Big Data and Oncology Care Quality Improvement in the United States

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Data Beyond Clinical Trials: How Can We Effectively Use These Data to Improve Quality?
Data Collection & Analysis Initiatives

- SEER: Surveillance, Epidemiology, and End Results
- QOPI: The Quality Oncology Practice Initiative
- NCDB: Commission on Cancer
- PCORI: Patient-Centered Outcomes Research Institute
- NC Cancer Registry
Surveillance, Epidemiology, and End Results (SEER)

- National Cancer Institute’s longitudinal data repository
- Source of data on cancer incidence, treatment and survival
- Designed to support research
- Population-based registries covering 28% of U.S. population
- >400,000 incident cases reported annually
Learning from Key Categories of Data

- Patient demographics
- Tumor characterization
- Initial course of therapy
- Biomarkers
- Outcomes (survival/prevalence)
SEER Data Help Identify Trends Within Racial Subgroups

Trends of incidence rates and annual percentage change for the top five cancer sites among each Asian American ethnic group, 1990-2008, men
Radiation therapy is not recommended following mastectomy or lumpectomy of LCIS.

<table>
<thead>
<tr>
<th>Radiation therapy after surgical procedure among in situ breast (LCIS &amp; DCIS) by surgery type, 2010-2011</th>
<th>No</th>
<th>Yes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>After mastectomy</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LCIS</td>
<td>99%</td>
<td>1%</td>
</tr>
<tr>
<td>DCIS</td>
<td>97%</td>
<td>2%</td>
</tr>
<tr>
<td><strong>After lumpectomy</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LCIS</td>
<td>99%</td>
<td>1%</td>
</tr>
<tr>
<td>DCIS</td>
<td>34%</td>
<td>66%</td>
</tr>
</tbody>
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SEER-Medicare Database

• Links 2 large population-based sources of data
  – SEER (outcomes data)
  – Federal Medicare claims data (claims-based clinical data)

• Helps identify patterns of care before a cancer diagnosis, during initial diagnosis/treatment and long-term follow-up for patients older than 65 years

• Can examine use of cancer tests and procedures, and costs of cancer treatment
Assessing Drug-Related Cardiotoxicity

Studies suggest that incidence of trastuzumab-related cardiotoxicity is higher outside of clinical trials, with highest risk seen in older patients

Yet… ✓ Median age of patients in pivotal trials is 51-52 years old
✓ Patients over 70 years old excluded from most studies

Using SEER-Medicare and Texas Cancer Registry-Medicare linked databases

• 9,500+ eligible patients identified
• Median age: 71
• CHF in trastuzumab users: 29.4%
• CHF in non-trastuzumab users: 18.9% (p<0.001)


CHF-free survival for patients with breast cancer
ASCO’s Quality Oncology Practice Initiative (QOPI®)

• Oncologist-led, practice-based quality assessment and improvement program
• Based on retrospective chart reviews conducted within hematology-oncology practices

Core module:
- Documentation of care
- Chemotherapy treatment planning and summary
- Pain assessment
- Smoking cessation efforts
- Psychosocial support

Disease module:
- Care of patients with specific tumors types including breast cancer, lung cancer, colon cancer, and lymphoma

Domain module:
- End of life care
- Clinical trial assessment
- Symptom and toxicity domains
Assessing Adherence to Clinical Guidelines

- QOPI analyses show high levels of performance in many areas of cancer care
- One analysis of 150+ practices showed high rates of compliance with recommendations for adjuvant chemotherapy standards in several cancers
Identifying Areas of Improvement

- Positive trends in adherence to quality measures, but clear room for improvement in smoking cessation counseling, evaluation of fertility risk, and fertility preservation counseling
QOPI on an Individual Practice Level

- The rate of chemotherapy administration was initially higher than in other QOPI participants (*) but approached the mean after results were shared with faculty oncologists.

Trends in chemotherapy administered in the last two weeks of life
(QOPI implementation at the University of Michigan Comprehensive Cancer Center)

THE FUTURE OF QUALITY MEASUREMENT AND IMPROVEMENT: ASCO’S CANCERLINQ™
1.7MM people diagnosed with cancer in the US

97% of patient data locked away in unconnected files and servers
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- A priori determination of data of interest
- High reliance on manual data extraction
- Lack of interoperability
- One-way knowledge transmission

Cancer registries

- 100% of clinical data in EHRs
- Rapid learning from real-world observational data
- Ethical use of data by the ecosystem
- Privacy and security
- Bi-directional exchange
  - Clinical decision support
  - Outcomes reports & benchmarking
Using Big Data to Track Trends: An Example

CancerLinQ and drug safety monitoring

- Monitor for emerging issues around recently introduced or existing agents used off label
- Examine safety outcomes for drug combinations
- Identify dosing deviations from labeled indication
- Study frequency, patterns and outcomes of off-label use
- Assess diagnostic test use with targeted agents
- Evaluate outcomes for subpopulations not well represented in registration trial, e.g., elderly
- Identify opportunities to educate physicians on safety findings
Analysis of ESA Usage in Breast Cancer Patients From CancerLinQ Prototype

Yearly percentage of cycles in which an ESA was received

- 2005: 34%
- 2006: 34%
- 2007: 29%
- 2008.1: 21%
- 2008.2: 19%
- 2009: 10%
- 2010: 6%
- 2011: 3%
- 2012: 3%
Real-world patients

Data aggregation

Population health outcomes

Improved healthcare operations

Improved quality of care

Clinical decision support
Vanguard Practices

- 15 practices
- Geographically dispersed
- Roughly 350 physicians
- Records from 500,000 patients

...Coming in 2015