



UNIVERSITY *of* MARYLAND
SCHOOL OF MEDICINE

Building a New Radiation Therapy Clinic: Wait, Where Do I Start? - Part II

Therapy (SAM) Symposium
AAPM Spring Clinical Meeting
Saturday March 18, 2017

Physics Audience: Good Joke?

- Rene Descartes is sitting at a bar. The bartender asks him: "Would you like another drink?" Descartes replies: "I don't think ..." and *poof* he disappears!





Building a New Radiation Therapy Clinic: Wait, Where Do I Start? - Part II

No Conflicts of Interest.

Any mention made of commercial products, consultants, and vendors is intended only as an example, and because of our familiarity with them.

DISCLAIMER

Meet SAM:





Building a New Radiation Therapy Clinic: Where Do I
Start? Part II

PERSPECTIVE AND RATIONALE

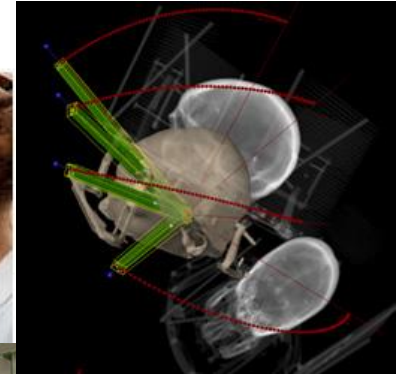


Building a New Radiation Therapy Clinic: Where Do I Start – Part II

- The New Radiation Therapy Clinic
 - By identifying the key elements of a new radiation-therapy clinic, we *also identify the key components of what we believe should constitute a quality program*
 - This presentation summarizes the University of Maryland Department of Radiation Oncology experience, and it describes the **leadership** role that we must undertake as clinical medical physicists

The Medical Physicist

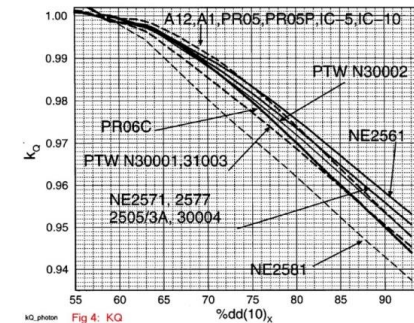
- Google - "*The Medical Physicist*"
 - Science
 - Math
 - Engineering
 - Computers
 - Technology
 - But ... Leadership?



Our Traditional Role

Calculations

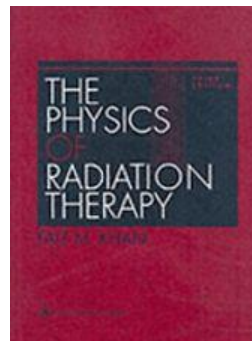
$$\begin{aligned}
 &P\left(\frac{a\bar{\sigma}_n/\sqrt{n}}{\bar{R}_n} 100\% \leq \frac{R-\bar{R}_n}{\bar{R}_n} 100\% \leq \frac{b\bar{\sigma}_n/\sqrt{n}}{\bar{R}_n} 100\%\right) \\
 &= P\left(\frac{a\bar{\sigma}_n/\sqrt{n} + \bar{R}_n - R_{\text{given}}}{\bar{R}_{\text{given}}} 100\% \leq \frac{R - R_{\text{given}}}{\bar{R}_{\text{given}}} 100\%\right) \\
 &= PD_V \leq \frac{b\bar{\sigma}_n/\sqrt{n} + \bar{R}_n - R_{\text{given}}}{\bar{R}_{\text{given}}} 100\% \\
 &= \int_a^b \frac{\Gamma(n/2)}{\sqrt{\pi(n-1)}\Gamma((n-1)/2)} \left(1 + \frac{t^2}{n-1}\right)^{-n/2} dt
 \end{aligned}$$



Measurements



External Beam

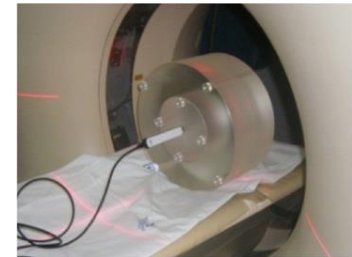


Physics



Brachytherapy

Applied Research



QA

Our Expanded Role

Team Collaboration



Planning Oversight



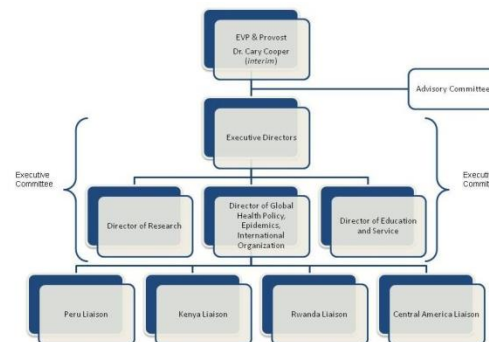
Compliance



Regulatory



The Patient!



