A CENTRAL REGISTRY
RELIABILITY STUDY

Visual Editor TNM & Summary Stage
Staging Skill Assessment

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Outline

• California Cancer Registry
• Study Rationale & Goals
• Study Design
• Reports & Dissemination of Results
• Study Results
• Analyses of Results
• Education
• Conclusions
• Next Steps
California Cancer Registry (CCR) & Our Regional Registries

CalCARES partners with California Department of Public Health (CDPH) to manage the operations of the state mandated California Cancer Registry (CCR)
Study Rationale

- Visual Editors (VE) on the front line
  - Provide feedback to state registrars on TNM coding
  - Some VE without any prior TNM experience
  - Others, experience long ago
  - Instructions for registry coding of AJCC TNM stage changing
  - VE’s expressed confidence in skills - not high
Study Goal

• Assess TNM knowledge
  ▪ Regional Registry Visual Editors
    ▪ Identify knowledge gaps
    ▪ Provide focused TNM Education
    ▪ Improve skills and boost confidence
  ▪ Visual Editors statewide were requested to participate
  ▪ Assess Summary Stage 2000 for same TNM cases
Pre-Study Requirements

• Each participant to complete AJCC Training materials:
  ▪ Registrar’s Guide to Chapter One
  ▪ Explaining Blanks and X, Ambiguous Terminology and Support for AJCC Staging
  ▪ Completion of AJCC Curriculum Modules I-IV
Study Design- Eureka DMS

Study designed to utilize *Eureka* DMS
- California Cancer Registry Data Management System

Design included ability to:
- Populate Study Cases with Text Information
- Assign Cases to Individual Participants
- Receive Completed Cases
- Generate Reports for Analysis

Timeline Module Development
- Testing in October 2015
- Module went live November 2015
Study Design- Cases Scenarios

12 Case scenario’s specially selected:

- Maximized TNM assessment and teaching value
  - Understanding of AJCC rules
  - Understanding on use of blanks, 88s and 99
  - Assess Summary Stage coding
Eureka – Reliability Study Screen

- Populates Study Answers
- Study Coordinator populates case scenario text
Assigning Cases

- Define Testing Date Range
- Assign Users for study
- Assign cases to participants
### Participant Case List

