Process Mapping

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Disclosures

• Vice President, Center for the Assessment of Radiological Sciences (CARS)
  – A non-profit organization dedicated to improving quality and safety of radiotherapy and radiological imaging.
Learning Objectives

• To understand why process maps are useful in the clinical environment.

• To become familiar with a few examples of process maps.

• To learn several important tips for creating useful process maps.
What is a Process?

• A process is a series of steps or actions performed to achieve a specific purpose.
  – process has inputs and outputs
• A process can describe the way things get done.

All clinical workflows involve many processes.
What is a Process Map?

• A pictorial representation of the sequence of actions that comprise a process.
Process Maps are used to

• Document processes.
  – Provide a reference to discuss how things should be done
  – Describe and understand the clinical workflow

• Analyze and improve on processes.
  – Identify areas of complexity and ambiguity
  – Identify failure modes and areas of re-work
  – To generate ideas for safety barriers
  – Illustrate process improvements
Why is Process Mapping Important?

- It provides an opportunity to learn, standardize, and improve clinical processes
  - Clinical processes if not clearly documented can be ambiguous and subject to multiple interpretations

“You don’t learn to Process Map, you Process Map to learn”. Myron Tribus Quote
What are the Benefits?

• Immediate benefits
  – Improving communication – everyone is on the same page!
  – Harmonizing clinical practice and ensuring that everyone operates with a shared model.
  – Improving efficiency. Workflow inefficiencies can become obvious when mapped out visually
Preparing to Process Map

- Assemble the Team.
- Agree on which process you wish to process map.
- Agree on the purpose of the process.
- Agree on beginning and ending points.
- Agree on level of detail to be displayed.
- Start by preparing a narrative outline of steps.
- Identify other people who should be involved in the process map creation, or asked for input, or to review drafts as they are prepared.
Ishikawa or “Fishbone” Diagram

• General use is as a cause-effect tool
• Can be used to show the variables that go into a process

Kaoru Ishikawa, 1960’s, Mitsubishi Motors
Symbols Used to Process Map

**Start & End:** An oval is used to show the materials, information or action (inputs) to start the process or to show the results at the end (output) of the process.

**Activity:** A box or rectangle is used to show a task or activity performed in the process. Although multiple arrows may come into each box, usually only one arrow leaves each box.

**Decision:** A diamond shows those points in the process where a yes/no question is being asked or a decision is required.
Process Map of Patient Setup

Process flow diagrams

Courtesy Derek Brown, UCSD
Process Maps – Why Bother?

**LINAC 1**
- Patient enters linac vault
- Setup patient to CT marks
- Shift
- Treat
- TP shift instruction

**LINAC 2**
- Patient enters linac vault
- Setup patient to marks
- First Tx
  - N: Treat
  - Y: Shift
    - Remark
    - Treat
    - TP shift instruction

Courtesy Derek Brown, UCSD
Choose the right level of detail. A process map that is too general loses its utility, while one that is too detailed becomes unmanageable and staff lose the big picture.
Process Maps: Applications

- Failure Mode and Effects Analysis (FMEA)
  - Assemble team
  - Create process map
  - Identify failure modes
  - Score each for severity, occurrence and detectability
Process Maps - Examples

“Consensus recommendations for incident learning database structures in radiation oncology”
IMRT Process Map at VCU

Simulation (By therapist, dosimetrist, and physicist)

Preparatory work for treatment planning (By dosimetrist)

Contouring and treatment planning directive (By physician, dosimetrist and physicist)

Treatment planning, plan approval, and plan transfer (By dosimetrist, physicist, and physician)

Patient-specific treatment plan QA (By physics)

Pretreatment physics check (By physics)

Treatment delivery (By therapist)
Preparatory work for CT Simulation

1. Patient arrives for the Sim

2. Has the Sim note been received by attending?
   - Yes: Proceed to Patient record check
   - No: Abort the Sim and consult the attending

3. Patient record check

4. Does patient have a pacemaker, is pregnant, and has prior radiation?
   - Yes: Briefly explain to patient what is being done and what steps will be taken before initial treatment day
   - No: Proceed to next step

5. Briefly explain to patient what is being done and what steps will be taken before initial treatment day
CT Simulation

Please follow the Initial preparation work sheet.

- Are there any special procedures?
  - Yes: Call the physicist/dosimetrist
  - No: Patient positioning and immobilization

Mark tattoos and align lasers to isocenter.

Perform the CT scan.

