# Table of Contents

Key Takeaways

Chapter 1: Advances in Cancer Treatment

Chapter 2: Innovation in the Cancer Medicine Pipeline

Chapter 3: Cancer Patient Spending and Financial Burden

Chapter 4: Cancer Costs in Context

Chapter 5: Evolving Cancer Market Dynamics

Chapter 6: US System in Context

Chapter 7: Solutions For Advancing Value in Cancer Care
Key Takeaways

• We have made remarkable progress in the fight against the more than 200 diseases we call cancer and current research holds enormous promise to address the great unmet need.

• Too many cancer patients face financial burdens, and these come from a variety of sources including treatment costs, non-medical costs, and insurance benefit design.

• The cost of cancer treatment comes from a range of sources including medicines, hospital and ED visits, diagnostics, and physician services.

• The oncology market is working to control spending on cancer medicines and overall treatment costs.

• Reforms are needed to accelerate the development path for cancer medicines and promote a delivery system that is increasingly patient-centered and value-based.
1. Advances in Cancer Treatment
Since Peaking in the Early 1990s, Cancer Death Rates Have Declined 27% 

Increases in cancer survival are estimated to translate to the avoidance of nearly 2.6 million cancer deaths.

Five-Year Survival is Increasing for Many Types of Cancer

Since 1975, the chances that a cancer patient will live 5 years or more have increased by 41% across cancers.¹

5-Year Survival Rates Among the Most Common Cancers, 1975-2014¹

73% of recent survival gains in cancer are attributable to treatment advances including new medicines.²

The continued increase in survival rates is in large part attributable to earlier detection and better treatments.¹

U.S. Cancer Survivors Over Time (millions)¹,²,³

<table>
<thead>
<tr>
<th>Year</th>
<th>Survivors</th>
</tr>
</thead>
<tbody>
<tr>
<td>1971</td>
<td>3</td>
</tr>
<tr>
<td>2001</td>
<td>9.8</td>
</tr>
<tr>
<td>2019</td>
<td>16.9</td>
</tr>
<tr>
<td>2029 (Projected)</td>
<td>21.7</td>
</tr>
<tr>
<td>2040 (Projected)</td>
<td>26.1</td>
</tr>
</tbody>
</table>

CAR-T Therapy Driving Breakthroughs for Cancer Patients

Engineered immune T-cells can recognize, zero in on and kill cancer cells.
Immunotherapy is Revolutionizing the Treatment of Many Advanced Cancers: Metastatic Melanoma

"No recent cancer advance has been more transformative than immunotherapy."

- Dr. Julie M. Vose, former President of the American Society of Clinical Oncology

Among teenage girls, widespread use of the quadrivalent human papilloma virus (HPV) vaccine has driven down infection rates by nearly two-thirds.
A greater understanding of the molecular basis of disease has transformed what was once known collectively as “disease of the blood,” into multiple subtypes of leukemias and lymphomas, opening up new treatment approaches.

**Transformation in Cancer Diagnosis Has Led to More Precise Treatment**

**60 YEARS AGO**

“Disease of the Blood”

- Leukemia
- Lymphoma

**50 YEARS AGO**

- Leukemia

**40 YEARS AGO**

- Chronic Leukemia
- Acute Leukemia
- Pre-leukemia
- Indolent Lymphoma
- Aggressive Lymphoma

**TODAY**

- ~ 40 Unique Leukemia types identified
- ~ 50 Unique Lymphoma types identified

5 year survival rates have grown to 70%

There are nearly 340 medicines in development for blood cancers

Targeted Therapies Drive Survival Gains in Chronic Leukemias

Since the approval of the first tyrosine kinase inhibitor (TKI) for chronic myeloid leukemia (CML), survival rates have improved dramatically and patients are living close to normal life spans.¹

- Imatinib—the first TKI—was approved in 2001 to treat CML. The transformative impact of this class of medicines had not been completely realized.
- After initial approval, continued research revealed that imatinib had a greater impact when initiated earlier in the progression of the disease.
- Further research also revealed that imatinib was effective in combating other types of cancer.
- Additional TKIs have since been approved for CML and offer alternatives to imatinib.

5-Year Survival Rates for CML Patients Nearly Triple After Introduction of Imatinib²

Prior to Introduction of Imatinib: 31%
After Introduction of Imatinib: 89%

The Role of Personalized Medicines Is Rapidly Growing

Personalized medicines provide effective and efficient care by targeting the right medicine to the right patient.