- Example: Participant Case List Screen

<table>
<thead>
<tr>
<th>#</th>
<th>Assignment</th>
<th>Case</th>
<th>Date Assigned</th>
<th>Start Date</th>
<th>End Date</th>
<th>Date Last Modified</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>331</td>
<td>7: TNM Reliability Study Phase 2 Test</td>
<td>4: RS CASE #1</td>
<td>05/31/2016</td>
<td>05/31/2016</td>
<td>11/30/2016</td>
<td>05/31/2016</td>
<td>code</td>
</tr>
<tr>
<td>332</td>
<td>7: TNM Reliability Study Phase 2 Test</td>
<td>5: RS CASE #2</td>
<td>05/31/2016</td>
<td>05/31/2016</td>
<td>11/30/2016</td>
<td>05/31/2016</td>
<td>code</td>
</tr>
<tr>
<td>333</td>
<td>7: TNM Reliability Study Phase 2 Test</td>
<td>6: RS CASE #3</td>
<td>05/31/2016</td>
<td>05/31/2016</td>
<td>11/30/2016</td>
<td>05/31/2016</td>
<td>code</td>
</tr>
<tr>
<td>334</td>
<td>7: TNM Reliability Study Phase 2 Test</td>
<td>7: RS CASE #4</td>
<td>05/31/2016</td>
<td>05/31/2016</td>
<td>11/30/2016</td>
<td>05/31/2016</td>
<td>code</td>
</tr>
<tr>
<td>335</td>
<td>7: TNM Reliability Study Phase 2 Test</td>
<td>8: RS CASE #5</td>
<td>05/31/2016</td>
<td>05/31/2016</td>
<td>11/30/2016</td>
<td>05/31/2016</td>
<td>code</td>
</tr>
<tr>
<td>336</td>
<td>7: TNM Reliability Study Phase 2 Test</td>
<td>9: RS CASE #6</td>
<td>05/31/2016</td>
<td>05/31/2016</td>
<td>11/30/2016</td>
<td>05/31/2016</td>
<td>code</td>
</tr>
<tr>
<td>337</td>
<td>7: TNM Reliability Study Phase 2 Test</td>
<td>10: RS CASE #7</td>
<td>05/31/2016</td>
<td>05/31/2016</td>
<td>11/30/2016</td>
<td>05/31/2016</td>
<td>code</td>
</tr>
<tr>
<td>338</td>
<td>7: TNM Reliability Study Phase 2 Test</td>
<td>11: RS CASE #8</td>
<td>05/31/2016</td>
<td>05/31/2016</td>
<td>11/30/2016</td>
<td>05/31/2016</td>
<td>code</td>
</tr>
<tr>
<td>339</td>
<td>7: TNM Reliability Study Phase 2 Test</td>
<td>12: RS CASE #9</td>
<td>05/31/2016</td>
<td>05/31/2016</td>
<td>11/30/2016</td>
<td>05/31/2016</td>
<td>code</td>
</tr>
<tr>
<td>340</td>
<td>7: TNM Reliability Study Phase 2 Test</td>
<td>13: RS CASE #10</td>
<td>05/31/2016</td>
<td>05/31/2016</td>
<td>11/30/2016</td>
<td>05/31/2016</td>
<td>code</td>
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<tr>
<td>341</td>
<td>7: TNM Reliability Study Phase 2 Test</td>
<td>14: RS CASE #11</td>
<td>05/31/2016</td>
<td>05/31/2016</td>
<td>11/30/2016</td>
<td>05/31/2016</td>
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<tr>
<td>342</td>
<td>7: TNM Reliability Study Phase 2 Test</td>
<td>15: RS CASE #12</td>
<td>05/31/2016</td>
<td>05/31/2016</td>
<td>11/30/2016</td>
<td>05/31/2016</td>
<td>code</td>
</tr>
</tbody>
</table>
Populated Case Scenario Screen

- Case scenario’s visually mimic view normally seen in VE process
- Participant Reviews text
- Directly Enters TNM and Summary Stage
- Saves case as complete
Software Reports

• Reports developed to calculate discrepancies & accuracy by:
  - Individual data item
  - Individual case
  - Individual Participant
  - Each Region
  - Statewide overall
Total Participants = 23
Total Cases = 12
Total Items per case = 11
  - 10 data items for each TNM case
    - 230 errors possible per data item
    - 2300 overall x 23 participants x 12 cases
  - 1 data item for each Summary Stage case
    - 276 errors possible overall x 23 participants x 12 cases

Total Errors ÷ (Total Cases x Total Items per Case) x 100 = Percentage of errors
### Software Reports