Organization



Teaching



The Medical Physicist

- Quotes from Medical Physics Scope of Practice
 - "This document summarizes the tasks for which medical physicists are uniquely qualified."
 - "The essential responsibility of the Qualified Medical Physicist's clinical practice is to assure the safe and effective delivery of radiation to achieve a diagnostic or therapeutic result as prescribed in patient care."
 - A key member of institutional staff and a vital member of the patient-care team



The American Association of Physicists in Medicine

We advance the science, education and professional practice of medical physics

Home

(AAPM Policy No. PP 17-B)



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The Medical Physicist as Clinical Leader



- “Uniquely Qualified”
 - Problem-solving skills
 - Apply the scientific method
 - Understand the technology
 - What it can and cannot accomplish
 - Appreciate the clinical perspective
- Medical Physics Practice:
“Reasonable and Prudent” *



* Shalek and Gooden:
Medical Physicists and Malpractice
Med Phys Publishing 1996



Building a New Radiation Therapy Clinic: Where Do I
Start? Part II

THE UNIVERSITY OF MARYLAND EXPERIENCE

The University of Maryland Department of Radiation Oncology



Central Maryland
Radiation Oncology





University of Maryland Department of Radiation Oncology: Perspective

- Six practice sites over five counties in Central Maryland
 - 11 accelerators
 - 4 proton gantries, 1 fixed
 - Gamma Knife / Gamma Pod / Hyperthermia
 - 2 HDR; LDR @ most sites
- Currently, roughly 250 or so patients treated daily
- Approximately 70 faculty members (clinical, physics, radiation biology) and over 200 staff
- Integrated practice
 - Standardized practice
 - Clinical Practice Guidelines
 - Consolidated staffing
- Centralized operational management
 - Operational / advisory committees
 - Quality management
- Integrated IT Infrastructure
 - Single databases



Building a New Radiation Therapy Clinic: Where Do I
Start? Part II

OVERVIEW AND INTRODUCTION



Building a New Radiation Therapy Clinic: Overview

- Introduction
 - Assumptions, needs, goals
- Project Management and Design
 - Concepts, phases, team members
 - Facility, equipment, staffing
- Clinical Program Implementation
 - Operations, quality management
- Closing
 - Lessons learned



Introduction

- Opening a Radiation Therapy Clinic – Intro
 - Assumptions – Feasibility Exists
 - What this presentation will and will not cover
 - We will assume:
 - Clinical need exists
 - Patient population
 - Necessary partnerships have been formed
 - Patient referral, physician groups
 - Area hospitals
 - Financial viability properly evaluated
 - Projected revenue versus costs – capital / operations



Introduction

- Opening a Radiation Therapy Clinic – Intro
 - Assumptions – Clinical Requirements Identified
 - Disease Sites / Needed Services
 - Breast, prostate, lung, head and neck, CNS, GI, Gyn, etc.
 - External beam
 - Conventional, IMRT, SBRT, IGRT
 - Brachytherapy
 - HDR, LDR
 - Other special procedures ...
 - TBI, Intracranial SRS, etc.



Introduction

- Opening a Radiation Therapy Clinic – Intro
 - Assumptions – A “Stand-alone facility” ...
 - Fully staffed, self-sufficient
 - Linear accelerator(s)
 - State-of-the-art
 - IMRT, SBRT, VMAT, IGRT
 - Surface imaging, fiducial markers / beacons
 - Brachytherapy: LDR / HDR
 - In-house CT - Multi-slice, 4DCT
 - Planning and record-and-verify systems



Introduction

■ Staffing

- Radiation oncologists, nursing staff, physicist(s), dosimetrist(s), therapists, administrative, reception, medical records staffs, ...
- Staffing models
 - Dependent upon patient numbers and practice complexity
 - Guidance: ACR, ASTRO, ASRT, etc.

