
Cost of Care
What is covered by insurance?

- **Humana Cancer Care Plan:**
  Covers targeted therapies that are FDA-Approved
  Radiation therapy, Radioactive Isotope Therapy, Chemotherapy, and Immunotherapy covered up to $1,000 per day
  Cancer-specific Humana Specified Disease Plan for treatments and many associated costs such as antiemetic drugs, hairpieces, durable equipment, lodging, hospital stays…much more.

- **AARP / Medicare**
  Coverage of Radiation therapy, chemotherapy (IV or Oral), and certain immunotherapies under Part B/D Coverage
  Tiered drug formularies depending on generic, preferred brand, speciality (patient can pay up to 25% of drug treatment cost)
  Many cancer drugs don’t have generic forms, making them tier 4 – patient thus pays 25% (so $250 for a $1000 drug administration).
  For people who choose the non-default drug, or brand name over generic, must go through an exceptions process with his or her doctor. Varies in- vs out of network.
Under the Affordable Care Act:
- If you are single, your annual out-of-pocket costs for in-network care are capped at $6,850.
- For a family, the annual cap is $13,700. This includes cancer interventions for most plans.

United Healthcare:
- Covers on and off-label drugs for cancer therapy and side effect management
- Side effect management supplies - exclusions apply
  Approved clinical trials are covered by United; Medicare-approved – Eloxatin, Camptosar, Erbitux, and Avastin
- All FDA-approved cancer treatments that are limited to the approved dose (no excess of one drug that is deemed unnecessary)
Where can I find information about clinical trials of targeted therapies?

• Both FDA-approved and experimental targeted therapies for specific types of cancer are being studied in clinical trials.

• The names of the targeted therapy types listed below are links to lists of ongoing clinical trials that are testing those types of targeted therapies in cancer patients.

• These trial descriptions can also be accessed directly by searching NCI’s list of clinical trials.

• NCI’s list of cancer clinical trials includes all NCI-funded clinical trials as well as studies conducted by investigators at hospitals and medical centers throughout the United States and around the world.
References:


- Updated by: Todd Gersten, MD, Hematology/Oncology. Florida Cancer Specialists & Research Institute, Wellington, FL. Review provided by VeriMed Healthcare Network. Also reviewed by David Zieve, MD, MHA, Isla Ogilvie, PhD, and the A.D.A.M. Editorial team.


Questions?

& Thank You

Sheryl Riley, RN, OCN, CMCN