**Example Individual Results**

#### TNM Reliability Study Results

<table>
<thead>
<tr>
<th>Case Description</th>
<th>SumStage</th>
<th>ClinT</th>
<th>ClinN</th>
<th>ClinM</th>
<th>ClinStage</th>
<th>ClinDesc</th>
<th>PathT</th>
<th>PathN</th>
<th>PathM</th>
<th>PathStage</th>
<th>PathDesc</th>
<th>Total Errors</th>
<th>Accuracy Per Case</th>
</tr>
</thead>
<tbody>
<tr>
<td>RS CASE #1 (C504)</td>
<td>0 - IN SITU</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>None</td>
<td>15</td>
<td>0</td>
<td>0</td>
<td>None</td>
<td>1</td>
<td>0</td>
<td>0 - None</td>
</tr>
<tr>
<td>RS CASE #2 (C505)</td>
<td>1 - LOCALIZED</td>
<td>1C</td>
<td>0</td>
<td>0</td>
<td>1A</td>
<td>0</td>
<td>None</td>
<td>1C</td>
<td>0</td>
<td>0</td>
<td>None</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>RS CASE #3 (C672)</td>
<td>1 - LOCALIZED</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>None</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>None</td>
<td>1</td>
<td>0</td>
<td>0 - None</td>
</tr>
<tr>
<td>RS CASE #4 (C187)</td>
<td>4 - REG LN &amp; EX</td>
<td>X</td>
<td>0</td>
<td>0</td>
<td>99</td>
<td>0</td>
<td>None</td>
<td>3</td>
<td>18</td>
<td>0</td>
<td>None</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>RS CASE #5 (C541)</td>
<td>1 - LOCALIZED</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>None</td>
<td>1A</td>
<td>X</td>
<td>99</td>
<td>0</td>
<td>None</td>
<td>2</td>
</tr>
<tr>
<td>RS CASE #6 (C672)</td>
<td>1 - LOCALIZED</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>None</td>
<td>2A</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>0 - None</td>
<td>4</td>
</tr>
<tr>
<td>RS CASE #7 (C619)</td>
<td>1 - LOCALIZED</td>
<td>1C</td>
<td>0</td>
<td>0</td>
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<td>None</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>None</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>RS CASE #8 (C649)</td>
<td>7 - DISTANT MET</td>
<td>4</td>
<td>1</td>
<td>4</td>
<td>0</td>
<td>None</td>
<td>1</td>
<td>4</td>
<td>0</td>
<td>None</td>
<td>1</td>
<td>0</td>
<td>0 - None</td>
</tr>
<tr>
<td>RS CASE #9 (C619)</td>
<td>7 - DISTANT MET</td>
<td>4</td>
<td>2</td>
<td>1</td>
<td>4</td>
<td>0</td>
<td>None</td>
<td>1</td>
<td>4</td>
<td>0</td>
<td>None</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>RS CASE #10 (C504)</td>
<td>2 - REG DIR EXTEN</td>
<td>1A</td>
<td>0</td>
<td>0</td>
<td>1A</td>
<td>0</td>
<td>None</td>
<td>2A</td>
<td>0</td>
<td>1B</td>
<td>0</td>
<td>None</td>
<td>0</td>
</tr>
<tr>
<td>RS CASE #11 (C343)</td>
<td>2 - REG DIR EXTEN</td>
<td>1A</td>
<td>0</td>
<td>0</td>
<td>1A</td>
<td>0</td>
<td>None</td>
<td>2A</td>
<td>0</td>
<td>1B</td>
<td>0</td>
<td>None</td>
<td>0</td>
</tr>
<tr>
<td>RS CASE #12 (C711)</td>
<td>1 - LOCALIZED</td>
<td>88</td>
<td>88</td>
<td>88</td>
<td>88</td>
<td>0</td>
<td>None</td>
<td>88</td>
<td>88</td>
<td>88</td>
<td>88</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>RS CASE #13 (C711)</td>
<td>1 - LOCALIZED</td>
<td>88</td>
<td>88</td>
<td>88</td>
<td>88</td>
<td>0</td>
<td>None</td>
<td>88</td>
<td>88</td>
<td>88</td>
<td>88</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

**Accuracy By Category**

<table>
<thead>
<tr>
<th>Errors by data item</th>
<th>0</th>
<th>4</th>
<th>1</th>
<th>2</th>
<th>0</th>
<th>0</th>
<th>3</th>
<th>4</th>
<th>1</th>
<th>3</th>
<th>1</th>
<th>Overall 85.60%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accuracy</td>
<td>100.00%</td>
<td>66.67%</td>
<td>91.67%</td>
<td>83.33%</td>
<td>100.00%</td>
<td>100.00%</td>
<td>75.00%</td>
<td>66.67%</td>
<td>91.67%</td>
<td>75.00%</td>
<td>91.67%</td>
<td>Overall 85.60%</td>
</tr>
</tbody>
</table>
# Software Reports

