The Intermountain Oncology Clinical Program: Present and Future

William T. Sause, MD
Director of Radiation Oncology;
Intermountain Healthcare; Murray, Utah

Objectives:
• Define current status of the Cancer Program at Intermountain Healthcare
• Summarize and outline long term objectives
• Define challenges of the Cancer Program
Oncology Clinical Program

Legacy of Life
April 8, 2016

Dr. William Sause
Medical Director

Brad Bott, MBA, CCRP
Operations Director
Oncology Overview
Cancer Care in America
Health Affairs, Sept. 2005

- Nixon signs National Cancer Act on December 23, 1971.
- Substantial public & private sector investment.
  - NCI = $4.75 billion* in 2007 or roughly 17% of the NIH budget
  - Pharma = $7.4 billion in 2003
- What have we gotten for this massive financial investment?
- Age-adjusted cancer death rate decreased 7.2% between 1991-2000.

* $4.83 billion in 2005; $4.8 billion in 2006
The results are simply stunning ... not evolutionary but revolutionary.
Novel Cancer Therapies
Trastuzumab in Breast Cancer
E.H. Romond et al. NEJM 353:1673, 2005

![Graph showing the survival rates of AC→T and AC→TH treatments.]

<table>
<thead>
<tr>
<th>Treat:</th>
<th>No:</th>
<th>Events:</th>
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</thead>
<tbody>
<tr>
<td>AC→T</td>
<td>1679</td>
<td>261</td>
</tr>
<tr>
<td>AC→TH</td>
<td>1672</td>
<td>134</td>
</tr>
</tbody>
</table>

HR=0.48, P=3x10^{-12}
The Cost of Progress?

The New York Times

Putting a Price on Treatment

Avastin is one of the most expensive drugs used to fight cancer. Here is how it stacks up against some others.

<table>
<thead>
<tr>
<th>TARGETED THERAPIES</th>
<th>CANCER TYPE</th>
<th>MONTHLY COST</th>
</tr>
</thead>
<tbody>
<tr>
<td>Erbitux</td>
<td>Colon</td>
<td>$6,800</td>
</tr>
<tr>
<td>Avastin</td>
<td>Lung</td>
<td>$7,000</td>
</tr>
<tr>
<td>Avastin</td>
<td>Breast</td>
<td>$4,100</td>
</tr>
<tr>
<td>Gleevac</td>
<td>Stomach</td>
<td>$3,550</td>
</tr>
<tr>
<td>Herceptin</td>
<td>Breast</td>
<td>$2,670</td>
</tr>
<tr>
<td>Tarceva</td>
<td>Lung</td>
<td>$5,924</td>
</tr>
<tr>
<td>Gemzar</td>
<td>Lung</td>
<td>$4,638</td>
</tr>
</tbody>
</table>

CHEMOTHERAPEUTICS

Drugs that directly fight tumor cells; they are often highly toxic

<table>
<thead>
<tr>
<th>CHEMOTHERAPEUTICS</th>
<th>MANUFACTURER</th>
<th>CANCER TYPE</th>
<th>MONTHLY COST</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alimta</td>
<td>Eli Lilly</td>
<td>Lung</td>
<td>$5,924</td>
</tr>
<tr>
<td>Camptosar</td>
<td>Pfizer</td>
<td>Colon</td>
<td>$4,631</td>
</tr>
</tbody>
</table>

Sticker Shock

Average per-patient cost of treatment for some cancer drugs that have come to market since 2004:

<table>
<thead>
<tr>
<th>Drug</th>
<th>Manufacturer</th>
<th>Cancer Type</th>
<th>Monthly Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avastin/Genentech</td>
<td>Colorectal</td>
<td>Lung</td>
<td>$46,600</td>
</tr>
<tr>
<td>Vectibix/Amgen</td>
<td>Colorectal</td>
<td>Lung</td>
<td>$56,300</td>
</tr>
<tr>
<td>Erbitux/ImClone &amp; Bristol</td>
<td>Colorectal</td>
<td>Lung</td>
<td>$36,000</td>
</tr>
<tr>
<td>Lucentis/Genentech</td>
<td>Age-related macular degeneration</td>
<td>$40,000</td>
<td></td>
</tr>
<tr>
<td>Revlimid/ Celgene</td>
<td>Multiple myeloma</td>
<td>$67,000</td>
<td></td>
</tr>
<tr>
<td>Sutent/Pfizer</td>
<td>Kidney</td>
<td>$46,500</td>
<td></td>
</tr>
</tbody>
</table>

1 Drug available free after $55,000 in expenditure.
2 Drug available free after patients use more than 5% of adjusted gross income in co-payments.