■ References

- ASRT Radiation Therapy Staffing and Workplace Survey 2014
- ASTRO Safety is No Accident 2012
- Battista JJ et al. JACMP 13(1) 2012
- Klein EE JACMP 11(1) 2009



Introduction: Example Facility

- UCHS KCC – Facility

- Clinic space

- Nurses station, 8 exam rooms, 3 consult,

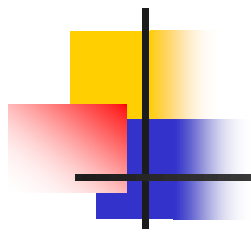
- Equipment

- 2 accelerators - Trilogy / TrueBeam
- CT - Philips Brilliance
- HDR Brachytherapy - Elekta Flexitron
- Planning systems - RayStation / Eclipse

- UCHS KCC – Staffing

- Staffing

- 1 Ops Manager
- 2 MDs
- 3 Nurses
- 2 Physicists
- 2 Dosimetrists
- 7 Therapists
- 3 Front Desk
- 1 IT
- 1 Research Coordi.



Project Management – Principles / The Physicist as PM
Building and Developing a Radiation Therapy Clinic

PROJECT MANAGEMENT AND PROJECT DESIGN



Project Management

- What is a Project?

- It's a **temporary** group activity designed to produce a **unique** product, service or result

- Project Management Institute Website:
(<http://www.pmi.org/About-Us/About-Us-What-is-Project-Management.aspx>)

- What is a Project?

- A project is **temporary**
 - Has a defined beginning and end in time, and therefore defined scope
- A project is **unique**
 - A specific set of operations designed to accomplish a **singular goal**
 - Often includes people who don't usually work together



Project Management: Phases and Groups

- Initiation

- Define the need, identify stakeholders, and clearly delineate deliverables

- Planning

- Organize project components; create list of tasks, project schedule, and assign responsibilities

- Execution

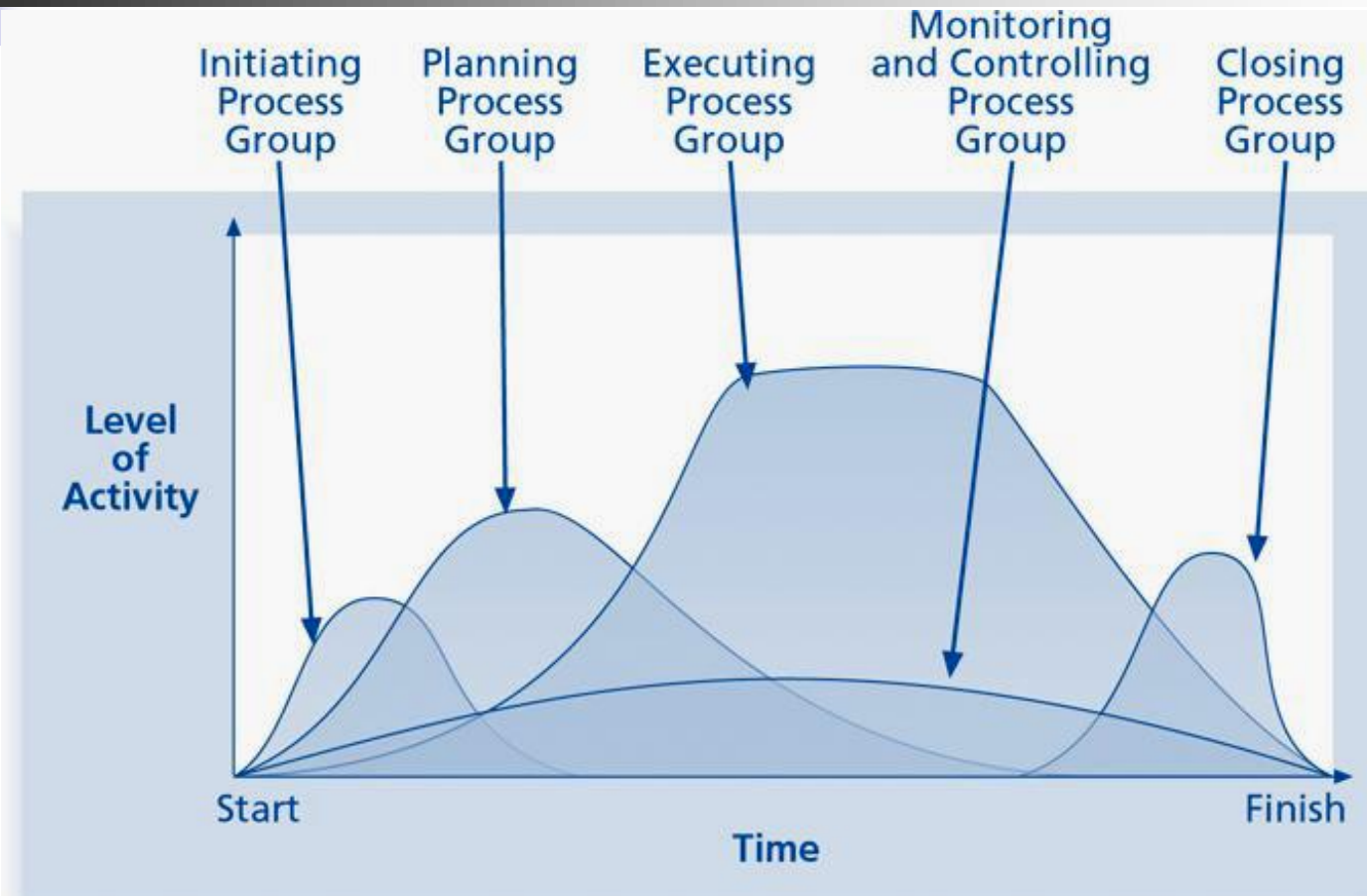
- Begin work on assigned tasks, **communicate**