- **Example Regional Report**

<table>
<thead>
<tr>
<th>Reliability Study Results - Region K</th>
<th>Total Errors by category</th>
<th>Overall Accuracy Rate by participant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>User</td>
<td>Visual Editor 1=yes 2=no</td>
</tr>
<tr>
<td>-------</td>
<td>------</td>
<td>---------------------------</td>
</tr>
<tr>
<td>1</td>
<td>K1</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>K2</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>K3</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>K4</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>K5</td>
<td>1</td>
</tr>
<tr>
<td>Total Errors</td>
<td>9</td>
<td>17</td>
</tr>
<tr>
<td>Poss Errors x 5 participants</td>
<td>60</td>
<td>60</td>
</tr>
<tr>
<td>Accuracy by Category</td>
<td>85.00%</td>
<td>71.70%</td>
</tr>
</tbody>
</table>

| Items per Case | 11 | | | | | | | | | | | | | | | |
| Total Cases | 12 | | | | | | | | | | | | | | | |
| Participants | 5 | | | | | | | | | | | | | | | |

- **Total Errors:**
  - Summary Stage Total errors overall = 3
  - TNM - Total Errors overall = 63
  - Combined SS & TNM Errrors = 72

- **Accuracy Rates:**
  - Summary Stage Accuracy Rate = 85.00%
  - Overall TNM Accuracy Rate = 89.50%
  - Overall Summary Stage & TNM Accuracy-all = 89.09%
Dissemination of Results

• Individual Participant
  ▪ Personal Accuracy
    • TNM
    • Summary Stage
    • Overall

• Regional Registry Management
  ▪ Results Specific to Region

• UCD Management

• CDPH Management
  ▪ Statewide and Regional Results
Study Results

Distribution of Errors by TNM Category
Clinical vs Pathologic

n=230 Total Possible Errors per TNM category

Number/Percent of Errors

Clin T: 88 (38%)
Clin N: 26 (11%)
Clin M: 38 (17%)
Clin Stage Grp: 38 (17%)
Clin Descrip: 0%
Path T: 67 (29%)
Path N: 60 (26%)
Path M: 74 (32%)
Path Stage Grp: 7 (3%)
Study Results

TNM Stage Accuracy by Case

All Regions Combined

<table>
<thead>
<tr>
<th>Study Cases</th>
<th>Percent Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>#1 Breast</td>
<td>87.83%</td>
</tr>
<tr>
<td>#2 Breast</td>
<td>90.00%</td>
</tr>
<tr>
<td>#3 Bladder</td>
<td>88.70%</td>
</tr>
<tr>
<td>#4 Colon</td>
<td>86.09%</td>
</tr>
<tr>
<td>#5 Endometrium</td>
<td>76.09%</td>
</tr>
<tr>
<td>#6 Bladder</td>
<td>86.53%</td>
</tr>
<tr>
<td>#7 Prostate</td>
<td>93.92%</td>
</tr>
<tr>
<td>#8 Kidney</td>
<td>79.57%</td>
</tr>
<tr>
<td>#9 Prostate</td>
<td>73.52%</td>
</tr>
<tr>
<td>#10 Breast</td>
<td>91.31%</td>
</tr>
<tr>
<td>#11 Lung</td>
<td>90.00%</td>
</tr>
<tr>
<td>#12 Brain</td>
<td>62.18%</td>
</tr>
</tbody>
</table>
Study Results

Summary Stage Accuracy by Case

All Regions Combined

<table>
<thead>
<tr>
<th>Study Cases</th>
<th>Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>#1 Breast</td>
<td>100%</td>
</tr>
<tr>
<td>#2 Breast</td>
<td>95.66%</td>
</tr>
<tr>
<td>#3 Bladder</td>
<td>93.75%</td>
</tr>
<tr>
<td>#4 Colon</td>
<td>100%</td>
</tr>
<tr>
<td>#5 Endomet</td>
<td>100%</td>
</tr>
<tr>
<td>#6 Bladder</td>
<td>100%</td>
</tr>
<tr>
<td>#7 Prostate</td>
<td>100%</td>
</tr>
<tr>
<td>#8 Kidney</td>
<td>91.31%</td>
</tr>
<tr>
<td>#9 Prostate</td>
<td>91.31%</td>
</tr>
<tr>
<td>#10 Breast</td>
<td>82.61%</td>
</tr>
<tr>
<td>#11 Lung</td>
<td>52.18%</td>
</tr>
<tr>
<td>#12 Brain</td>
<td>82.61%</td>
</tr>
</tbody>
</table>
Study Results

