IROC
NCI-NCTN Imaging and Radiation Oncology Core

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Educational Exhibit Presented at RSNA 2013
NCI Clinical Trial Efforts

For over 50 years, NCI has supported a standing infrastructure - the NCI Clinical Trials Cooperative Group Program - to conduct large scale cancer clinical trials across the nation, with successful completion of many important trials that have led to new treatments for cancer patients. More than 25,000 patients and thousands of clinical investigators participate in the program’s clinical trials annually. It is NCI’s vision and responsibility to ensure that the Cooperative Groups are optimally situated and well-prepared to design, enroll and complete state-of-the-art trials for cancer patients.

In recent years stakeholders have expressed concerns that the program is falling short of its. As a result, NCI asked the Institute of Medicine (IOM) to assess the state of clinical cancer trials, review the Cooperative Group Program, and provide advice on improvements.

This review was completed and 4 major goals highlighted:

1. Improve speed and efficiency of design, launch, and conduct of trials
2. Incorporate innovative science and trial design into cancer trials
3. Improve prioritization, selection, support, and completion of trials
4. Incentivize the participation of patients and physicians in trials
NCI Director, Harold Varmus, MD summarized the efforts in 2010 as:

*This is not just about getting the clinical trial groups properly retrofitted..., it's about injecting a new kind of science into the way we do clinical trials.*
NCI Clinical Trial Efforts

The NCI National Clinical Trial Network will be guided by the CTAC Clinical Trials Strategic Planning Subcommittee which will have representation from all stakeholders in the network. The next organizational component are the NCI Disease / Imaging Steering committees which will be tasked to evaluate and prioritize clinical trials going forward.

Reproducibility / Validation / Efficacy


Number 3
Avoid using advanced imaging technologies — PET, CT, and radionuclide bone scans — to monitor for a cancer recurrence in patients who have finished initial treatment and have no signs or symptoms of cancer

*PET and PET/CT, which are "expensive," have not been proven as surveillance tools to improve outcomes,* said Dr. Schnipper

*These scans can also give false-positive results,* which can cause a patient to undergo additional unnecessary or invasive procedures or treatments or to be exposed to additional radiation, said Dr. Schnipper.
IROC Mission

Provide integrated imaging and radiation oncology quality control programs in support of the NCI’s NCTN Network thereby assuring high quality data for clinical trials designed to improve the clinical outcomes for cancer patients worldwide.
NEW CONTRAST AGENTS

Michael V. Knopp, MD., PhD
IROC’s Five General NCTN Core Services

1. Site Qualification  
   (FQs, ongoing QA, proton approval, resources)
2. Trial Design Support/Assistance  
   (protocol review, templates, help desk, key contact QA centers)
3. Credentialing  
   (tiered system to minimize institution effort)
4. Data Management  
   (pre-review, use of TRIAD, post-review for analysis)
5. Case Review  
   (Pre-, On-, Post-Treatment, facilitate review logistics for clinical reviews)

IROC’s Data Upload Strategy

IROC is building upon ACR investment into TRIAD software to expand it to serve as a efficient tool to upload imaging and radiation therapy data sets for Quality Assurance and Analytical Processing for NCTN trials. This is an evolutionary process that will occur over the next years as IROC develops more efficient and effective workflows.
ICL Trial Implementation Pipeline

Trial Initiative
- Protocol Proposal
- Protocol Amendment

Site Credentialing
- Equipment Validation
- Protocol Refresher
- (Virtual) Site Visit
- Site Specific Manual

Trial Performance
- Data Management
- Quality Control
- Real-time Image Review
- Trial Report & Update

Trial Assessment
- Blind Central Review
- Endpoint Analysis
- Summary & Report

Semi-automatic Image QC
Phase II Trial of Response Adapted Therapy of Stage III-IV Hodgkin Lymphoma Using Early Interim FDG-PET Imaging

ICL PET/CT Quality Check Weighted-Scoring System

Weight Score Criteria of Data Compliance (SWOG0816)

