Managing Treatment Planning Systems

J. Keith DeWyngaert, PhD … **08/08/13**

Managing Treatment Planning Systems
ARIA/ECLIPSE ENVIRONMENT

WELL, WHAT DO YOU MANAGE?

➢ **Manage Resources**

➢ **Manage Process**

➢ **Manage Security**

➢ **Manage Safety**

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WELL, WHAT DO YOU MANAGE?

Manage Resources

hardware/software

Manage people

Manage Security

Backups

access

Manage Process

Quality control

Quality assurance

Timeline and checks/approvals

Manage Safety

Testing

Validation

Support

Customer Alerts

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Perspective

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A little history which has helped define my perspective…

Trained at JCRT in Boston
Multi-site environment (4 hospitals / 2 Cancer Institute research buildings)
Multi-vendor environment (linacs and simulators from 5 vendors)
Centralized simulation and planning using VAX computer (centralized processing)

Single site department
managed everything between 2 physicists (including IT)
Treatment Planning using VAX system (centralized with dumb terminals)
Wrote code for clinical needs (morning QA device/mu check/brachy)
   (easy to know what's going on in dept)
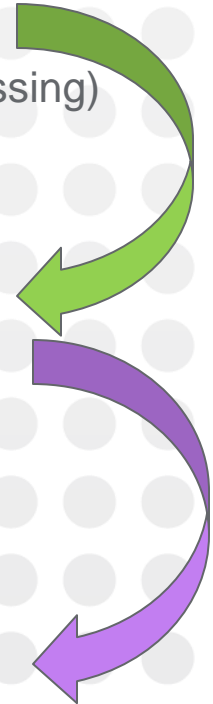
Manage a two-site department
Within walking distance
– transitioned mostly to single vendor (5 linacs/GK/2 CT-Sims/2HDR)
Distributed physics and planning amongst two sites
Planners assigned by disease site, not geographical site
Maintained concept of centralized system – even if staff were not

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A little *more* history which has helped define my perspective…

1) **Upgraded from ARIA 8.6 to ARIA 10.0 Spring 2012**

   a) Image server which used a NAS failed about a week post-upgrade
   b) Started getting image corruption messages
   c) Discovered backup image server had not been initiated
   d) Any CT image sets opened during that period became corrupted
   e) "Documents" became corrupted

2) **October 29th 2012 – Hurricane Sandy descends upon NYC**

   a) Hospital site basement flooded (2 linacs/CT-Sim/HDR/GK/Animal irradiator)
   b) No power to Cancer Center for 5 days
   c) ~ 40 patients moved for treatment to Cancer Center from hospital
   d) Lost immobilization devices for hospital patients
   e) Lost workstations at one site (more people than workstations)
   f) Combine patient load to one site (~120 patients)

Crisis Management

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Two classes of crises

Events over which we have no control

- Outside forces
- Natural disasters
- Events that can blind-side us

Events that might have been avoided
had we chosen to take actions necessary to protect ourselves and the public

- BP oil spill
- Tylenol scare of the 1980s (before tamper-proof packaging)
- Self-inflicted crises (poor QC, QA or equipment maintenance)

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Crisis Management Advice – *Perspective*

➢ Take a moment to figure out what's going on **– impose order**

➢ Act promptly, not hurriedly – **"be quick, but don't hurry"**

➢ Manage expectations – **address size and scope of crisis**

➢ Demonstrate control – **assume control of response**

➢ Keep loose -- **ability to adapt rapidly and calm those around you**

John Baldoni "How a Good Leader Reacts to a Crisis",
Harvard Business Review, Jan 4, 2011

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Manage Security

- access
- data system integrity
- protection against disasters

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Real World Report: Minutes to Delete, Months to Recover

Shionogi & Co:

$3.2B pharmaceutical company

Laid off IT admin:

- Logged in remotely to vSphere from McDonald's WIFI
- Deleted every production virtual machine – email, order entry, payroll, Blackberry and other critical services
- Equivalent to burning down physical datacenter
- FBI investigation showed admin logged in 20 times prior to his attack – company didn't see given lack of role-based monitoring

COALFIRE FEDERAL

HyTrust
Cloud Under Control

This is a classic case what a laid off worker did at Shionogi.

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Cyber Attacks and Security Breaches

Solutions exist to keep medical images and other patient data secure while enabling better information-sharing.

- Although data security has been identified as a pressing issue for the healthcare industry to address, progress is slow because many **healthcare organizations don't have sufficient resources to manage all of the projects needed to keep patient data safe**. Even at larger healthcare organizations, it's difficult to expect staff IT professionals to have the bandwidth for everything from threat management and mobile security to medical image storage and data recovery.