- Monitoring and Controlling

- Continually review progress versus objectives

- Closing

Project Management: Phases and Groups



<http://staff.lib.uci.edu/departments/it/projects/docs/PrimeronProjectManagement.pdf>

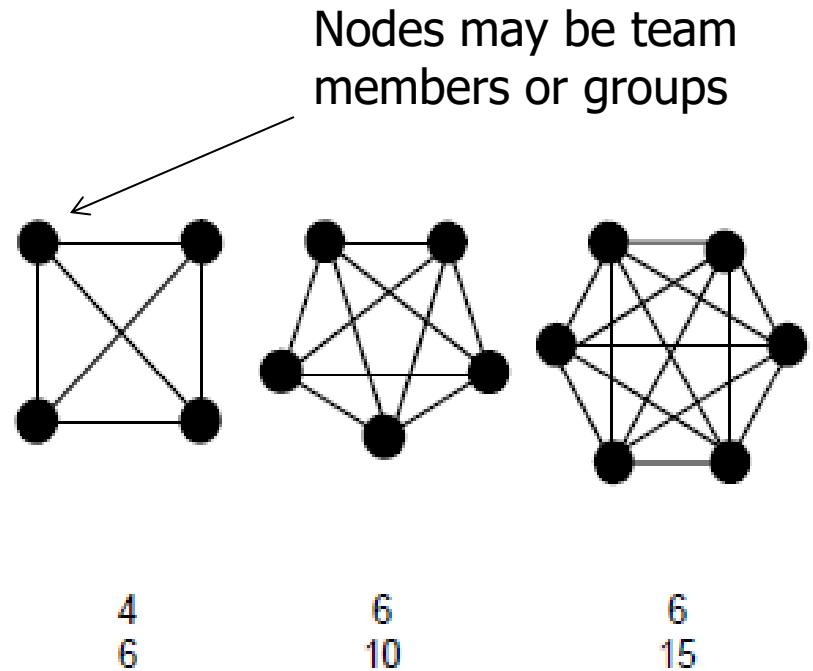
Project Management Forces

- The Scope Triangle
 - Competing forces
 - Increased project quality may require more time or resources; less time may result in less project quality
 - “Scope Creep” – accumulation of new project functionality
 - Increased time or resources

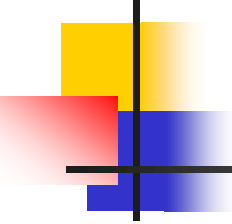


Project Management Communication

- The “*Mythical Man Month*”
 - Adding resources to a project does not necessarily speed it
 - **Communication** complexity
 - Potential Scope Creep



<http://www.nickjenkins.net/prose/projectPrimer.pdf>



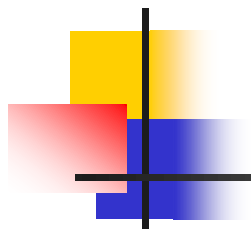
Project Example: RayStation Implementation

■ Initial Project Plan

- 
- Contract
 - Specifications
 - Beam Data
 - Consolidate
 - Acceptance
 - Functionality
 - Commissioning
 - Clinical implementation
 - Training
 - Large physics and dosimetry groups

■ What actually happened?