<table>
<thead>
<tr>
<th>Category</th>
<th># QC Items</th>
<th>Weight (100)</th>
<th>Green</th>
<th>Weight</th>
<th>Yellow</th>
<th>Weight</th>
<th>Red</th>
<th>Weight</th>
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</thead>
<tbody>
<tr>
<td>Timing</td>
<td>1</td>
<td>Timing Point of PET/CT, C2, C6, ...</td>
<td>10</td>
<td>within</td>
<td>&lt;7 days</td>
<td>6</td>
<td>&gt;7 days</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Emission Dose Time</td>
<td>15</td>
<td>50-70 mCi</td>
<td>15</td>
<td>3000</td>
<td>5</td>
<td></td>
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<tr>
<td></td>
<td>3</td>
<td>Consistency of Emission Update Time with PET</td>
<td>15</td>
<td>1 min</td>
<td>15</td>
<td>10-20 min</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>Consistency of Administration Data</td>
<td>5</td>
<td>complete</td>
<td>5</td>
<td>repeatable</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Data</td>
<td>5</td>
<td>Consistency of PET/CT Scanned</td>
<td>15</td>
<td>same</td>
<td>15</td>
<td>n/a</td>
<td>different</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>Consistency of Arm Positioning</td>
<td>5</td>
<td>same</td>
<td>5</td>
<td>different</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>Consistency of Scan Direction</td>
<td>5</td>
<td>same</td>
<td>5</td>
<td>different</td>
<td>3</td>
<td></td>
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<tr>
<td></td>
<td>8</td>
<td>Segmentation</td>
<td>3</td>
<td>no segmentation</td>
<td>3</td>
<td>clear segmentation</td>
<td>3</td>
<td></td>
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<tr>
<td></td>
<td>9</td>
<td>De-identification</td>
<td>2</td>
<td>De-identified</td>
<td>2</td>
<td>not De-identified</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>Image Resolution</td>
<td>2</td>
<td>Good image</td>
<td>2</td>
<td>Poor image</td>
<td>1</td>
<td></td>
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<tr>
<td></td>
<td>11</td>
<td>Protection (e.g., &gt;4 hours)</td>
<td>2</td>
<td>&gt;4</td>
<td>2</td>
<td>n/a</td>
<td>&lt;4</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>12</td>
<td>FDG Dosage (e.g., 7-15 mCi)</td>
<td>5</td>
<td>7.15</td>
<td>5</td>
<td>5-17</td>
<td>4</td>
<td>12-21</td>
</tr>
</tbody>
</table>

Study: (Green) Compliant: >=80; (Yellow) Acceptable: 70-80; (Red) Non-compliant: <70
Patient: (Green) Compliant: >=85; (Yellow) Acceptable: 75-85; (Red) Non-compliant: <75
SWOG0816 Central Review stats

Real-time Central Review - SWOG0816
Monthly Summary (954 as of 03/14/2013)

Central Read Turnaround Time:
24 hours: 70%, 48 – 72 hours: 20%, 10% adjudication etc.

Verification of Reference Calibration
Protons

TLD (OSLD commissioning completed)
Verification of Reference Calibration

- TLD system

On-Site Dosimetry Review Visit

The **only** completely independent comprehensive radiotherapy quality audit in the USA and Canada with **measurements**

1. Identify errors in dosimetry and QA and suggest improvements.
2. Collect and verify dosimetry data for chart review.
3. Improve quality of patient care.
### On-Site Dosimetry Review Audit

Discrepancies Discovered (Jan. ’05 – Mar. ’11)

<table>
<thead>
<tr>
<th>Discrepancies Regarding:</th>
<th>Number of Institutions Receiving rec. (n = 156)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Review QA Program</td>
<td>115 (74%)</td>
</tr>
<tr>
<td>Photon Field Size Dependence (FSD)</td>
<td>62 (40%)</td>
</tr>
<tr>
<td>Wedge Factor (WF)</td>
<td>50 (32%)</td>
</tr>
<tr>
<td>Off-axis Factors (OAF)/Beam symmetry</td>
<td>46 (29%)</td>
</tr>
<tr>
<td>Electron Calibration</td>
<td>27 (17%)</td>
</tr>
<tr>
<td>Photon Depth Dose</td>
<td>25 (16%)</td>
</tr>
<tr>
<td>Electron Depth Dose</td>
<td>18 (12%)</td>
</tr>
<tr>
<td>Photon Calibration</td>
<td>13 (8%)</td>
</tr>
</tbody>
</table>

Monitor Units = \[
\frac{\text{Prescription Dose}}{(\text{calibration}) \cdot (FSD) \cdot (WF) \cdot (depth dose) \cdot (OAF)}
\]

### Chart Review Process

- Radiotherapy records, calculations & films received from study group
- **Independent** dose recalculation (±5%)
- Resolve errors with institution
- Discuss results with Group and Study Chair
- Facilitate clinical review at meetings, RPC, HQ
Results of Chart Review

- 1% Systematic errors
  Potential to impact every patient treated by institution
- 11% Individual errors
  - Impacts study groups and institution
- 27% Reporting errors
  - Impacts study group and institution

Without RPC review 39% of the doses used by the study group would be incorrect

Purpose of Credentialing

- Educate
- Improve understanding of protocol
- Evaluate ability to deliver dose with advanced technologies
- Improve treatment delivery
- Reduce the deviation rate
  before credentialing >10%: now at <5%
The transformative changes by NCI to innovate its National Clinical Trial organization are considerable, visionary, and enabling while consolidating, integrating, and standardizing.

The premier national imaging and radiation oncology quality assurance and core laboratories have formed a cooperative under the administrative umbrella of the American College of Radiology to facilitate the standardization, harmonization and increased efficiencies to support imaging and radiation oncology quality assurance, quality control and data management in an fully integrated, multi-institutional based effort.

The Imaging and Radiation Oncology Core (IROC) cooperative will be seeking further coordination with other national and international efforts as well as alignment with initiatives such as QIBA.

The IROC effort has the potential to substantially advance the use of imaging and radiation therapy within clinical trials and thereby help to further achieve the transformative goals for the Nations Cancer Trial efforts.

The strategic alignment and collaboration promises to facilitate better quality and more efficient and appropriate use of imaging within multi-center trials and will have the opportunity to help set the future best practice standards and methodologies for imaging and Radiation Oncology