- A good solution to this dilemma is working with an established, proven technology partner instead of trying to do it all in-house. There are many practical and affordable products and services - from cloud-based vendor neutral archives (VNAs) to secure mobile medical image viewers - to keep medical images and other patient data secure while enabling better information-sharing. Letting a technology expert do what it does best allows healthcare organizations to focus on what they do best: providing care to patients.

Barbara White is Director, AT&T ForHealth Cloud Solutions

Cloud solution

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sample add touting cloud advantages…

1. A **current copy of your data is always outside the disaster zone**: your data stays high and dry in the cloud,.

2. A **third-party team offsite**, unaffected by the disaster, can restore your critical systems in the cloud while you and your staff focus on restoring order onsite.

3. You have **on-demand access to a virtually unlimited resource**—for exactly as long as you need it. Until your sites are back online, keep your systems up and running by shifting services to the cloud;

4. Even if your offices aren't ready for your return, you have **secure remote access to critical systems**, applications, and data in the cloud for as long as you need it.

5. **Faster, cheaper, better:** Cloud technology has enabled vastly more-efficient and secure data transfers and storage, plus disk-to-disk remote recovery. Meeting your Recovery Time Objectives (RTOs) is easier, less expensive, and more reliable in the cloud.

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Virtualization and Cloud Makes Problem Worse

Tradtional Datacenters

10,000s servers, 1,000s of switches & routers
Managed from different places by different people

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Private Cloud

All infrastructure (10,000+ items) in 1 system, managed by highly privileged, unmonitored admins

High Risk of Catastrophic Failure

Cloud Under Control

IT Support of Radiation Oncology

Radiation Oncology IT - Applications & Projects

Applications:
- ARIA / Eclipse …. Windows platform
- Physics QA Applications: IMSure, PipsPro, SNC Patient (MapCheck, ArcCheck), Doselab, ATLAS, Argus, Quasar Pentabeam, Mobius3D, fractioncheck
- EPIC   (enterprise wide Electronic Medical Record)

Many of these interface with planning or imaging database

Current Projects:
- Physics QA Applications migration to CITRIX
- Secondary DB and Image servers for swifter disaster recovery (Housed at a Disaster Recovery location)

Future Projects:
- ARIA v11 Upgrade
- Radiation Oncology Data Warehouse
- Business Intelligence Tools
- Velocity
- EPIC 2012
- ICD-10

Radiation Oncology IT – System Redundancy

Patient DB & images:

High Availability Rapid Recovery Protection or HARRP provides continuous data protection to ensure minimal data loss and immediate recovery from any disaster or system outage.

- Dedicated HARRP server for ARIA database server with real-time mirroring
- Dedicated HARRP server for ARIA image server with real-time mirroring

ARIA application access:

Full CITRIX shop with Fat client access in key areas such as treatment machines & nursing.

- CITRIX farm with fail-over between servers.
- Fat Client Access in the event of a full CITRIX outage.
- Remote access via institution Onsite health site.
- Primary and secondary 10GB pipe from CCC to CDC.

Treatment Planning:

Treatment planning is available through CITRIX or licensed Eclipse boxes distributed throughout the physics department.

- FAS servers dedicated for plan calculations.
- Eclipse PCs are also capable and licensed for plan calculation as a secondary solution

Radiation Oncology IT – Dedicated Hardware

DATABASE SERVER

- Varian database server
- HARRP server with Varian database

IMAGE SERVER

- Varian Image Server
- HARRP server with Varian images

TEST BOX

- T-Box (Full copy of Varian database for testing)
- Image share for test environment

RESEARCH SERVER (anonymized copy of data)