Sources: the companies; Morgan Stanley
Cancer Facts and Statistics

• According to the National Cancer Institute about 1,660,000 people are diagnosed with cancer each year. That’s 4,548 per day, 189 per hour, and \textbf{3 people diagnosed with cancer every second}.

\begin{figure}
\centering
\includegraphics[width=\textwidth]{cancer_cases.png}
\caption{Utah: Total Cancer Cases}
\end{figure}

Source = National Cancer Institute and Utah Cancer Registry, 2014
In 2010, 9,233 Utahns were diagnosed with cancer and 2,810 died of cancer. Cancer is the second leading cause of death in Utah and the United States, exceeded only by heart disease.

Source = Utah Cancer Registry, 2010; SEER Data, 1995-2006
National Cancer Institute Predictions
2013 - 2023

Colon & Rectum
Lung & Bronchus
Breast
Prostate
Oncology Clinical Program Overview
Teams

- Regional – Multidisciplinary Physician Sub-Specialists and Disease Specific Tumor Boards; Leadership – Physician and Operations
- Disease-Site Development Teams with Sub-Specialty Representation
- Oncology Clinical Program
- Oncology Clinical Trials Office
  - >22 employees, representation in each region
- Ancillary Services
Patient-Centric Cancer Care
Vision and Opportunity

• Quality Care and Continuous Improvement

• Supportive Care and Survivorship

• Research
What Do Cancer Patients Want?

• When deciding where to go for care:

  1. Doctor who specializes in my cancer

  2. Technology and treatment options

  3. Clinical quality

Source = The Advisory Board Company: Oncology Roundtable, June 2015
What Do Cancer Patients Want?

• Which services would have been most valuable to you?

  1. All care takes place in same building/hospital
  2. Specialized symptom management
  3. One point of contact to help me understand my care

*Source = The Advisory Board Company: Oncology Roundtable, June 2015*
Key Activities

• Quality Care and Continuous Improvement
  – Disease-Specific Research Projects
  – Cancer Care Delivery Research
  – Cost-Effectiveness Research
• Service
  – Patient Navigation (cancer concierge services)
  – Ancillary (financial counseling, genetic counseling, psych-social)
  – Cancer Continuum (risk assessment, prevention, detection, survivorship, end-of-life care)
• Research
  – Biospecimen
  – Clinical Trials (all trial types/phases)
  – Health Science Research
Quality Care and Continuous Improvement
Examples: Tumor-Specific Projects

**Breast Cancer**
- ER/PR Specimen Handling
- Breast Reconstruction
- IHC4 vs. Oncotype DX Testing
- MRI Utilization in Breast Cancer Patients
- Short-Term Imaging Follow-Up
- Sentinel Lymph Node
- Tissue Procurement
- Time to Biopsy
- Mammography Callback Rate
- Early Stage Adjuvant Radiation Therapy
- Node Dissection Rate for DCIS
- DCIS at Diagnosis
- Axillary Dissection Following Positive Sentinel Node Biopsy
- Early Stage at Diagnosis
- Neoadjuvant Chemotherapy
- ER/PR Hormone Therapy
- Micrometastasis
- Hypo-fractionation
- Breast Screening Cost
- BIRADS 3
- False Negative Mammography Project
- Spring-Loaded TruCut vs. Vacuum-Assisted Bx

**Colorectal Cancer**
- Stage III Chemotherapy
- Rectal Cancer – Endoscopic Ultrasound
- Colon Familial Polyp (HICCP-UPDB)
- Metastatic Colon Cancer Tissue
- Colon 12 Node Retrieval
- HPNCC Genetics & Lynch Syndrome Project
- Pancreaticoduodenectomy Study
- Colonoscopy Frequency S/P Definitive Cancer Surgery
**Melanoma**
- Melanoma Database
- Ear Melanoma Study

**Lung Cancer**
- State-Wide Lung Cancer Screening Program
- Pre-Operative Imaging

**GYN Cancers**
- Endometrial Ablation Cancer Study
- Type II Endometrial Cancer and Obesity
- Estrogen Insensitivity Study
- Ovarian Cancer Study
- Endometrial Familiarity Study
- PAP & HPV Testing
- Endometrial Lynch Syndrome Project
- Stage III Radiation

**Urologic Cancers**
- Epidemiology of Testicular Cancer in the Utah Population
- Prostate Quality of Life Study
- Appropriate use of Advanced Imaging in Prostate Cancer
- Radiation Treatment Templates
- Renal Cancer Database
- Finasteride
- Familial Polyp
- Prostatectomy Length of Stay (LOS)
- Prostatectomy Variable Cost Evaluation
- Physician Report Card
- PSA Recurrence
- Prostatectomy Margin Status

>40 active and on-going projects
2015: Breast Cancer MRI Use and Practice Variation