- Contract - OK
 - Small empowered group
- Beam Data
 - Became a project itself
- Acceptance - OK
 - Essentially 2-3 people
- Clinical Release
 - Initial goal, but delayed
- Training
 - Overwhelmed project initially



The Project Team and Project Phases

Radiation Therapy Clinic Design and Development

PROJECT DESIGN AND EXECUTION

Project Design and Execution



- The Project Team



Project Team
Brainstorming Session
This Works!

- The Project Manager

- The Project Team

- The Clinical Team
 - Clinic Staff
 - Technical Staff
- Administrative Team
- Architects / Engineers
- IT Staff
- Principal Vendors

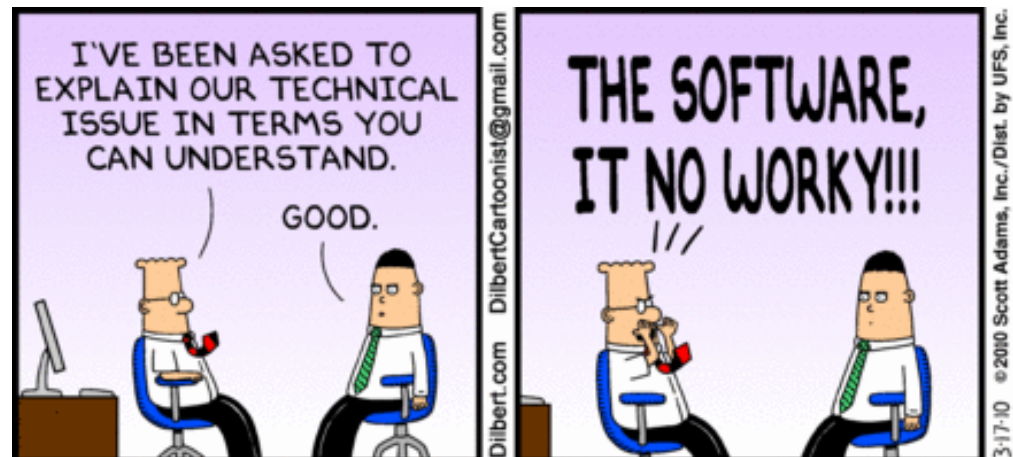
The (Physicist as) Project Manager



- The Project Manager
 - Identifies project requirements
 - Establishes clear objectives
 - Directs the project from start to finish
 - Lead teams to ensure cross-functionality, continuity, and cohesiveness
 - The Project Manager's roles include
 - Leader, Administrator, Facilitator, Arbitrator, Mediator, Liaison, Coordinator, **Communicator**

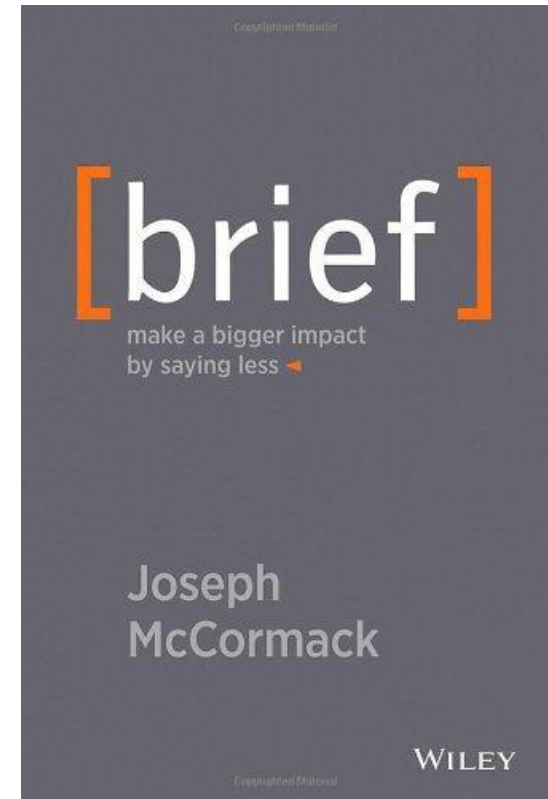
Effective Communication: The True “Final Frontier”

- Let's digress ...
 - The No. 1 Challenge
 - Even harder for physicists
 - However, extremely important
 - Understand the “Big Picture”