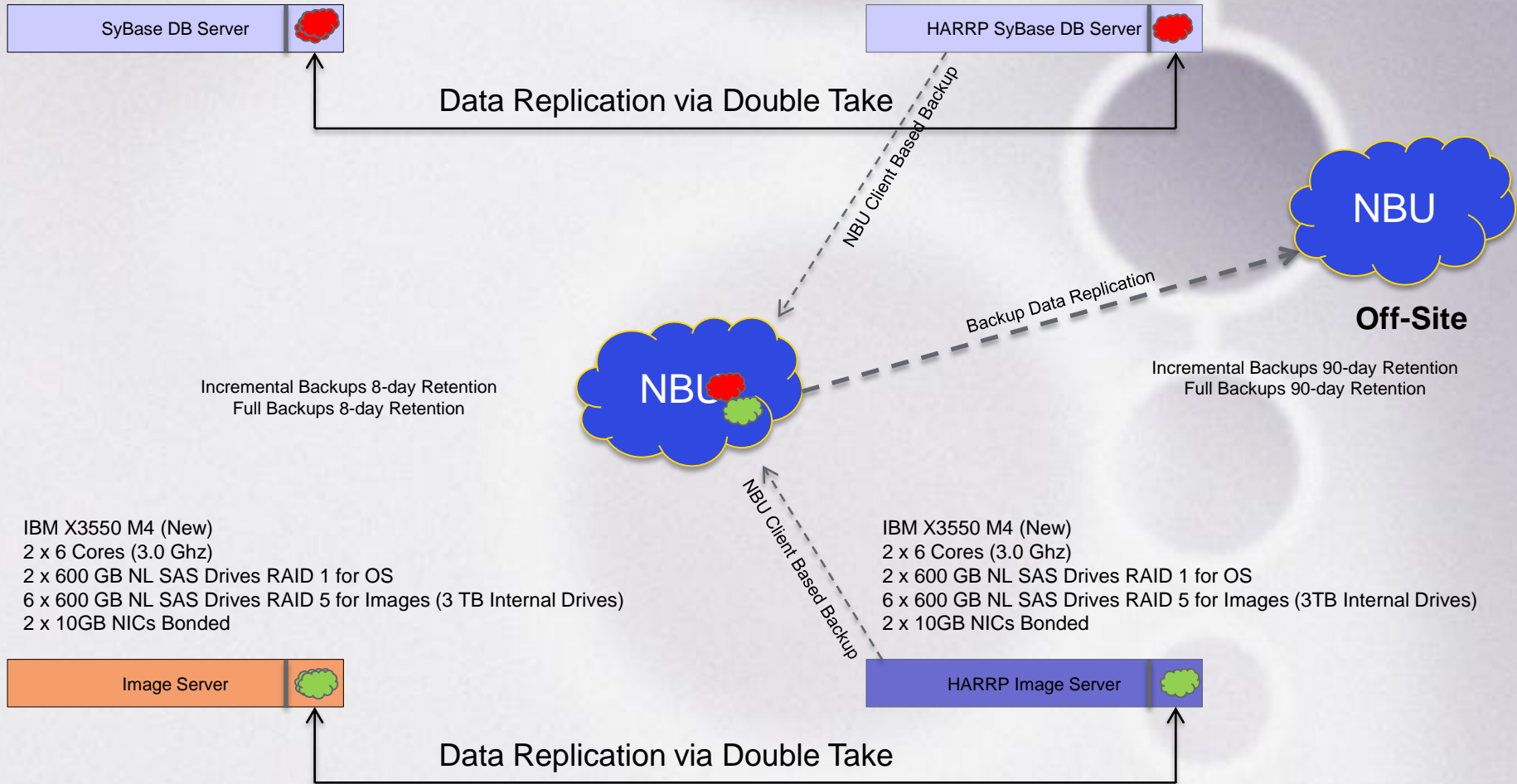- Research Server (Varian database server for research)
- Image share for research environment

CITRIX SERVERS

- 8 CITRIX servers
- 9 FAS servers (dedicated for plan calculations for robust planning)

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IT Data Security – Enterprise solution

Varian File Share Infrastructure*

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| SyBase DB Server | HARRP SyBase DB Server |

Data Replication via Double Take

NBU Client Based Backup

NBU

NBU

Backup Data Replication

NBU

Off-Site

Incremental Backups 8-day Retention
Full Backups 8-day Retention

Incremental Backups 90-day Retention
Full Backups 90-day Retention

NBU Client Based Backup

IBM X3550 M4 (New)
2 x 6 Cores (3.0 Ghz)
2 x 600 GB NL SAS Drives RAID 1 for OS
6 x 600 GB NL SAS Drives RAID 5 for Images (3 TB Internal Drives)
2 x 10GB NICs Bonded

IBM X3550 M4 (New)
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| Image Server | HARRP Image Server |

Data Replication via Double Take

NBU: network backup utility

* Reviewed and validated by Varian

Radiation Oncology IT – Backups

Backups via enterprise wide Net Backup solution

- Incremental backups - 8-day retention period

- Full backups – 8-day retention period

Off-Site Backup data replication

- Incremental backups - 90-day retention period

- Full backups – 90-day retention period

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how are we doing…consider the metrics below


