Considerations and Issues in Electronic Charting for Brachytherapy

A report from the work group of TG262
Susan Richardson, Ph.D.
Why?

• The American Reinvestment & Recovery Act (ARRA) was enacted in 2009. ARRA includes many measures to modernize our nation's infrastructure, one of which is the "Health Information Technology for Economic and Clinical Health (HITECH) Act". The HITECH Act supports the concept of electronic health records.

• The meaningful use of interoperable electronic health records throughout the United States health care delivery system is a critical national goal.
Electronic Brachytherapy

- Interpretation dependent rules:
  - State/NRC regulations
  - Radiation Safety officer involvement and beliefs
  - Amount of electronic record use for external beam
  - Pressure!
  - Type of brachytherapy administration

- Many clinics are still at the ‘hybrid’ level of electronic records
What tools can help me?
Issues with moving electronic

- How will records be accessed when audited?
- Who can access them and when?
- Poor computer skills or comfort levels with computers may be an issue:
  - Staff
  - Auditors
  - Radiation Safety
- Time – it can take *longer* to do it electronically, at least in the short term.
Conversion of paper to electrons

- What paperwork do you need to keep? Look at it critically.
- How long do you need to keep it? Space?
- Options:
  - Scan the paperwork, make a digital copy of the paperwork, print as PDF from TPS or other system, import as a treatment plan? Or document? Etc
- Where is the signature? Where is the time stamp?
- If data is duplicated, which is “official?”
Items to consider

• Much of work flow is checklist driven or paperwork driven

• Electronic charts need electronic triggers*

• Do you have the tools in place to treat your patients safely and efficiently?

• What information do you want in the patient’s (auditable and requestable) chart?

• Verbal changes of written directives

Benedetti, 2013 SCM
An Overview

- **Standalone**
  - These are devices or procedures which do not connect to EMR at all.

- **R&V Connectivity**
  - Typically, they require scheduling in the EMR and a connectivity module, which then makes patient treatment plans available to the machine to deliver. After each delivery, the treated dose is automatically recorded back to the EMR, but not other data such as imaging.

- **Full Connectivity**
  - Device is driven by the EMR similar to current XRT

<table>
<thead>
<tr>
<th></th>
<th>Written Directive</th>
<th>Standalone</th>
<th>R&amp;V connectivity</th>
<th>Full connectivity</th>
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<tbody>
<tr>
<td>Prostate seed implant</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LDR</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HDR</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>?</td>
</tr>
<tr>
<td>Radiopharmaceutical</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gamma Knife</td>
<td>?</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
</tbody>
</table>
Brachytherapy Types

- HDR
  - Integrated R&V (Aria/Brachyvision)
  - Non-integrated R&V (all others)
- LDR
  - Live time prostate implants? Plan is dynamic!
  - Eye plaques
  - Can you get pdfs into your medical record?
- Radiopharmaceutical
  - Spheres/Thyroid/Xofigo/etc
HDR

- Information management issues
  - What happens if computers and systems don’t communicate properly?
  - External beam you send them home – not an option for patients with implanted applicators!

- Lack of hard stops (e.g. you can treat without the prescription being approved)

- Timing considerations
  - Plans is verbally approved, why aren’t we treating?
HDR

• Process mapping
  – Where can improvements be made?
  – What is the easiest solution?
  – Is everyone on board with the solution?
    • Especially the MD!
  – Is everyone familiar with Plan B (or C?)?

• The process is inherently different than XRT
  – E.g. time outs/face photo verification in Mosaiq
# HDR Brachytherapy Checklists

