



AMERICAN ASSOCIATION *of* PHYSICISTS IN MEDICINE

Advancing the Science, Education & Professional Practice of Medical Physics

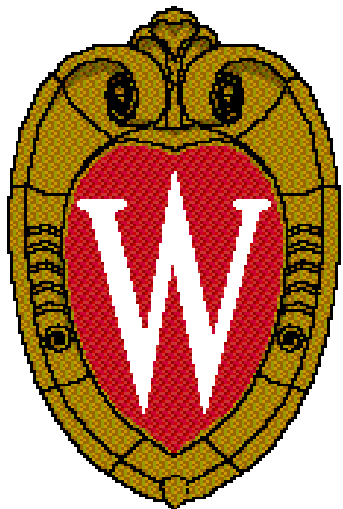
AAPM ACTIVITIES, WITH A FOCUS ON SAFETY AND QUALITY

Bruce Thomadsen

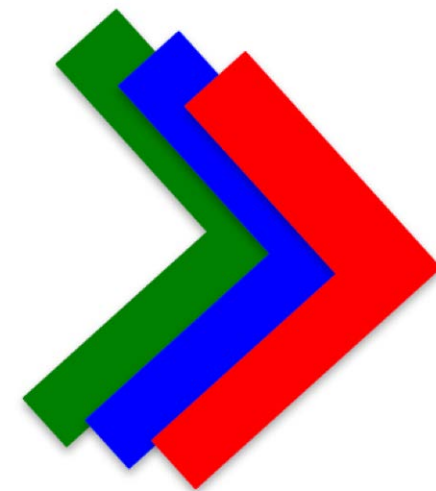
AAPM President-Elect



DISCLOSURES



- Professor of Medical Physics at the University of Wisconsin
- The President of the Center for the Assessment of Radiological Sciences, a 501(c)(3) non-profit Patient Safety Organization listed with the Agency for Healthcare Research and Quality, dedicated to improving quality and patient safety in radiotherapy and radiology. ***I receive no remuneration from CARS.***





LEARNING OBJECTIVES

- Become familiar with some of the issues currently facing the AAPM
- Learn the quality and safety activities of the AAPM



SOME INTERESTING FACTS ABOUT THE AAPM

- About 30% of our approximately 8,500 members volunteer – This is amazingly high for a professional organization.
- On a recent survey of the membership showed high satisfaction with the Association.

	Strongly Disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly Agree (5)	AVG	Std. Deviation
AAPM disseminates scientific and technical information in medical physics.	1.04% 24	0.87% 20	6.15% 142	41.85% 966	48.18% 1112	4.41	0.76
AAPM promotes the highest quality medical imaging and radiation therapy.	1.13% 26	1.21% 28	8.62% 199	40.77% 941	44.97% 1038	4.36	0.82
AAPM promotes improvements in patient safety.	0.87% 20	0.95% 22	7.24% 167	45.23% 1044	44.28% 1022	4.35	0.75
AAPM provides helpful opportunities for members to share cutting edge research.	1.00% 23	3.21% 74	11.79% 272	44.24% 1021	37.13% 857	4.20	0.87
AAPM encourages research and development to advance medical physics.	1.56% 36	2.25% 52	12.65% 292	43.33% 1000	37.74% 871	4.20	0.88
AAPM helps keep me informed regarding advances in medical physics.	1.13% 26	2.34% 54	12.39% 286	47.75% 1102	34.79% 803	4.18	0.84
AAPM provides valuable opportunities for networking.	1.26% 29	2.04% 47	13.99% 323	48.70% 1124	32.63% 753	4.13	0.83
AAPM supports the medical physics education of physicians and other medical professionals.	1.34% 31	4.55% 105	19.45% 449	39.95% 922	27.25% 629	4.08	1.02
AAPM provides valuable professional development opportunities to advance the careers of members.	1.56% 36	4.12% 95	16.38% 378	45.71% 1055	29.33% 677	4.05	0.93
AAPM provides genuine opportunities for members to share best practices.	1.21% 28	4.25% 98	16.51% 381	46.71% 1078	28.64% 661	4.05	0.91
AAPM helps members to anticipate the challenges and trends that will likely impact the medical physics community.	1.52% 35	6.11% 141	20.58% 475	45.36% 1047	24.57% 567	3.90	0.94

Do not try to read. Look at the dark squares under Agree and Strongly Agree.



HOW IS EXCOM USING THE SURVEY RESULTS

- Other than shouting about them...
- We use the identification of area that are rated the least positive to work to improve,
- We are paying attention to the comments to also note where improvements can be made.
 - Anticipating changes that would affect medical physicists
 - Connecting AAPM membership and leadership



MEDICAL PHYSICS WORKFORCE NEEDS

- How many new medical physicists are needed now?
- How many will be needed in a few years?
 - A function of Retirements
 - A function of CMS changes
 - A function of NIH changes



...there are **known knowns**; there are things we know we know. We also know there are **known unknowns**; that is to say we know there are some things we do not know. But there are also **unknown unknowns** – the ones we don't know we don't know...it is the latter [sic] category that tend to be the difficult ones.

