The SEER Virtual Tissue Repository Pilot:
Leveraging Population-Based Biospecimens

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Surveillance Research Program NCI, NIH
Extend the Capacity of SEER Registries To Support Cancer Research

- Researchers often lack material with clinical relevance: can be provided by SEER Registries
- Path labs store FFPE* tumors, slides and digital images
- SEER registries can serve as bio-repositories for unusual outcomes and rare cancers

*formalin-fixed, paraffin-embedded
Utility of Biospecimens for Cancer Research

FFPE tumor blocks
- Protein expression
- DNA/RNA detection

Histology slides
- Pathology review
- Immunohistochemistry

Digital Images
- Quality control
- Digital pathology research*

* Whole Slide Imaging (WSI)
SEER-Virtual Tissue Repository (VTR) Benefits

• Linked to SEER data – track long term outcomes

• Provide custom annotation (clinical data items)

• Evaluate representativeness (population-based)

• Span health care facilities/labs/academic centers

• New cases added annually
Full-Scale SEER-VTR

Investigator

VTR Central Repository

NCI  ↓  IMS

SEER Registries

Tissue and Data

Information Management Services, Inc. (IMS)
Seven SEER-VTR Pilot Registries

Greater California
Hawaii
Utah
Iowa
Louisiana
Kentucky
Connecticut

7 registries funded for VTR pilot in FY2016
SEER-VTR Pilot Objectives

Develop best practices
- Collecting biospecimens
- Custom annotating clinical data
- Determining human subjects consent

Provide a resource of annotated biospecimens
- Rare outcomes in two common cancers
Localized Breast Cancer

- Patients who died within 2 years
- Controls with more typical 5+ year survival

Pancreatic Adenocarcinoma

- Patients who survived 5+ years
- Controls with more typical <2 year survival
SEER-VTR Pilot Workflow

ID Case
- NCI

Collect Reports
- Registries

Verify Cases
- NCI and Clinicians

ID Tissue
- Path labs

Annotate
- NCI/Registries

Case

Control

Match Control #1

Match Control #2
Web-based tool: 42 questions collected across catchment areas

- Storing/sharing biospecimens
- Sharing/providing histology slides
- Digitization of images
- Terms of release for research
Custom Annotation of Biospecimens

• Systemic therapy
• Radiation treatment
• Co-morbidities
• Recurrence details
• Biomarkers

Abstracting data items into SEER*Abs (IMS)
Systemic Therapy

- Drug Code
- Single/Total Dose
- Dose Units
- Frequency
- Route
- Start/End Dates
• Include SEER abstracts linked with de-identified path reports

• Provide access to cases and biospecimens

• Queries based on tumor/patient characteristics, survival, and biospecimen availability
SEER-VTR Central Repository

Stores ~2300 text-searchable path reports

<table>
<thead>
<tr>
<th>Details</th>
<th>Sex</th>
<th>Age at diagnosis</th>
<th>Histology</th>
<th>Race</th>
<th>Pathology reports</th>
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</table>

*Infiltrating* duct carcinoma

Found 402 results in 145 milliseconds — Export these results

[1 2 3 4 5 6 7 ... 41]
• Static Images for QC

• Whole Slide Images for digital pathology research

Exploring platforms for storing and accessing image files
Pilot Summary

Develop best practices

• Custom annotating clinical data
• Collecting a variety of biospecimens

Provide a resource of annotated biospecimens

• Case-control pilot studies will be available for research
Future Directions

• Scale up a system of searchable annotated biospecimens

• Support digital pathology and imaging research

• Create opportunities for identification of molecular targets

• Enable characterization of unusual cancer outcomes
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SEER Registries (GC, CT, HI, IA, LA, KY and UT)  
Information Management Services (IMS)

VTR Data linkage Pilot is a Rapid Response Special Study for SEER

Image Acquisition Pilot is supported by EGRP
Case-Control Matching

Breast Cancer (2003-2008):
- Age (by 5 years)
- HR Status (neg, pos, unknown)
- Race (white, black, other, unknown)
- Grade (I, II, III+IV, unknown)
- Size (<20, 20-50, 50+ mm)
- Histology (8500/3, other)
- Radiation (yes, no+unknown)
- Nodes evaluated
  - (1-3, 4-10, 11-20, 20+, unk)

Pancreatic Cancer (2003-2011):
- Stage (localized+regional, dist)
- Age (<59, 60-69, 70+)
- Sex (male, female)
- Race (white, black, other)
- Site (head, body+tail+other)
- Grade (I, II, III+IV, unknown)
- Radiation (yes, no+unk)

Deterministic vs probabilistic
Systemic Therapy Agents

Pancreas Agents
- DNA binding compounds
- EGFR/Protein Kinase inhibitors
- Taxane class compounds
- Angiogenesis inhibitor
- Other, specify

Breast Cancer Agents
- DNA binding compounds
- EGFR/Protein Kinase Inhibitors
- Taxane class compounds
- Microtubule binding compounds
- Aromatase Inhibitors (AI)
- Estrogen/hormone modulators
- Other, specify
5-Fluorouracil (5-FU): Pyrimidine (Thy) antagonist, blocks DNA synthesis
Capecitabine: metabolized to 5-FU
Cisplatin: DNA crosslinker, blocks DNA synthesis
Oxaliplatin: DNA crosslinker, blocks DNA synthesis
Epirubicin: DNA crosslinker, blocks DNA synthesis
Mitomycin: DNA crosslinker, blocks DNA synthesis
Irinotecan: Topoisomerase inhibitor, blocks DNA synthesis
Gemcitabine: Deoxycytodine, induces apoptosis, blocks DNA synthesis

Erlotinib: EGFR inhibitor, JAK2 inhibitor
Cetuximab: EGFR inhibitor, treats colon cancer with WT KRAS
Sorafenib: Tyr Kinase inhibitor (VEGFR, PDGFR, Raf)

Docetaxel: Taxane drug class, mitotic spindle (2X potent as paclitaxel), resistance prone
Paclitaxel: Taxane drug class, microtubule breakdown, fewer side effects than docetaxel

Bevacizumab (avastin): Angiogenesis inhibitor (inhibits blood vessel growth);

*Pancreatic  + Breast
Scaled Up SEER-VTR

Provide a resource of annotated biospecimens

• Searchable repository

Query, receive and store information

• De-identified by SEER registries

Provide a peer-review process for requests

• Organized at the NCI-include external review panel
42. Which of the following IRB approvals would your pathology laboratory require?

Check any that apply

- [ ] Principal Investigator’s institutional IRB
- [ ] Registry IRB
- [ ] Hospital IRB
- [ ] Pathology lab IRB
- [ ] No IRB approval required
- [ ] Other: ___