Bilateral Mastectomy Rate System Wide 11.8% (562/4,762)
Region A 16.0% (146/913)
Region B 9.7% (205/2,109)
Region C 15.9% (157/986)
Region D 7.2% (54/754)
Service
Quality Care Publications

• State-wide Lung Cancer Screening Program (submitted to JAMA, 2015)

TITLE: First-Year Patient Outcomes in a Comprehensive Lung Cancer Screening Program

AUTHORS: Andrew T. Miller, M.D.\textsuperscript{1}, Patricia Kruger, R.N.\textsuperscript{2}, Braden Rowley\textsuperscript{3}, Teresa Robertson\textsuperscript{4}, William Sause, M.D.\textsuperscript{3}, Karen Conner, M.D.\textsuperscript{5}, Jack Ruckdeschel, M.D.\textsuperscript{2}, Denitza P. Blagev, M.D.\textsuperscript{6,7}

*The Oncology Clinical Program has produced many publications and presented at many national meetings. This is just one example.*
Supportive Care and Survivorship

- Cancer Concierge Services
  - Patient Navigation
  - Financial Navigation
  - Palliative and Survivorship Care
  - Hospice
- System-Wide Cancer Genetic Counseling
- Supportive Care Clinics
Research
High-Impact Research

- Clinical Research
- Discovery Research
- Translational Medicine Research
Clinical Research

– Oncology Clinical Trials Department
  • Pharmaceutical
  • Investigator initiated
  • Cooperative Group

– Early Phase Clinical Trial Program
  • Access to new treatments and technology

*Bringing Cutting Edge Cancer Care Close to Home*
The CURRENT STATE OF AFFAIRS

According to the NCI, 85% of cancer patients are treated at community hospitals in or near the communities in which they live, with less than 3% ever getting access to clinical trials - 1.5% for minority populations. 

And for those that do participate in trials... 40% of sites fail to enroll a single patient, costing Pharma over $50,000 per site.
Integrated Health Care Network

A Phase III Study (CheckMate 017) of Nivolumab (Anti-Programmed Death-1) vs Docetaxel in Previously Treated Advanced or Metastatic Squamous (SQ) Cell Non-Small-Cell Lung Cancer (NSCLC)

David R. Spigel,1 Karen Reckamp,2 Naiyer Rizvi,3 Elena Poddubskaya,4 Howard West,5 Wilfried Ernst Erich Eberhard,6 Paul Baas,7 Scott J. Antonia,8 Adam Pluzanski,9 Everett E. Vokes,10 Esther Holgado,11 David Waterhouse,12 Neal Ready,13 Justin Gainor,14 Osvaldo Aren Frontera,15 Leora Horn,16 Luis Paz-Ares,17 Christine Baudelet,18 Brian Lestini,18 Julie Brahmer19

1Sarah Cannon Research Institute, Nashville, TN, USA; 2Vanderbilt-Ingram Cancer Center, Nashville, TN, USA; 3Memorial Sloan Kettering Cancer Center, New York, NY, USA; 4M.D. Anderson Cancer Center, Houston, TX, USA; 5University of Chicago, Chicago, IL, USA; 6University of Texas MD Anderson Cancer Center, Houston, TX, USA; 7Fresenius Medical Care North America, Aliso Viejo, CA, USA; 8University of Alabama at Birmingham, Birmingham, AL, USA; 9Charing Cross Hospital, London, UK; 10Royal Marsden Hospital, London, UK; 11University ofPhysics, Cincinnati, OH, USA; 12University of Miami, Miami, FL, USA; 13University of Cincinnati, Cincinnati, OH, USA; 14University of California, Los Angeles, CA, USA; 15Hospital del Mar, Barcelona, Spain; 16Hospital Clínico San Carlos, Madrid, Spain; 17Hospital La Fe, València, Spain; 18University of British Columbia, Vancouver, BC, Canada; 19National Cancer Institute, Bethesda, MD, USA

Source = ASCO, 2015
### Regimen Cost (80 kg patient)

<table>
<thead>
<tr>
<th>Regimen</th>
<th>Cost of Nivolumab</th>
<th>Cost of Ipilimumab</th>
<th>Cost of Regimen</th>
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</thead>
<tbody>
<tr>
<td>Nivo+ Ipi for 11.5 m</td>
<td>$144,408</td>
<td>$151,158</td>
<td>$295,566</td>
</tr>
<tr>
<td>Nivo for 6.9 m</td>
<td>$103,220</td>
<td>$0</td>
<td>$103,220</td>
</tr>
<tr>
<td>Ipilimumab for 2.9 m</td>
<td>$0</td>
<td>$158,252</td>
<td>$158,252</td>
</tr>
</tbody>
</table>