Oncology Treatment Modalities in Top Pharmaceutical Markets, Share of Sales, 2003-2013

- Targeted Therapies
- Cytotoxics (Chemo)
- Supportive Care
- Hormonals

Cancer Treatment Advances Result in Substantial Gains to Society

Between 1988 and 2000:

23 million years of life saved due to cancer treatment advances

$1.9 trillion value of improved cancer treatment to society based on improved productivity, extended life and other factors

2. Innovation in the Cancer Medicine Pipeline
Promise in the Pipeline: More than 1,100 Medicines in Development for Various Cancers

“These are exciting times… the pace of discovery and application of new knowledge to patient care is rapidly accelerating.”

— Dr. Jose Baselga, Physician-in-Chief, Memorial Sloan Kettering Cancer Center

Medicines and Vaccines in Development for Cancer by Tissue of Origin (Selected) – May 2018

*Some medicines may be in more than one therapeutic category.*

Sources: PhRMA, Medicines in Development for Cancer, May 2018; American Association for Cancer Research. “Jose Baselga, MD, PhD” http://cancerprogressreport.org/2015/Pages/baselga.aspx.
Promise in the Pipeline: More than 200 Immuno-oncology Medicines in Development

Number of Medicines in Development in the United States, May 2017, Selected Classes of Immunotherapy

- Adoptive Cell Therapies: 40 medicines
- Bispecific Antibodies: 30 medicines
- Checkpoint Modulators: 45 medicines
- Cytokines: 23 medicines
- Oncolytic Cell Therapies: 14 medicines
- Vaccines: 96 medicines

“In the past 5 years, immunotherapy has emerged as one of the most exciting new approaches to cancer treatment that has ever entered the clinic.”

- American Association for Cancer Research

Researchers are using novel approaches to attack cancer at the molecular level. An average of 85% of drugs in the oncology pipeline, including 79% in the clinical research phase, have the potential to be first-in-class medicines.

Biopharmaceutical Companies are Researching New Targeted Cancer Therapies


42% of all medicines are in development.

73% of cancer medicines have the potential to be personalized medicines.
The cancer pipeline is ripe with innovative therapeutic options. Emerging combinations of medicines hold particular promise for controlling and killing cancer cells.

**Oncolytic viral therapies** zero in on cancer cells, replicate, and cause them to rupture.

**PARP inhibitors** interrupt cancer’s hyperactive DNA repair systems, thus allowing tumors to be crippled and die.

**CRISPR/Cas9 gene editing** allows researchers to manipulate cancer cell function.

**Immunotherapies** help target and kill cancer cells by unleashing the immune system. (e.g. CAR-T)

“We are in the midst of a sea change in how we are treating cancer. We’re really seeing the fruits of many years of research into what drives cancer and how it interacts with the immune system to defeat it and survive.”

- Dr. Louis Weiner, director of the Georgetown Lombardi Comprehensive Cancer Center

Developing a new cancer medicine is a complex process, fraught with setbacks, but these so-called “failures” are not wasted efforts. Researchers learn from them to inform future study.

**Cancer Researchers Build on Knowledge Gained from Setbacks to Inform Advances**

**MELANOMA**
- 96 unsuccessful attempts
- 7 new medicines

**BRAIN CANCER**
- 75 unsuccessful attempts
- 3 new medicines

**LUNG CANCER**
- 167 unsuccessful attempts
- 10 new medicines

*Setbacks and advances from 1998 to 2014*

Lung-MAP (Lung Cancer Master Protocol) matches patients to specific investigational medicines based on genomic screening. Shared infrastructure accelerates drug development and increases efficiency.

**HOW IT WORKS:**

Patients undergo genomic profiling to identify mutations that may cause non-small cell lung cancer.

Patients are directed to a treatment arm based on their genomic profile.

Patients receive highly targeted therapies and researchers collect data to advance the study of new medicines.