<table>
<thead>
<tr>
<th>Date</th>
<th>Procedure</th>
<th>Req</th>
<th>Resp</th>
<th>Attending</th>
<th>St</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>6/10/2015</td>
<td>Prescription signed</td>
<td>PHY</td>
<td>PHY</td>
<td>DS</td>
<td></td>
<td>Rx complete and approved by attending</td>
</tr>
<tr>
<td>6/10/2015</td>
<td>Plan Signatures</td>
<td>PHY</td>
<td>PHY</td>
<td>DS</td>
<td></td>
<td>Plan approved by dosimetrist and attending</td>
</tr>
<tr>
<td>6/10/2015</td>
<td>Appl. tip correct</td>
<td>PHY</td>
<td>PHY</td>
<td>DS</td>
<td></td>
<td>Applicators defined correctly, ring offset applied</td>
</tr>
<tr>
<td>6/10/2015</td>
<td>Channels per protocol</td>
<td>PHY</td>
<td>PHY</td>
<td>DS</td>
<td></td>
<td>Channel assignments per departmental protocols</td>
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<tr>
<td>6/10/2015</td>
<td>Matches template</td>
<td>PHY</td>
<td>PHY</td>
<td>DS</td>
<td></td>
<td>Interstitial: channel assignment matches template</td>
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<tr>
<td>6/10/2015</td>
<td>Consistent with Rx</td>
<td>PHY</td>
<td>PHY</td>
<td>DS</td>
<td></td>
<td>Planned dose same as Rx dose; point doses &amp; DVH OK</td>
</tr>
<tr>
<td>6/10/2015</td>
<td>Conformance &lt; 10%</td>
<td>PHY</td>
<td>PHY</td>
<td>DS</td>
<td></td>
<td>SAVI: air volume &lt; 10% PTV_Eval volume</td>
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<tr>
<td>6/10/2015</td>
<td>Dwells verified</td>
<td>PHY</td>
<td>PHY</td>
<td>DS</td>
<td></td>
<td>RedCalc performed, within 3%, uploaded as Calc 2nd check</td>
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<tr>
<td>6/10/2015</td>
<td>Treatment approved</td>
<td>PHY</td>
<td>PHY</td>
<td>DS</td>
<td></td>
<td>Treatment approved in Brachyvision &amp; transfer to console PC</td>
</tr>
</tbody>
</table>
Patient Name: [Redacted]

MRN: [Redacted]

MD: [Redacted]

Patient Identification: [Redacted]

Date: [Redacted]

Site/Technique: [Redacted]

Nurse: [Redacted]

Fraction # [Redacted] of [Redacted]

Treatment Planning Checks:
Mosaiq Written directive is signed and dated by authorized user: [Redacted]
Brachyvision Treatment plan - number of catheters and lengths correct: [Redacted]
Brachyvision Treatment plan dose matches written directive prescription: [Redacted]
MU check performed if treating from non-standard plan: [Redacted]

Pre-Treatment Checks:
Daily QA performed: [Redacted]
Brachyvision Treatment plan transferred to GammaMed afterloader correctly: [Redacted]
Patient was connected to afterloader and checked by 2 individuals: [Redacted]
Calculated treatment time matches afterloader: [Redacted]

\[ \text{Total Time} = \text{Decay Factor} \times \text{treatment planning time} \]

GammaMed wheels locked: [Redacted]

Treatment plan approved in Mosaiq by authorized user: [Redacted]
Checklist, cont.

**Treatment**
- Area monitor off prior to treatment: [ ]
- Area monitor on during treatment: [ ]
- Area monitor off after treatment: [ ]
- Residual activity in patient checked with survey meter: [ ]
- GammaMed afterloader secured: [ ]

Dosimetrist signature: _____________________________  Physicist signature: _____________________________
Moving in the right direction...
Brachy HDR Workflow

Delivered dose appears in RT Summary & Patient Summary
Use your EMR wisely

<table>
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<tr>
<th>Dx: *Corpus Uteri</th>
<th>Start</th>
<th>Status</th>
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<tbody>
<tr>
<td>Radiation Oncology Course: 1</td>
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<tr>
<td>Rad Rx: vag cuff - HDR Ir192-Intracav - HDR Dose: 2,100 cGy @ 700 cGy x 3</td>
<td>A 2/24/2014 TPM</td>
<td>A 2/24/2014 TPM</td>
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</table>

### Radiation Prescriptions

**Dx:** *Corpus Uteri

**Course:** 1

<table>
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<th>Technique</th>
<th>Modality</th>
<th>Fractions</th>
<th>Rx Dose</th>
<th>Total Dose</th>
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<tbody>
<tr>
<td>vag cuff</td>
<td>HDR Ir192-Intracav HDR</td>
<td>3</td>
<td>3</td>
<td>700 cGy</td>
<td>Every 14 Days</td>
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**Rx Site:** vag cuff

**Status:** Approved TPM 2/24/2014

**Technique:** HDR Ir192-Intracav

**Modality:** HDR

**Dose Spec:** Depth 0.5

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<tr>
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<th>T</th>
<th>W</th>
<th>T</th>
<th>F</th>
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**Plan Dgs:**