Final task list:
- Patient picture uploaded in sim-note
- Setup pictures uploaded in sim-note
- Export images to ari
- Add patient/physician name/text date in dosimetrist's taskpad
- Treatment Day Appointment card given to patient
Preparatory Work for Treatment Planning

1. Import CT images and isocenter in the TPS
2. Check patient name/MRN got translated
3. Add physician name, disease site, planning dosimetrist name
4. Make a copy of isocenter (to keep marked isocenter untouched)

- Verify CT density table
- Add/remove couch (as per protocol)

- As per Sim-note and verbal communication with physician

- Is there any fusion request?
  - Yes: Contact the fusion dosimetrist/Physicist to fuse CT/MRI/PET images
  - No: Pull prior treatment history, dosimetric parameters, scans (if available)

- Is there prior radiation?
  - Yes: Pull prior treatment history, dosimetric parameters, scans (if available)
  - No: Verbally communicate to the physician that images are ready for review
Contouring and Treatment Planning Directive

1. Contour target and critical structures
2. Specify PTV & PRV margins
3. Make prescription note for dosimetrist
4. Was there prior irradiation?
   - Yes: Provide initial guidance for beam angles
   - No: Update dosimetrist taskpad: contours approved
5. Specify target dose/fractionation/margins
6. Specify critical organ limit
Treatment Planning, Plan Approval and Plan Transfer
Patient Specific Quality Assurance

1. Setup Matrixx phantom irradiation
   - Align Matrixx phantom with lasers
   - Use Gantry angle sensor (tolerance ±5°)

2. Take patient planning data
   - Find Kuer factor (eliminates effect of daily output variations)
   - Apply calculated Kuer factor & irradiate 10x10 field

3. Open patient plan & TPS calculated planar dose

4. Apply Kuer angle correction

5. Grid scale to 0.1 cm

6.Apply correct origin to value from calibration file

7. Perform Gamma Analysis

8. Measure OAR field reference dose
   - Decide on required scaling factor (TPS Dref dose / measured Dref dose)

9. Perform QA analysis

10. Update Excel spreadsheet that IMRT QA analysis is complete

11. Notify physicist that IMRT QA analysis is ready for review

12. Update Matrixx patient plan and calibration files to network drive

13. Upload Matrixx patient plan & calibration files to network drive

14. Update IMRT QA Excel spreadsheet - Matrixx irradiation complete with date

15. Call/email physics assistant that plans are ready for QA
Pretreatment Physics Check

Perform a 2nd check on IMRT QA results

Perform basic checks

Check the dose planes imported from Pinnacle
Cross-check proper K user factor used
Check gantry angle correction factor applied

Are the results ok

Yes

Upload MatriXX QA results in Aria

Update physics taskpad that MatriXX QA complete

Update the MatriXX Excel spreadsheet

No

Check Pinnacle fluence

Are there many lateral beams?

Yes

Change the beams and repeat: MatriXX Irradiation and Planar dose plans

The physicist also performs the weekly chart check and EOT check
Treatment Delivery

- Daily QA performed
- Place patient on Couch in the needed immobilization device
- Align lasers with tattoos
- OBI to determine initial shifts based on bony landmarks
- Call physician to approve shifts
- Is there any imaging modality requested on Area?
  - Yes: Perform the imaging requested
  - No: Apply shifts
- Deliver the treatment
- Treatment complete steps
  - Update the treatment note with shifts
  - Update treatment complete
- Send patient note for next treatment time
Process Maps - Examples

TG-100 IMRT Process Tree
Useful, Usable Maps and Diagrams

- What’s important in designing process maps?
  1. In healthcare it is customary to look at processes from the patient’s perspective
  2. For clinical processes a **multidisciplinary team** is necessary for the development of a valid map
  3. The number of sub-processes identified should be the **smallest number** to meet the objective
Useful, Usable Maps and Diagrams

• What’s important in designing process maps?

4. The users of the map should have the same understanding of the meaning of the sub-processes.

5. Choose the right level of detail. A map that is too general loses its utility, while one that is too detailed becomes unmanageable and staff lose the big picture.

6. Don’t get hung up on fancy graphics. There is value in the process of creating the map.
Process map can help you:

1. Visualize whether the steps of a process are logical
2. Uncover problems or miscommunications
3. Develop a common base of knowledge about a process
4. Bring to light redundancies and pathways that would otherwise remain unnoticed or ignored
5. All of the above
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Process maps can still be useful:

1. If they are not accurate
2. If team members are afraid to describe what actually happens
3. If the team is too far removed from the actual working of the process
4. If they do not capture the entire process in detail but rather the workflow at a more general level
5. If some steps in the process have been missed
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The first activity of a process improvement is:

1. Making a process map
2. Putting together a team representative of the process of care
3. Giving everyone a clear understanding of the process
4. Performing a FMEA
5. Understanding roles and responsibilities of each team member
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Reference: Slide # 9
Closing Thoughts

• Brainstorming and Affinity Diagrams can be used to identify processes you wish to Process Map.
• There is no single right way to Process Map. It is a tool to standardize clinical workflow to minimize mistakes.
• Process Maps can be used in a variety of settings outside Quality Improvement, such as:
  - Orienting new employees
  - In-service presentations
  - Brainstorming possible process changes
  - Creating or revising policies and procedures that support the process
  - Creating measures
  - Identifying logical outcomes of a process