University of Michigan Medical School

PLANNING THE PURCHASE OF A RADIATION THERAPY TREATMENT PLANNING SYSTE

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The Department of Radiation Oncology
University of Michigan

Acknowledgements

- UM TPS Evaluation Team
  - Dick Fraass
  - Marc Kessler
  - Pete Roberson
- Numerous Vendor Conversations

Disclosure

- University of Michigan has research agreements with Varian Medical Systems, a manufacturer of Treatment Planning Systems

Disclosure 2

- We are in the process of evaluating treatment planning systems

The New Yorker, 2007

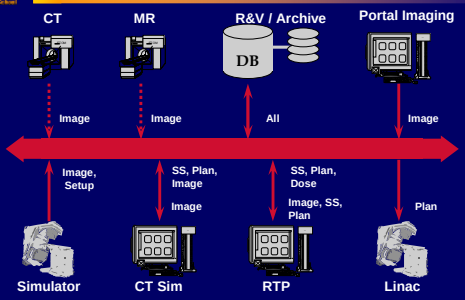
Questions to ask before you 'start'

- **How is a new TPS going to impact your current processes for:**
  - **Imaging?**
  - **Planning?**
  - **Delivery?**

Questions to ask before you 'start'

- **Network Integration**
  - **What changes will be necessary in order to import imaging data?**
    - Current Needs
    - Anticipated Needs
  - **How will treatment delivery information be transferred to the delivery system?**
    - Safety Checks
    - Additional Software required at delivery management system?
  - **How do you determine inter-system compatibility before you purchase?**

Network Integration



Some Possible Answers

- **Minimally**
  - **Generally means same manufacturer and product line, e.g. an upgrade**
- **More than I know**

Before you 'start'

- Too often, all the effort is exerted in identifying the 'right' TPS to purchase, and not on how to integrate it into your planning process
- Although most planning systems have similar feature sets, particular implementations may cause significant changes in your current planning process
  - Dose Normalization
  - Evaluation Tools
  - Plan Documentation

Some Useful References

American Association of Physicists in Medicine
Radiation Therapy Committee Task Group 53:
Quality assurance for clinical radiotherapy treatment planning

Purchase Process
(From IAEA-430)

- Assessment of Need
- Request for Information
- Vendor Demonstrations
- Tender Process
- Selection
- Purchase

Assessment of Need

Issue	Question and/or comment
Status of the existing TPS	Can it be upgraded? Hardware? Software?
Projected number of cases to be planned over the next 2–5 years	Include types and complexity, for example number of 2-D plans without image data, number of 3-D plans with image data, complex plans, etc.
Special techniques	Stereotactic radiosurgery? Mantle? Total body irradiation (TBI)? Electron arcs? HDR brachytherapy? Other?
Number of workstations required	Depends on caseload, average time per case, research and development time, number of special procedures, number of treatment planners and whether the system is also used for MU/time calculations
Level of sophistication of treatment planning	3-D CRT? Participation in clinical trials? Networking capabilities?
Imaging availability	CT? MR? SPECT? PET? Ultrasound?
CT simulation availability	Network considerations
Multileaf collimation available now or in the future	Transfer of MLC data to therapy machines?
3-D CRT capabilities on the treatment machines	Can the TPS handle the therapy machine capabilities?
Need for special brachytherapy considerations	For example, ultrasound guided brachytherapy. Can ultrasound images be entered into the TPS?
IMRT capabilities	Available now or in the near future?
Treatment trends over the next 3–5 years	Will there be more need for IMRT or electrons or increased brachytherapy?
Case load and throughput	Will treatment planning become the bottleneck?

From IAEA-430

Team

- **Multi-disciplinary Team**
  - Physics
  - Physicians
  - IT Group
  - Dosimetry
  - Administration
  - Multi-Site (if appropriate)

MEMORANDUM
DATE: December 9, 2004
TO: Bruce Curran, Pete Roberson, Avi Eisbruch, Randy Root, Dick Fraass, Howard Sandler, Marc Kessler, Molly Sullivan, Len Marsh, Randy Ten Haken, Bill McLaughlin
FROM: Ted Lawrence
RE: Path toward integrating a commercial treatment planning system

Dear treatment planning group:

Putting Together a Plan

New Treatment Planning System Project Plan

Primary Authors:
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Marc L. Kessler, Ph.D.
Peter L. Roberson, Ph.D.