Source = ASCO, 2015
BioRepository Research

• Paraffin Tissue Repository
  • ~4 million tissue blocks
    – All disease types
    – Surgical blocks from early 1970s to present
    – Autopsy blocks from early 1950s
• Research, validation studies and test development
• Material linked to patient clinical data
  – Enterprise Data Warehouse
  – Utah Population Database
Clinical Trials

COMMUNITY HOSPITALS ON THE NEW FRONTIER OF DISCOVERY — WHERE PATIENTS LIVE
Intermountain Healthcare: Opportunities

- Integrated Healthcare System Committed to Continuous Quality Improvement
- Patient-centric research activities
- Access: hospitals and patients (state-wide reach)
- Strong history of clinical research, with significant clinical trial opportunities to:
  - Mobilize resources and access to patients to accelerate research and expand the availability of clinical trials in our communities.
  - Create a large and active database that utilizes patient electronic medical records and tumor sequencing data to digitally match patients to clinical trials and clinical trials to patients.
  - Provide access to patient and low cost genomic data (with patient consent) to the research community to facilitate the development of clinical trials that are designed to meet the needs of their patients (and others).
  - Advance value-based cancer care with a system that increases availability of treatments that are targeted to specific patients.
- Access to “BIG DATA” for quality improvement and outcomes-based research projects
- Access to robust BioSpecimen Repository
Intermountain Healthcare: Challenges

- Explosion of New Science and Cost
- Patients want experts
  - How to deliver experts to lower population service area and keep patients close to home/integrated service system
- Service-Oriented and Patient-Centric (including patient navigation services)
- BioSpecimen Repository
  - Infrastructure and research agenda
- Clinical Trials Infrastructure:
  - Physician Engagement (protected time)
  - Hospital and Physician Alignment
  - Clinical Research Infrastructure to Ensure Efficient and Compliant Processes
  - Integrated IT Systems
  - Expand our clinical trial portfolio (all trial types and phases)
  - Expand partnerships (academic cancer centers, integrated healthcare delivery systems, biotech, pharma, federal funding agencies)
- Physician Recruitment and Alignment (strategic/system-wide initiatives)
- Highly Competitive Environment
Strategic Planning

• Efforts Currently Underway:
  • External Consultant
  • 3-5 Year Strategic Plan
  • Intermountain Cancer Genomics and Precision Medicine
  • Comprehensive System Approach to Cancer Care Delivery
  • Integrated Cancer Care Programs and Processes System-Wide
  • Exceptional Care, Close to Home
Intermountain Cancer Genomics
Discovery Research

- Research Collaborations
  - Stanford U.
  - U. of Oklahoma
  - Primary Children’s

- BioRepository Genomic Research
  - Biomarkers
Genomic Medicine

Cancerous cell

Genomic analysis

Faulty Genes
1. FGFR1
2. P53
3. MEK1
4. EGFR
5. HER2

*drug 1*
*drug 2*
*drug 3*
*drug 4*
Clinical Cancer Genomics Program

• Genomic Testing
• Personalized Medicine Clinic
• Molecular Tumor Board
• Treatment delivery
# Cancer Genomics Workflow

<table>
<thead>
<tr>
<th>Personalized Medicine Clinic</th>
<th>Day 1</th>
<th>Molecular analysis (NGS)</th>
<th>Day 8-9</th>
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<tbody>
<tr>
<td>Tumor Biopsy</td>
<td>Day 2-3</td>
<td>Analytics</td>
<td>Day 10-13</td>
</tr>
<tr>
<td>Pathology Review</td>
<td>Day 4-5</td>
<td>Molecular Tumor Board</td>
<td>Day 14-15</td>
</tr>
<tr>
<td>Sample Prep</td>
<td>Day 6-7</td>
<td>Results and Treatment</td>
<td>Day 16-17</td>
</tr>
</tbody>
</table>
Molecular Tumor Board

• Multi-institutional participants
• Experts in Cancer Genomics
• Interpretation of Findings
Patient Case: Lung Cancer

• 56-year-old with lung cancer

• Failed standard chemotherapy

• Genomic analysis: BRAF mutation
Lung Cancer: targeted treatment

Before

After
Future Vision

- Multidisciplinary Genomics—to service the system
  - Cardiovascular-genomics (high-risk patients)
  - Neonatal-genomics (hyperbilirubinemia)
  - Neurosciences (Alzheimer’s, Amyotrophic Lateral Sclerosis - ALS, Autism)
  - Infectious Disease (rare infections)
Cont’d

- Genomics: Multidisciplinary
- Immunology: Immuno-Oncology, etc.
- Innovations: Stanford Technology Center
- Translational Research
Questions?