**THE PARTNERS:**

Lung-MAP is a unique public-private partnership between:

- Patient and disease advocacy groups
- Biopharmaceutical companies
- National Cancer Institute
- Foundation for the National Institutes of Health

3. Cancer Patient Spending and Financial Burden
Multiple Factors Contribute to the Financial Burden Faced by Cancer Patients

Top Patient Financial Concerns

<table>
<thead>
<tr>
<th>Non-Medical</th>
<th>Medical</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gasoline</td>
<td>Diagnostic Tests or Scans</td>
</tr>
<tr>
<td>49%</td>
<td></td>
</tr>
<tr>
<td>Food (Groceries or Dining Out)</td>
<td>Prescription Medicines</td>
</tr>
<tr>
<td>48%</td>
<td></td>
</tr>
<tr>
<td>Over-the-Counter Medicines</td>
<td>Physician Office Visits</td>
</tr>
<tr>
<td>42%</td>
<td></td>
</tr>
<tr>
<td>Special Clothing and/or Wigs</td>
<td>Outpatient Treatments (Incl. Radiation)</td>
</tr>
<tr>
<td>38%</td>
<td></td>
</tr>
<tr>
<td>Car Repairs</td>
<td>Surgery</td>
</tr>
<tr>
<td>23%</td>
<td></td>
</tr>
</tbody>
</table>

A Cancer Diagnosis Impacts Productivity and Employment for Patients and Caregivers

Patients

67% of patients who were employed full-time when diagnosed either stopped working or reduced their work hours

Caregivers

More than 25% of caregivers made extended employment changes

At 6 months post-diagnosis, 60-70% of out-of-pocket costs are driven by physician and facility care for commercially insured patients with breast, lung and colorectal cancer on average.

Breast Cancer Patient Out-of-pocket Costs At 6 Months Following Diagnosis

- 41% Professional Services
- 22% Facility Services
- 21% Non-Cancer Drugs
- 8%
- 5%
- 4%

Benefit Design Hinders Access to Cancer Medicines in Some New Classes

Some plans place treatments for certain high-cost conditions on the highest drug formulary cost sharing tier.

Percentage of Silver Plans Placing All Drugs per Class on Specialty Tier, 2016

- **Molecular Target Inhibitors***: 23%
- **Antiangiogenics***: 50%

*There are no generic drugs available in this class. All products are single-source.

Source: Avalere Health PlanScape®, a proprietary analysis of exchange plan features, April 2016. This analysis is based on data collected by Managed Markets Insight & Technology, LLC.
High Cost Sharing Leads to Abandonment or Delays in Cancer Treatment

Patients with highest co-pay were 5 times more likely to abandon treatment than the lowest co-pay group.

Oral Oncolytic Abandonment Rate by Patient Out-of-Pocket Amount

4. Cancer Costs in Context
Spending on Cancer Medicines Represents Less than 2% of Overall Health Care Spending

Cancer Medicines as a Portion of Total U.S. Health Care Spending, 2018*

- **Cancer Medicines**
  - $58.4 Billion

- **Remaining Health Care Spending**
  - $3.65 Trillion

* 2018 CMS total National Health Expenditures is a projection

** Cancer drug invoice spending and does not include discounts

Sources:
Cancer Medicines Represent About 20% of Cancer Spending

Medicare, Actively Treated Cancer Population, 2014

- 18% Cancer Drugs
- 5% Commercially Insured, Actively Treated Cancer Population, 2014
- 20% Cancer Drugs
- 28% Hospital Inpatient

Commercially Insured, Actively Treated Cancer Population, 2014

- 20% Cancer Drugs
- 13% Other Out Pt Services
- 4% Professional Services
- 8% Radiology

Overall Drug Spending Growth Expected to be Moderate as Cancer Progress Continues

Projected Cancer Drug Spending as a Portion of Total Drug Spending, US$ Billions

Projected Net Total Drug Spending Growth = 3-6% per year

The volume-weighted Average Sales Price (ASP) for cancer drugs administered through Medicare Part B has been growing in line with medical inflation.


* 2016 and 2017 Weighted ASP numbers are projections.
Cancer Treatments Face Growing Competition from Generics and Biosimilars

Global Oncology Sales at Risk of Reduction Due to Estimated Loss of Exclusivity
(Billions of US Dollars)*

*Pre-Expiry spending is the actual and estimated spending in the 12 months prior to loss of exclusivity (LOE) and is shown for developed markets only. Estimates are based on patent expiry dates or expected generic/biosimilar availability, and historic analogues where available. Biologics and small molecules are modeled separately. Biologic brand sales at risk are based on any non-original biologic competitor, regardless of approval type.

Sources: IQVIA Market Prognosis, National Sales Perspectives, QuintilesIMS Institute, May 2019. Includes small and large molecules.
Market Drives Rapid Switch to Generic Medicines: Example - Injectable Cancer Medicine Docetaxel

Market Drives Rapid Switch to Generic Medicines: Example - Injectable Cancer Medicine Gemcitabine

Better Use of Cancer Medicines Can Reduce Health Care Costs

Advanced melanoma patients who were adherent to immunotherapy experienced 10% lower health care costs.