TNM Reliability Study
Overall Accuracy

- 1851 / 80.48%
- 449 / 19.52%

All Regions combined
Accuracy 80.48%

- TNM Correct
- TNM Errors
- n=2300
Study Results

Reliability Study
Summary Stage Overall Accuracy

- 245/88.41%
- 31/11.30%

All Regions Combined 88.41%

Summary Stage Correct
Summary Stage Errors
n=276
Study Results

Comparison TNM & SS2000 Accuracy by Region

- Region A: TNM 81%, SS2000 88%
- Region B: TNM 90%, SS2000 85%
- Region C: TNM 83%, SS2000 93%
Analyses of Results

Two Types of Errors:

- **Coding Errors**
  - Selection of incorrect AJCC TNM category (value)
  - Assigned X when a valid TNM category available
  - Descriptor error
  - Incorrect assignment of M

- **Data Entry Errors**
  - Non-use/incorrect use of blanks, 88, 99 to reflect stage in registry data fields
Analyses of Results

Types of TNM Errors

- All Errors: 449
- Coding Errors: 219
- Data Entry Errors: 230

48% Coding Errors
52% Data Entry Errors
Analyses of Results

Coding Errors = 48%

• Result of:
  ▪ Incorrect understanding of some AJCC principals
    • Rules for classification
    • Use of clinical info in path stage
    • Assessment/timeframe rules for M assignment
  ▪ Tumor size errors-converting cm to mm
  ▪ Incorrect use of X
  ▪ AJCC T, N & M tables –some layout differences between chapters
    • TNM Subcategories not used when applicable
    • Used incorrect TNM Subcategory
  ▪ Special AJCC rules for some circumstances
    • Differ from general rules
Analyses of Results

Data Entry Errors = 52%

- Modifications required for stage entry in registry fields

- **Record layout does not allow AJCC stage composition entry**
  - Requires use of blanks in some scenarios
  - Errors due to unclear understanding on when/how to use blanks to represent AJCC Stage in record layout.

- Use of 88’s when TNM not defined by AJCC

- Stage group 99.
  - AJCC rules and other Standard Setter rules differ
Analyses of Results

TNM Adjusted Accuracy
IF “Data Entry Errors” Non-Existent
Accuracy with “Coding Errors” Only

2081/(orig 1851)
0/(orig 230)
219(9.5%)

Adjusted Accuracy
90.50%
n=2300
Identified Education Needs

Clarification and training needed on:

- How to use blanks to represent an “implied value” in data entry
- How/when to use blanks when Info unknown or rules for classification not met
- How/when to use 88’s or 99
- **Correct way to use clinical information in pathologic stage**
- Review of the “M” Rules
  - Assessment method
  - Timeframe
  - How to represent AJCC stage composition in record layout

- **7th Edition Manual Review**
  - Chapter specific rules
  - Rules for Classification
  - Surgical treatment and Pathologic stage
  - TNM Subcategories clinical vs pathologic

- **Summary Stage vs TNM**
  - Different rules
  - Can’t convert
Education Provided

• Education presentation developed
  ▪ Presented in person at regional offices or via live webinar

• Included:
  ▪ Overall Results- all regions combined.
  ▪ Customized regional results contrasted to overall results.
Education Provided