EVault® — A Seagate Company

The best case for the worst case.™

White Paper

12 Best Practices for Data Backup and Recovery

✓ **Onsite/offsite protection**: onsite backup with off-site disaster storage

✓ **Reliability**: disk-to-disk, not disk-to-tape

Solution breathe: Backup servers/pcs/applications

✓ **Expertise**: full service backup and recovery to fit your needs

? **Security**: data encryption during transmission and of backup

✓ **Accessibility**: retrieve data with minimal delay

✓ **Scalability**: grow with your business

✓ **Compliance**: regulatory expertise

✓ **Disaster recovery**: tested and proven recovery plan

✓ **Ease of Use**: dashboard information regarding backups and security

Mixed platform support

Staying power: financially stable with history of success

PATIENT COMPLETES TREATMENT
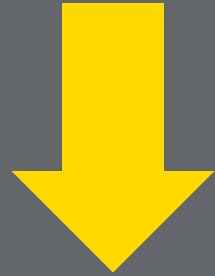
WHAT HAPPENS TO THEIR DATA

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❖ Final physics chart check (paper and electronic)

❖ Change task status to Complete in ARIA to track these charts

❖ Change Treatment Course status to Complete (not active)

❖ We do not archive patient data – all patient info is available

EXTERNAL DATA

ECLIPSE

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MR & PET/CT from internal NYU sources

► Contact MR group to push images

► CD from PET/CT scanners

Bellevue (City Hospital—we provide services)

► CD for MR or PET/CT

► Close to electronic push to us (through PACS)

External to NYU

► CDs

► Sometimes they are in proprietary format

Who imports these outside image sets

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EXTERNAL DATA – outgoing

➢ Situation where another institution needs planning data for one of your patients (or you need their data)

  ▶ more patients are returning for treatment to another body site (anecdotal)

  ▶ May have multiple locations for transfer of patient data

  ▶ Hurricane Sandy – some patients were sent to regional Rad Onc departments for treatment

➢ Currently send copies or printouts of plans (patient release)

➢ There is software available to allow for secure peer-to-peer transfer of planning data or cloud transfer

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UPGRADES

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Pre-upgrade

➢ Preparation (Project Manger)

➢ Test software on separate test server with copy of data

Post-upgrade (mini-commissioning)

➢ Validation of algorithms (new and existing)

➢ End-to-End tests

➢ Tests transfer of data

➢ Tests planning system configuration

➢ Tests naming of accessories (have seen these change)

➢ Test imaging system (schedule MV/kV/CBCT imaging on linac)

➢ Test display at linac console

MANAGE STAFF – Rights and Access

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USER RIGHTS – define for each group and assign members

- ❖ Clerical
- ❖ Nursing
- ❖ Data Managers
- ❖ Therapists
- ❖ Medical Residents
- ❖ Attendings
- ❖ Medical Physics Residents
- ❖ Dosimetrists
- ❖ Physicists
- ❖ System Administrator
- ❖ Service (vendor)

26 groups

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USER RIGHTS

	Contour	Register images	Calculate (license)	Approve plan & images	Treatment approve plan	Configure beam
Med Res	✓	✓	✓			
Attendings	✓	✓	✓	✓	✓	
Dosimetrist	✓	✓	✓	✓	✓	
Physics Res	✓	✓	✓	✓	✓	✓
Physics	✓	✓	✓	✓	✓	✓
Sys Admin	✓	✓	✓	✓	✓	✓ (me)
Service	✓	✓	✓	✓	✓	✓

policy

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Template

WHAT IS IT

❖ A Master Copy or Sample that has some details in place that can be adapted for specific use

WHY USE IT

❖ Create consistency in planning process

❖ Simplify process (especially for non-planners)

❖ Speed up planning process

❖ Simplify post-plan analysis (DVH analysis)

❖ Research

❖ Control

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Templates

- **Structure Templates**
  - Typically "loaded" by medical resident
  - Creates consistency in structure naming

- **Plan Templates**
  - Basic Field Arrangements (residents and Attendings)
  - More complex templates used by physicists (e.g., prostate)
  - Some dosimetrists rely heavily on this resource

- **Optimization templates**
  - Constraints already established

- **Isodose templates**
  - Used for HDR brachytherapy planning
  - customized by user

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TEMPLATE MANAGEMENT

❖ Each physicist or dosimetrist has rights to create and APPROVE their own templates that they determine to be beneficial

❖ We have given overall review to one dosimetrist and perform an annual review to "clean-up" template list (i.e., delete ones not used).