Source: Gupte-Singh K, Lin J, Lingohr-Smith M, Menges BL, Rao S. Adherence to cancer therapies and the impact on healthcare costs among patients with advanced melanoma in the USA. Proceedings of the 22nd Annual International Meeting International Society of Pharmacoeconomics and Outcomes Research; 2017 May; Boston, MA. Abstract available at: https://www.ispor.org/ScientificPresentationsDatabase/Presentation/70971?pdfid=49558
5. Evolving Cancer Market Dynamics
Health Plans Make Extensive Use of Prior Authorization in Oncology

Health Plans’ Use of Prior Authorization in Oncology

- Oral: 76%
- Office Administered: 82%

Health Plans Deploy a Range of Tools to Manage Cancer Drug Spending

Current and Anticipated Payer Measures to Manage Oncology Costs (Q1 2017)

- Utilizing one or more value frameworks* in determining reimbursement: 31%
- Using clinical pathways to determine treatment regimens: 35%
- Contracting for preferred first-line therapies: 59%

*Value Frameworks: NCCN Evidence Blocks, ASCO Value Framework, etc.

Source: Zitter Health Insights, Managed Care Oncology Index, 2016.
Non-small cell lung cancer patients treated according to a clinical pathway incurred lower drug and total costs.

12-Month Savings with Lung Cancer Clinical Pathway*

*Clinical pathways are care plans that provide specific guidance on the sequencing of care steps and the timeline of interventions. They often consider evidence on the benefits and harms of alternative care options and take the cost of therapy into account.

Early results from oncology medical homes, bundled payment and specialty Accountable Care Organizations (ACOs) show potential for reducing total cancer costs.

<table>
<thead>
<tr>
<th>Model</th>
<th>Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient-centered medical homes</td>
<td>Pilot reduced total costs 35% annually</td>
</tr>
<tr>
<td>Episode- or bundled payment</td>
<td>Pilot reduced total costs of care 34%</td>
</tr>
<tr>
<td>Specialty ACOs</td>
<td>Reduce drug spending 5%, total spending 2% +</td>
</tr>
</tbody>
</table>

"Notably, all those interviewed suggested that the use of clinical pathways was a driver of financial savings, either through reduced drug spending or indirectly through more appropriate patient treatment."

- Sonal Shah, PharmD, and Greg Reh, *American Journal of Managed Care*
Nearly 200 oncology practices are participating in the Oncology Care Model (OCM) to improve quality and reduce the cost of cancer care in Medicare Part B.

OCM* Practice Results – Performance Period One

- Achieving a performance-based payment: 25%
- Achieving significant savings: 60%
- Implementing Guidelines-Based Care: 100%

*The Oncology Care Model (OCM) aims to provide higher quality, more highly coordinated oncology care at the same or lower cost to Medicare. Under OCM, physician practices have entered into payment arrangements that include financial and performance accountability for episodes of care surrounding chemotherapy administration to cancer patients. The practices participating in OCM have committed to providing enhanced services to Medicare beneficiaries such as care coordination, navigation, and national treatment guidelines for care. CMS is also partnering with commercial payers in the model.

Shared risk or outcomes-based contracts (OBCs) between health insurers and manufacturers are becoming more common across diseases, including oncology.

More than 40% of the 65 outcomes-based contracts projected between 2018-2022 are expected to be in oncology.

The rate of commercially insured patients receiving infused chemotherapy in hospitals increased from 6% of transfusions in 2004 to 43% in 2014.

Site of Care Shifts Drive Higher Cancer Costs

Commercial spending on chemotherapy infusions and oncology 6-month treatment episodes are twice as high in the hospital outpatient department compared to the physician office setting.

Average Drug-Level Spending on Infused Chemotherapy (2004-2014)

- Physician Office: $1,466
- Hospital Outpatient Department: $3,799

Hospital Consolidation Associated with Increases in Cancer Spending

Spending increases associated with just a $1\%$ increase in the proportion of medical providers affiliated with hospitals and/or health systems.

340B Creates Incentives to Shift Delivery of Physician-Administered Cancer Medicines to More Expensive Hospital Settings

Site of Care for Breast Cancer Drug Therapies Reimbursed in Medicare Part B

6. US System in Context
Other developed countries use centralized government price setting and coverage decisions to manage drug spending, resulting in significantly slower access to medicines than in the US.