• Education included:
  ▪ Detailed Answer Key for each case
    • AJCC Stage Composition
    • AJCC Staging Rationale
    • Data entry examples and rationale
    • AJCC Curriculum Modules-where to find supporting info
    • AJCC Manual-where to find rules/info
  ▪ Review of TNM rules for classification
  ▪ Special Rules situations
  ▪ Correct use of X, Blank, 88 or 99 with examples
  ▪ Summary Stage Answers & differences with TNM
  ▪ TNM Tips
  ▪ VE Tips
  ▪ Q&A’s
# Education Example

## Case # 2 Breast

Invasive tumor on Bx, no residual tumor on resection

### AJCC Stage

<table>
<thead>
<tr>
<th></th>
<th>T</th>
<th>N</th>
<th>M</th>
<th>Stage Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clin</td>
<td>cT1c</td>
<td>cN0</td>
<td>cM0</td>
<td>IA</td>
</tr>
<tr>
<td>Path</td>
<td>pT1c</td>
<td>pN0</td>
<td>cM0</td>
<td>IA</td>
</tr>
</tbody>
</table>

**Path T included clinical info**

### Data Entry

<table>
<thead>
<tr>
<th></th>
<th>T</th>
<th>N</th>
<th>M</th>
<th>Stage Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clin</td>
<td>1C</td>
<td>0</td>
<td>0</td>
<td>1A</td>
</tr>
<tr>
<td>Path</td>
<td>1C</td>
<td>0</td>
<td>0</td>
<td>1A</td>
</tr>
</tbody>
</table>

pM left blank to indicate “implied value” of cM0 to correctly represent stage in record layout

**Tip:**

- Use the clinical tumor size info in this case (cT1c) which *is assigned as* a pT because path rules for classification were met by the definitive *tumor resection*.

- *Case is not pT0 because we can* incorporate the clinical cT1c info per AJCC rules.

- See AJCC Module II, Lesson 8, Slides 5,6,7
Education Provided

• Further Education provided:
  ▪ During timeframe of study, new values released by AJCC for TNM
  ▪ Additional education was provided to VE
    ▪ New 2016 allowable values for TNM categories reviewed
    ▪ Rationale for “c” & “p” prefixes
    ▪ Multiple Examples/Case scenario’s
    ▪ Compared 2015 TNM stage/data entry to 2015 TNM stage/data entry

• Post study education continues
Education Example 2016 cases

For an *in situ* tumor: Bx DCIS & Surgery DCIS
Correct stage composition now possible

Breast/AJCC Stage
Clin: pTis, cN0, cM0, Stage 0
Path: pTis, cN0, cM0, Stage 0

### 2015 vs 2016 Data Entry

<table>
<thead>
<tr>
<th></th>
<th>2015</th>
<th></th>
<th>2016</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>T</td>
<td>N</td>
<td>M</td>
</tr>
<tr>
<td>Clin</td>
<td>pTIS</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Path</td>
<td>IS</td>
<td>cN0</td>
<td>cM0</td>
</tr>
</tbody>
</table>

*Must use blanks to correctly represent stage in record layout*

- pTis, cN0, cM0 no longer “blank”-
  - have values to complete correct clinical & path stage composition

Special In situ rule per AJCC pg. 12, table 1.8
Conclusions

TNM Reliability Study

- Met Established Goals
  - Assessment of Regional Registry VE skills
    - TNM coding
    - TNM data entry
    - Summary Stage coding

- Identified Areas to Focus Education
  - Increased understanding of TNM, Summary Stage principals
  - Improved understanding of Registry Data Entry
  - Boosted confidence of VE staff
Conclusions

• Eureka DMS
  ▪ Enhancement & Customizations possible
  ▪ Meet evolving registry needs
  ▪ Programmer & CTR Collaboration Successful

• Reliability Study Effective Education Tool
Next Steps

Reliability Study Phase 2

- Retest with new cases
  - Using 2016 allowable values

- Timeline Goal
  - Summer/Fall 2016

- Compare results Phase I/Phase II
  - Determine additional training needs
Acknowledgement

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