Revision History:
Draft 1: 14 December 2006

Purpose

The purpose of this document is to describe the overall plan for acquisition and implementation of a new treatment planning system for use throughout the UM Radiation Oncology Enterprise. This document will help all involved parties understand the advantages, compromises and tradeoffs involved in the implementation of this plan.

Putting Together a Plan

- Necessary TPS Functionality
- Required Infrastructure
- Enterprise Architecture
- Deployment Strategy
  - Acceptance Testing
  - Clinical Commissioning
  - Training
  - Support
- System Evolution
- Business Plan

Information Gathering

Treatment Planning Across the Enterprise

The Next Ste

The Current Step

Gather input from enterprise
- Access special and similar needs

Discuss / Evaluate Options ★
- Single or Multiple Vendor Solutions
- Impact on Clinics and Research

Investigate research collaboration
- Move research to commercial system?

Vendor Resources

General Requirements

1. A comprehensive Radiotherapy Treatment Planning (RTP) system for conventional, 3D conformal and inverse planned IMRT external beam radiation therapy and brachytherapy.
2. A modern workstation technology that links several client workstations to a central server workstation. Each client can perform calculations using their own CPU and Graphics Display System and share other resources of the server (disks, plotters, printers).

Hardware requirements (minimum)

1. Hardware runs the Windows XP professional operating system
2. CPU at least 3.2 GHz
3. Hard drive at least 70GB
4. RAM is at least 4G
5. High resolution monitor (at least 20", 1280x1024 pixels)
6. Workstation can be networked into the existing hospital system
7. TCP/IP protocol at minimum of 100Mbits/sec
8. Color laser printer
9. OpenGL graphics acceleration
10. System can connect with an optional flat panel monitor
11. System can connect with an optional digitizer
12. System can connect with an optional digital film scanner

Connectivity

1. Multiple 3D workstations can be connected to RTP network.
2. Multiple 3D workstations can import image and plan data
3. Support for different image modalities (at least CT, MR, NM and PET) for target and critical organ delineation.
4. Supports DICOM-RT import/export of
   a. DICOM 3.0 images
   b. RT Images (DRR, simulator image, etc.)
   c. RT Structures
   d. RT Plans
   e. RT Dose Matrix
   f. RT Dose points
   g. RT Fluence
   h. RT dMLC for IMRT
   i. RT Blocks
   j. RT Compensators

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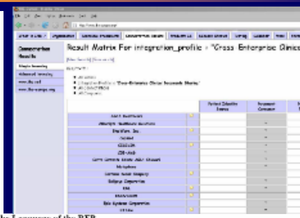
System Compatibility

IHE

Integrating the Healthcare Enterprise

IHE Radiology User's Handbook

2005 Edition



The Language of the RFP

For your Must-haves and perhaps your Intend-to-haves, use "shall" terminology in your RFP, as shown in the following examples:

"The PACS system shall support the SWF Integration Profile and the PIR Profile as the Image Manager/Image Archive Actor."

"The PACS system shall support the SWF Integration Profile as the Evidence Creator Actor and the Image Display Actor."

"The PACS system shall support the IHE Portable Data for Imaging Integration Profile as a Portable Media Creator Actor."

www.ihe.net

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Licensing

Site	Full Planning Workstations	Estimated Simultaneous Users	Physician Review Workstations	Estimated Simultaneous Users
UM – Clinical	36		25	
UM – Development	25		2	
UM – Home Access	15		2	
UM – Off-Campus Support	2		0	
UM – Main Campus Total	78	30	29	10
UM – Alpena	2	2	1	1
UM – Central MI	2	2	2	2
UM – Foote	3	3	2	2
UM – Ingham	3	3	2	2
UM – Prov-Novi	5	5	2	2
UM – Prov-Southfield	5	5	2	2
UM – Ann Arbor VA	2	2	2	2
UM – TOTAL	100	52	42	23