Effective Communication: Brevity

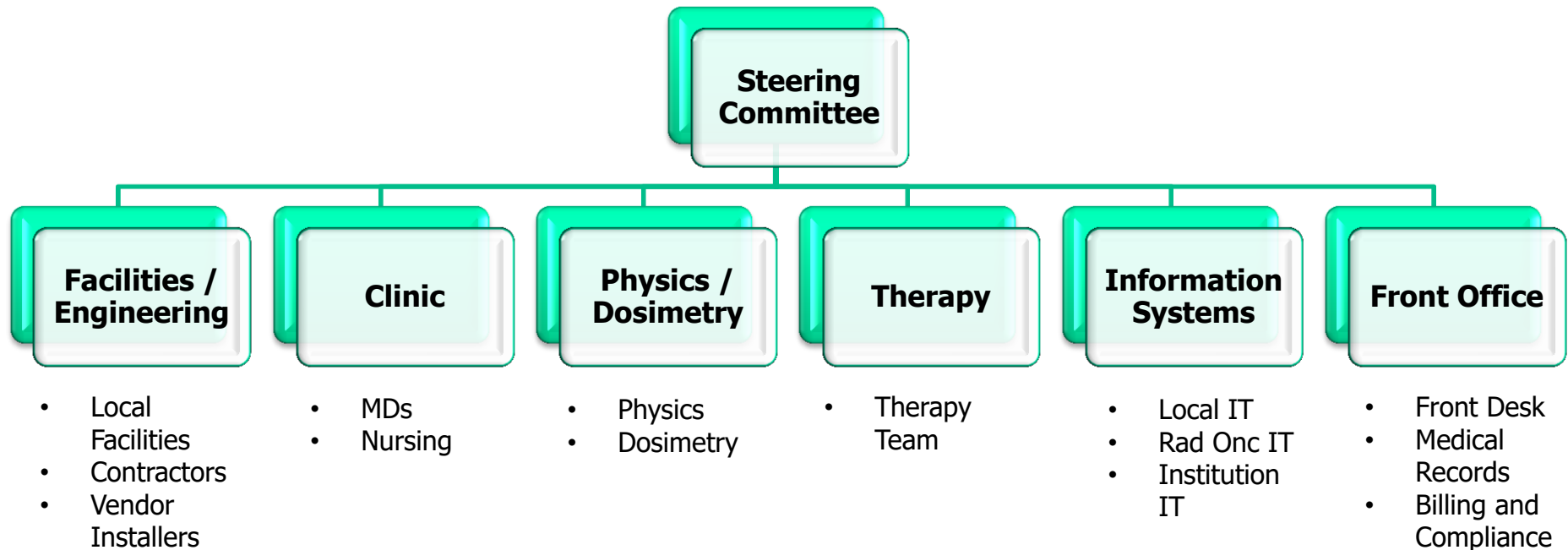
- But ... be brief
- Information Overload
 - Attention span – 8 sec
 - Distraction at 15 min
 - Focus only 6 hrs/wk
- Common mistakes
 - Over explain
 - Under prepare
 - Miss the point completely



John Wiley and Sons, 2014

Project Execution: Project Team Organization

- Steering Committee and Sub-Committees
 - Standing and Ad-Hoc Members





Project Team Organization

- **Steering Committee**

- **Leadership group**
 - Senior administration
 - Medical direction
 - Section chiefs:
Nursing, Physics,
Therapy
- **Project manager**
- **Sub-committee leadership**

- **Responsibilities**

- Project management
- Receive sub-committee reports
- Maintain project timeline
- Maintain project documentation
- Project liaison activities



Project Team Organization

- Facilities / Engineering

- Senior administrator
- Facilities manager
- Construction foreman
- Vendor PMs
- Physics / clinic / therapy representatives

- Responsibilities

- Architectural design
- Construction
- Physical plant
 - Electrical / Plumbing / HVAC / Etc.
- Major-equipment vendor liaison
 - Linac(s) / CT / Brachytherapy



Project Team Organization

■ Clinic

- Physician leadership representation
- Nursing staff
- Administration / hospital liaison

■ Responsibilities

- Design clinic space
- Secure clinical equipment
- Clinical-staff training and credentialing
- Hospital / physician liaison
- EMR design



Project Team Organization

■ Physics / Dosimetry

- Physics leadership
- Dosimetry leadership
- Staff physicists / dosimetrists
- Radiation safety / regulatory representative(s)

■ Responsibilities

- Physics / dosimetry space design
- System specification and commissioning
 - Treatment / Imaging / Planning
- Regulatory
- Physics / dosimetry training