**Status:**
Plan Report for "Nuc2.5Vag7Gy"

Source wire serial number: 24-01-2466-001-110113-11708-03
Source calibration date: 11/18/2013 12:00:00 AM (nominal)
Source calibrated activity: 10000.00 mCi (nominal)
Source half life: 73.83 d
Treatment date: 2/24/2014 12:00:00 AM
Source treatment activity: 10000.00 mCi (nominal)
Total air kerma strength: 3346.44 cGy cm² (nominal)
Total Curie seconds: 2960.00 (nominal)
Total treatment time: 296.00 s

Treatment size:
Total prescription: 700 cGy in 1 fractions.
Dwell times are displayed for a single fraction.
Plan was created: 2/24/2014 3:16:16 PM
Plan was saved: 2/24/2014 3:16:37 PM
Dose calculation medium: Homogeneous

No attached clinical protocol

Applicator: Applicator1, Channel: 1, Source Model: GMP Ir-192 HDR, Tx Strength: 40700.00 cGy cm² / h (nominal),
Position [cm] 129.80 129.30 128.30 128.30 127.80 127.30 126.80 126.30 125.80 125.30
Time [s] 54.0 35.0 23.0 20.0 13.0 13.0 20.0 23.0 35.0 60.0
Position [cm]
Time [s]

No seeds

Reference point:
pt at TipSurface -0.95 -0.24 6.26
x [cm] y [cm] z [cm] Total dose [cGy], 1 fraction(s) 1566.0
GammaMedPlus iX: Treatment History Report

varian / Swedish Cancer Institute / 640351 / 2014-03-10 13:58:51

Patient / Treatment Data

Patient Data
Last name: 
First name: 
Patient ID: Unspecified
Sex: Unspecified
Birth date: Unspecified

Plan Data
Total Planned Fractions: 3
Physician: 
Treatment site: Unspecified
Applicator: 
File name: 1455n12m

Treatment Summary

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<tr>
<th>Fraction Number</th>
<th>Matching Fraction</th>
<th>Console Entry Date</th>
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Document Type

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<th>Document Type</th>
<th>Source ID</th>
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<th>Status</th>
<th>Encounter</th>
<th>By</th>
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<th>By</th>
<th>Review Req</th>
<th>Co-Sign Req</th>
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<td>3/10/2014</td>
<td>PDW</td>
<td>3/10/2014</td>
<td>SLR</td>
<td>S. Richardson</td>
<td></td>
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<td>3/10/20</td>
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<td>Treatment Record</td>
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<td>SLR</td>
<td>S. Richardson</td>
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<td>3/10/20</td>
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<td>Physics Cont Consult</td>
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<td>3/10/2014</td>
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<td>S. Richardson</td>
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<td>3/04/2014</td>
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<td>S. Richardson</td>
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<td>PDW</td>
<td>3/10/2014</td>
<td>SLR</td>
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<td>2/24/2014</td>
<td>YCF</td>
<td>2/25/2014</td>
<td>YCF</td>
<td></td>
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<td></td>
<td>2/25/20</td>
</tr>
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</table>
LDR – e.g. prostate

- Timeout may occur in the OR before your team is there! How will you document?
- Intraoperative planning creates a new document
- Change of written directives/seed counts to be incorporated
- Lots of the paperwork will fall to the hands of physicists
Radiopharmaceuticals

<table>
<thead>
<tr>
<th>Rx</th>
<th>Site</th>
<th>Technique</th>
<th>Modality</th>
<th>Act</th>
<th>Rx dose</th>
<th>Total Dose</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>RT Lobe</td>
<td>Brachytherapy</td>
<td>Yttrium</td>
<td>1</td>
<td>12,050 cGy</td>
<td>12,050 cGy</td>
</tr>
</tbody>
</table>

Status: Approved VKM 6/04/2015
Liver brachytherapy

dositbx planning:
1. special physics consulut

Radiopharmaceutical: Y-90 TheraSphere; Nordion
Treatment site: RT LOBE
Lung shunt factor: 10%
Planned lung dose: 8.59
Required Y-90 activity: 5 GBQ
Actual Y-90 activity: 5.29 GBQ
Injection date and time: 6/11/2015 11 AM
Delivered target dose: 122.9
Delivered lung dose: 8.76
Total lung dose: 8.76
Maximum allowed lung dose per treatment: 30Gy
Maximum allowed total lung dose: 50Gy
Acknowledgements


• Sonja Dietrich

• TGT262 members
Thank you!