US Patients Have Access to Cancer Medicines on Average Two Years Earlier Than Patients in Other Developed Countries

Average Time Delay Compared to the US in the Approval and Reimbursement of Oncology Medicines from 2010 to 2014

<table>
<thead>
<tr>
<th>Country</th>
<th>Delay Between US Approval and Country-Specific Approval</th>
<th>Delay Between Country Approval and Reimbursement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Germany</td>
<td>10</td>
<td>4</td>
</tr>
<tr>
<td>France</td>
<td>10</td>
<td>7</td>
</tr>
<tr>
<td>UK</td>
<td>10</td>
<td>13</td>
</tr>
<tr>
<td>Italy</td>
<td>10</td>
<td>15</td>
</tr>
<tr>
<td>Spain</td>
<td>10</td>
<td>17</td>
</tr>
<tr>
<td>Australia</td>
<td>15</td>
<td>17</td>
</tr>
<tr>
<td>Taiwan</td>
<td>22</td>
<td>21</td>
</tr>
</tbody>
</table>

More Cancer Medicines are Available to US Patients

Availability of Oncology Medicines within One Year of Global Launch, 2011-2018

Source: PhRMA analysis of IQVIA Analytics Link and FDA, European Medicines Agency (EMA) and Japan’s Pharmaceuticals and Medical Devices Agency (PMDA) data on oncology new active substances first launched globally from 2011 to 2018, June 2019.
Cancer death rates are lower in the US where patients have access to cancer medicines about 2 years earlier than in other developed countries.

Age-Standardized Cancer Death Rates, 2013*

<table>
<thead>
<tr>
<th>Country</th>
<th>Deaths per 100,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>USA</td>
<td>115.2</td>
</tr>
<tr>
<td>Italy</td>
<td>119.7</td>
</tr>
<tr>
<td>France</td>
<td>120.5</td>
</tr>
<tr>
<td>Germany</td>
<td>122.8</td>
</tr>
<tr>
<td>UK</td>
<td>128.9</td>
</tr>
</tbody>
</table>

*2013 is the latest year for which data are available for all listed countries.

Source: PhRMA analysis of WHO Mortality Database, May 2019. Note: 2013 data was used because some countries lack newer data.
Health technology assessment (HTA) recommendations across countries show little consistency, highlighting the effect of cultural factors on HTA design and implementation, and that a “one-size-fits-all” approach is not realistic in determining access to needed medicines.

In the U.K. only 7 government assessments recommended without restrictions.
Americans diagnosed late-stage non-small cell lung cancer gained an estimated 201,700 life years from 2006 to 2017 due to innovative medicines being made available with little to no delay after regulatory approval. Patients would have lost half of these survival gains if the United States had adopted HTA frameworks like those used by foreign governments to determine access to care.

7. Solutions For Advancing Value in Cancer Care
Advancing the Path for Development of New Cancer Medicines

Advances in regulatory science are creating efficiencies and enhancing the tools needed to drive innovative cancer drug discovery, development and approval.

**Solutions For Accelerating Cancer Progress**

- **Integrating Patient Perspective**
  - Incorporate patient input & increase patient engagement.

- **Accelerating Qualification & Use of Biomarkers**
  - Increase acceptance of novel outcome measures.

- **Advancing Use of Real-World Evidence**
  - Enable use of both safety & efficacy data in regulatory decision making.

- **Increasing Acceptance of Novel Clinical Trial Designs**
  - Enhance use of adaptive & other flexible study designs.
Biopharmaceutical Companies Advancing Patient-Centered Solutions for Better Value

- Expand Value-Based Contracts
- Strengthen Decision Support Tools
- Increase Availability of Evidence on Value
- Develop Quality Measures
- Improve Use of Medicines

SOLUTIONS FOR BETTER CANCER CARE
# Enabling the Cancer Drug Market’s Move to Value

<table>
<thead>
<tr>
<th>Value Based Contracts</th>
<th>Value Frameworks</th>
<th>Quality Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expand value-based contracts by modernizing outdated regulations.</td>
<td>Develop better data and tools to support informed decision-making by patients, physicians and payers.</td>
<td>Close gaps in clinical and patient-focused quality measures.</td>
</tr>
</tbody>
</table>

“[R]egulatory reforms can address these concerns and encourage more robust competition within the drug market.”

- Scott Gottlieb & Kavita Patel

“[E]merging approaches for assessing drug value are welcome….The frameworks will require refinement, however, before they're ready to be broadly applied.”

- Peter Neumann & Joshua Cohen

“All phases of the cancer care continuum…need new measures.”

- National Academy of Medicine