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Training

Site	Basic Dosimetry (on-site)	Basic Dosimetry (factory)	Basic Physics (on-site)	Basic Physics (factory)	Advanced Dosimetry (factory)	Advanced Physics (factory)	Installation & Configuration (factory)
UM – Clinical	6		8		3	4	2
UM – Development	3		3		1	1	1
UM – Off-Campus Support	1		1		1	1	
UM – Main Campus Total	10		11		4	6	3
UM – Alpena		1		1	1		
UM – Central MI		1		1			
UM – Foote		1		1	1	1	
UM – Ingham		1		1		1	
UM – Prov-Novi		1		1	1	1	
UM – Prov-Southfield		1		1	1	1	
UM – Ann Arbor VA		1		1			
UM – TOTAL	10	7	11	7	8	10	3

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Research

Requirements for clinical implementation and translational research using a commercial treatment planning system at the University of Michigan Health Care System

Background

UMPlan has been in use in our enterprise for over twenty years for basic clinical treatment planning *and* as the basis for most of our research and development efforts to improve patient care using highly conformal treatment techniques and computer-assisted technologies. This system was developed by members of the physics faculty in close and continual collaboration with the clinical faculty. It has been the primary tool for our department wide NIH-funded program project grant now in its 12th year and many other individual research projects and multi-department collaborations.

A major factor in our success with UMPlan in both the clinic and translational research domains is the complete control and transparency we have with this system. This control and transparency has also allowed us to effectively integrate UMPlan with other major in-house and commercial and clinical and research systems across our enterprise, including the information and treatment delivery systems developed by Varian Medical Systems.

Deployment (multi-site features)

General Issues of Deployment and Operation

Cross-facility Support

UM personnel routinely support clinical operations at other facilities within the UM Enterprise. This support can range from simple dose calculations through full 3D (and developing 4D) planning. UM physics and dosimetry personnel who are covering an alternate site require the ability to connect back to their home site to perform planning, QA and chart checks, and other support. This coverage is not a hub and spoke arrangement with main campus, but can occur between any two UM facilities.

Multi-database Operations

At present each UM facility maintains its own database of patients and treatment units. For general and cross-facility support, it is necessary that main campus (and, optionally, any off-campus facility) be able to access the planning and machine characterization data from any other facility for planning, beam analysis, and general physics support. A mechanism must also be available for moving patients between facility databases, for cases where intensive planning effort is not effective due to network issues. Ideally, mechanisms for tracking versions of patient data across databases should be available.

Making the Case

Radiation Oncology
Treatment Planning System Replacement
Background: 1984 - 2005

- Initially develo
  - No comme
  - First FDA c
  - Establishe
    - Nation

Radiation Oncology
Treatment Planning System Replacement
Project Timeline

Radiation Oncology
Treatment Planning System Replacement
Alternatives

- What would happen if this project were not funded this year?

Making the Case

- **How are you going to keep the system up-to-date?**
  - **Service Contracts**
  - **Upgrades vs Updates**
  - **Hardware Obsolescence**
  - **Continued Training**
  - **New Integration Requirements**

Making it work

- **In general it will take 6-9 months to commission a new planning system and integrate it into routine operation**
  - **Available resources?**
    - Dual Planning System Operation
    - Space (Servers, Desktop, Network)
    - Training
  - **Clinic Pressure**
    - Roll out the new features that drove the decision
    - Site-by-site transition (prostate, lung, head & neck, …)

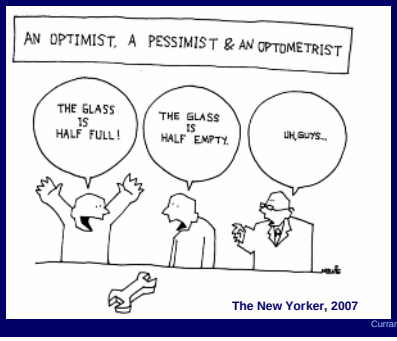
Making it work

The New Yorker, 2007

Making it work

- **There will be features that prevent doing things "the way we've always done them" that you did not expect**
  - **No possible way to fully explore all changes resulting from the new TPS**
  - **Some changes will be subtle and may not become clear until after significant use**
    - Dose Algorithms / Calculation Changes
      - **Heterogeneity Corrections**
      - **Dose Grid constraints**
    - Optimization / Evaluation Tools
      - **Objective Function Building blocks**

The End



The New Yorker, 2007