Project Team Organization

■ Therapy

- Chief Therapist
- Staff therapist(s)
- Administration
- Physics / Dosimetry representative

■ Responsibilities

- Therapy space design
 - Treatment vault(s) / CT suite
- Immobilization devices
- EMR design
- Therapy-staff training



Project Team Organization

■ Front Office

- Administration
- Nursing
- Billing and compliance
- Medical records / reception
- IT staff

■ Responsibilities

- Patient reception / registration
- Medical records
 - EMR and workflows
 - EMR interfaces
- Billing and compliance
- Staff training



Project Team Organization

■ Information Systems

- IT Director or designee
- IT staff
 - Institution liaisons
- Administration
- Physics / dosimetry
- Clinic staff
- Front desk
- Therapy

■ Responsibilities

- Servers / network / connectivity
- System(s) interfaces
- Clinical applications
 - EMR, planning systems, QA systems, etc.
- Office automation / communication

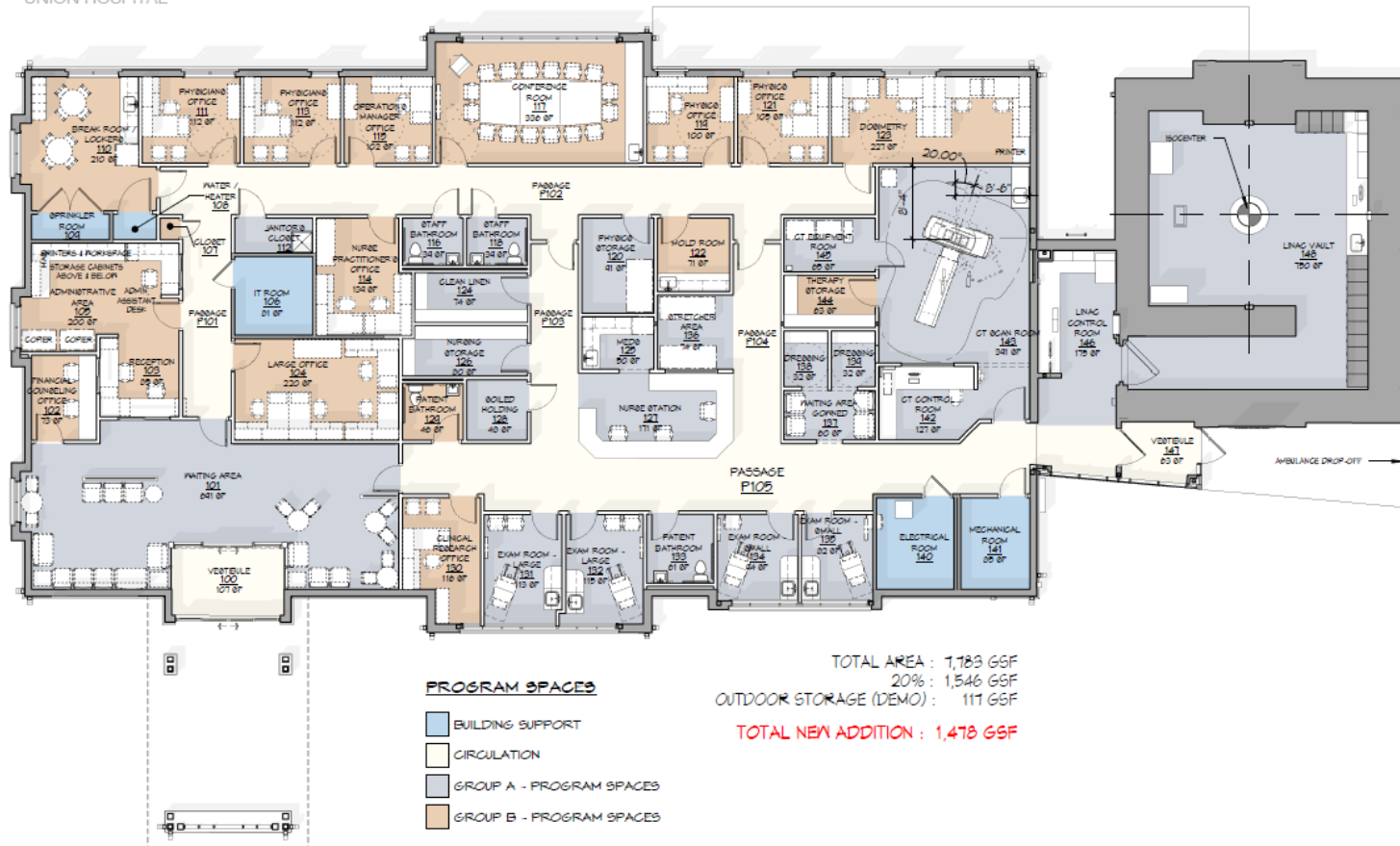


Project Teams' Progression: Sample Meeting Format

- Project Steering Committee
 - UCH KCC Coordinating Committee –
Standing Meeting Agenda
 - Old Business
 - Update / Time-line Review
 - Recent Activities
 - Barriers Encountered
 - Next Actions
 - [Link to Meeting Minutes ...](#)

Project Initiation and Planning: Identify and Satisfy Needs

RADIATION ONCOLOGY CENTER
UNION HOSPITAL





Project Development

- Project-team members take on different roles during the project phases

Radiation Therapy Clinic Development Project Groups Effort and Phases

| Group / Phase | Initiation | Planning | Execution | Monitoring | Closing |
|--------------------------|------------|----------|-----------|------------|----------|
| Leadership | High | Low | Low | Low | High |
| Engineering | Low | Moderate | High | Moderate | Moderate |
| Administration | Moderate | High | Moderate | High | High |
| Physician | High | Moderate | Low | Low | Moderate |
| Clinic | Low | High | Moderate | Moderate | Moderate |
| Physics/Dosimetry | Low | High | Moderate | High | High |