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MANAGE STAFF – Training and Assistance

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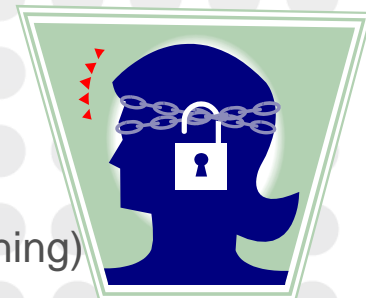## ARIA/ECLIPSE ENVIRONMENT

MANAGE STAFF

Training

- ❖ Vendor training (remote or on-site)
- ❖ Vendor webinar trainings
- ❖ Internal teaching
- ❖ New Patient Rounds (review plans)
- ❖ Resident talks
- ❖ Invited speakers (MDs or physics)
- ❖ Varian website (myVarian)

Competencies

- ❖ How to judge someone knows what they are doing
- ❖ See one – do one – teach one ???
- ❖ How to establish backup for planning / QA
- ❖ How to let physicists be physicists (be curious and question everything)

Vendor Support

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Vendor Help Desk

❖ All physics staff have access to help desk for any issue

❖ Varian may "Smart Connect" in to "observe" process or collect data (if you invite them by using time-stamped key)

❖ Place Ticket for any workstation related issues which will be handled by local Varian IT group.

❖ Very useful when configuring data

❖ Log calls to Varian

Wish we could access records of all calls and service records

Manage Process

Staff Assignments
    Quality control
    Quality assurance
    Timeline and Checks / Approvals

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Manage Process

- ❖ Assignments –Responsibilities
    - ❖ DOD (dosimetrist of the day)
    - ❖ POD (physicist of the day)

report
DOD
POD

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WELL, WHAT DO YOU MANAGE?

➢ **Manage Process**

    ❖ **DOD** (dosimetrist of the day)

        ❖ 5 dosimetrists ➡ each takes a day of the week

        ❖ Import images into Eclipse

        ❖ Enter into our Patient Tracker system (whiteboard)

        ❖ Handle any urgent cases (same day sim&treat)

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WELL, WHAT DO YOU MANAGE?

➢ **Manage Process**

  ❖ **POD** (physicist of the day)
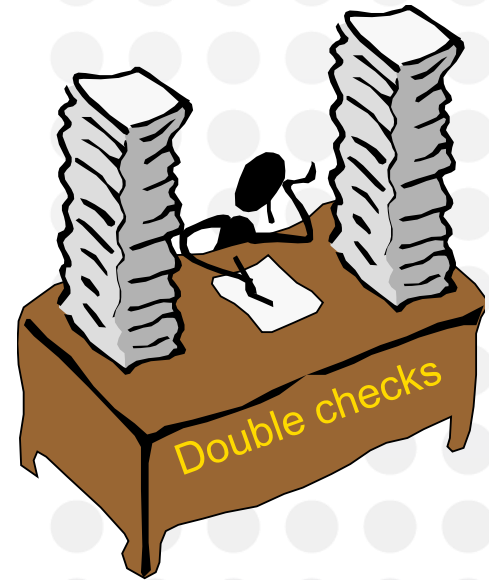
    ❖ Broken into 10 half-days

    ❖ **Each half-day**

      ❖ Primary POD

      ❖ Secondary POD

      ❖ Tertiary POD

    ❖ **Primary POD handles**

      ❖ CT-Sim

      ❖ Final physics chart QA

      ❖ SBRT treatment coverage

      ❖ Daily morning QA review

      ❖ Respond to clinical issues on floor

Double checks

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WELL, WHAT DO YOU MANAGE?

Manage Process

- ❖ POD (physicist of the day) – Why do this?
  - ❖ Better sharing of workload
  - ❖ Maintain skills

- ❖ Coverage on Sunday treatments and late night
  - ❖ => need to broaden pool of coverage

- ❖ Not everyone has same talents but everyone has to be knowledgeable enough to handle common tasks

- ❖ Should not good managers play to people's strengths?

Summary

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What have I learned that I can share

1. There is value in a record of the patient while on-treatment that is both paper and electronic

    => Image data corruption – fortunate we had paper records

    => Hurricane Sandy – fortunate we had electronic records, but also used paper records to contact patients as we did not have access to electronic data for a couple of days.

2. Everyone under "one roof" is nice if you can do it; find "face time" that staff have with the physicians very beneficial
    => distributed placement of staff with frequent meetings

3. Centralized administration of Planning System

    => Centralized processing…not necessarily Centralized planning

4. Specialization of tasks important—base level of shared knowledge and skills needs to be established

5. Data Backup strategy needs professional attention and follow-up

6. Trust…but Verify

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Thank-you

Physicists	Dosimetrists	Residents

Stewart Becker   Melissa Duffy   Elizabeth Hipp
Tami Duckworth   Vera King   Paulina Galavis
Kerry Han   Allison McCarthy
Christine Hitchen   Josh No
Gabor Jozsef   Juliet Qu
Sunshine Osterman
Cynthia Polvorosa

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