| Therapy | Low | Moderate | Moderate | Moderate | Moderate |
| Information Tech. | Low | High | High | Moderate | Low |

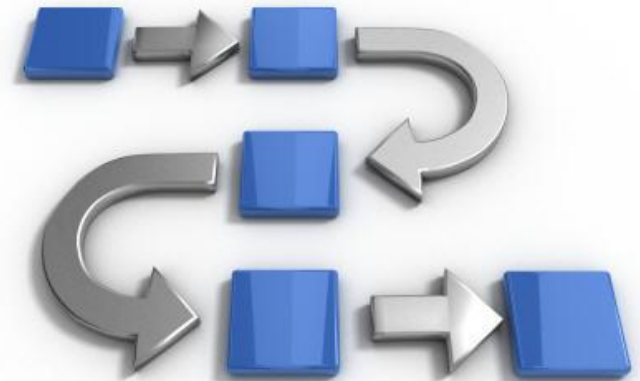
Project Development

- Required activities versus timeline
 - What needs to be accomplished?
 - Best developed by individual groups
 - Develop checklists during brainstorming sessions
 - [Link to Checklist](#)



Project Finalization

- Project Execution – Final Stage: Bringing it all Together
 - The End-to-End Test
 - From patient registration to treatment verification
 - Go-Live
- Project Closing



End to End Testing

- Patient Registration
- Clinical Evaluation
- Imaging / Fusion
- Treatment Planning
- Treatment Delivery
- Dosimetry Verification



Building a New Radiation Therapy Clinic:
We've Opened – Now What?

THE CLINICAL PROGRAM



The Clinical Program

- Clinical Program Organization
 - Medical Directors
 - Operations Managers
 - Section Chiefs
 - Operations Committees
 - Advisory Committees
- Committees
 - Operations Committees
 - Advisory Committees
 - [Link to Organizational Structure ...](#)

The Clinical Program: Key Committees



- Clinical Operations
 - Decision Making
 - Leadership: Medical Director, Senior Administration
 - Key Advisors: Physics, Therapy, Nursing
 - Reports from Advisory Committees
- Quality Committee
 - Quality / Safety
 - Variance Reporting
 - Safety Notices
 - Manages CQI Program
 - Quality Indicators

Useful Source Document:
ACR / ASTRO Practice Parameter
for Radiation Oncology 2014

Epilogue ...

- Opening a Radiation Oncology Center
 - Lessons Learned ...
 - Teamwork, Teamwork, Teamwork ... It takes a village ...
 - Murphy's Law ... Plan on it
 - Add 20% ... to costs, time, effort
 - But ... it can be done
 - And it's very rewarding !!



Acknowledgements ... and Thank You !!

- I wish to acknowledge my
University of Maryland
Department of Radiation
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 - In particular Erika Maynor
 - Without them, what we have
accomplished would not have
been possible!
- Thank you for your kind
attention!