Donald Rumsfeld
February 12, 2002



MEDICAL PHYSICS WORKFORCE NEEDS

- How many new medical physicists are needed now?
- How many will be needed in a few years?
 - A function of Retirements
 - A function of CMS changes
 - A function of NIH changes
- How many should be, or could be, minted each year?
- How good is the match between:
 - Number needed and number coming out of residencies
 - Number of graduates and residency slots and other types of jobs
 - Balance between therapy, imaging and nuclear, and other types
- We need to get numbers.



- Future Numbers

“Prediction is very difficult, especially about the future.”

~~Yogi Berra~~

~~Samuel Goldwyn~~

~~Niels Bohr~~

Piet Hein?

Robert Storm Petersen?

(Mark Twain? With no evidence)



AND VISIONARY ACTIVITIES

- Future Working Group
- Medical Physics 3.0



QUALITY OF MEDICAL PHYSICS TRAINING

- There is some concern about the background preparation of new medical physicists. (Some of that is from grumpy of physicists.)
- Trying to work with CAMPEP and ABR to get some information.



INTERACTIONS WITH THE WORLD

- With the NRC:
 - Responses to several requests
- NIH Budget Cuts
- ARRT Exam Content
- IAEA on several topics, mostly training
- ACGME on resident training and the participation of medical physicists.
- States:
 - Dermatology exemptions
 - Changes in regulations on CT dose and QMP



INTERACTIONS WITH THE WORLD

- With the NCRP on LNT
- With COMP, ESTRO, IOMP, and on.
- With RSNA, ASTRO, and on.

- AAPM may be submitting a proposal for the World Congress 2025.



A LITTLE MORE

- **Medical Physicist's Scope of Practice.**
 - Medical Physicist's Assistant Scope of Practice.



A LITTLE MORE

- Medical Physicist's Scope of Practice. Well, Professional Council is dealing with this, but we tag along.
- Medical Physicist's Assistant Scope of Practice.

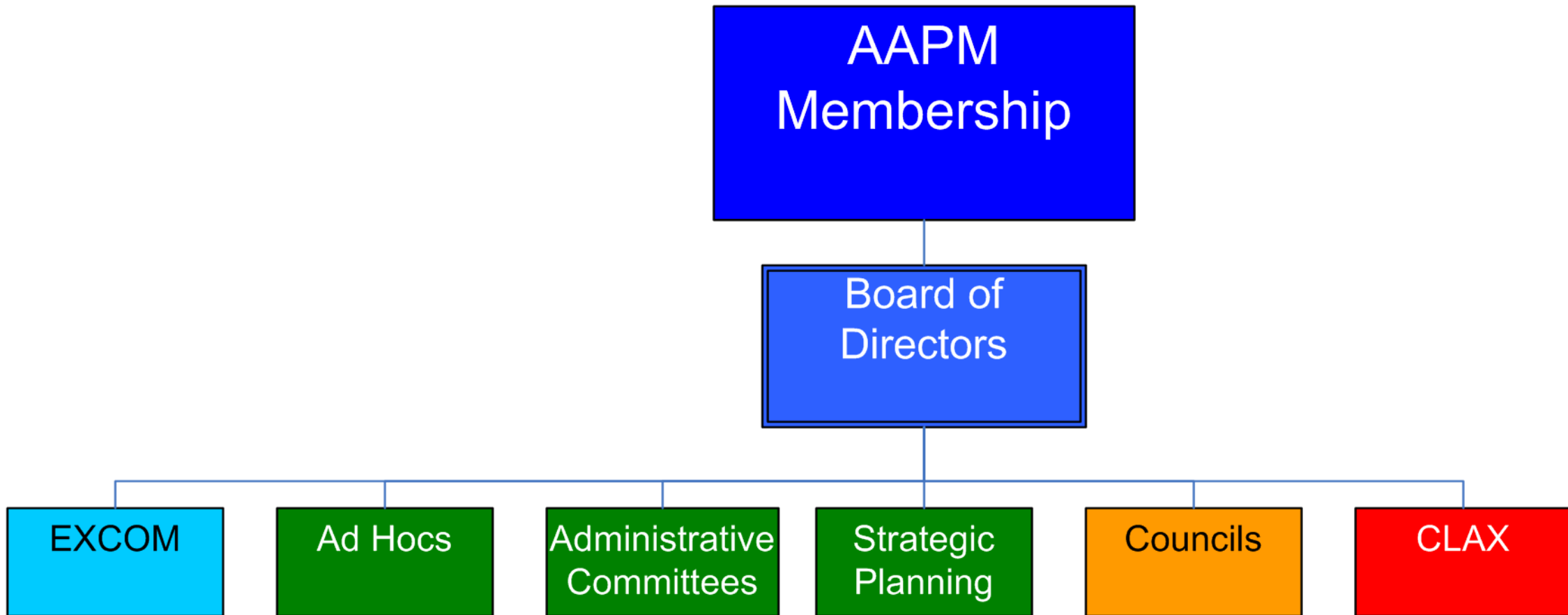


A LITTLE MORE

- Medical Physicist's Scope of Practice. Well, Professional Council is dealing with this, but we tag along.
- Medical Physicist's Assistant Scope of Practice.
- A new Code of Ethics.



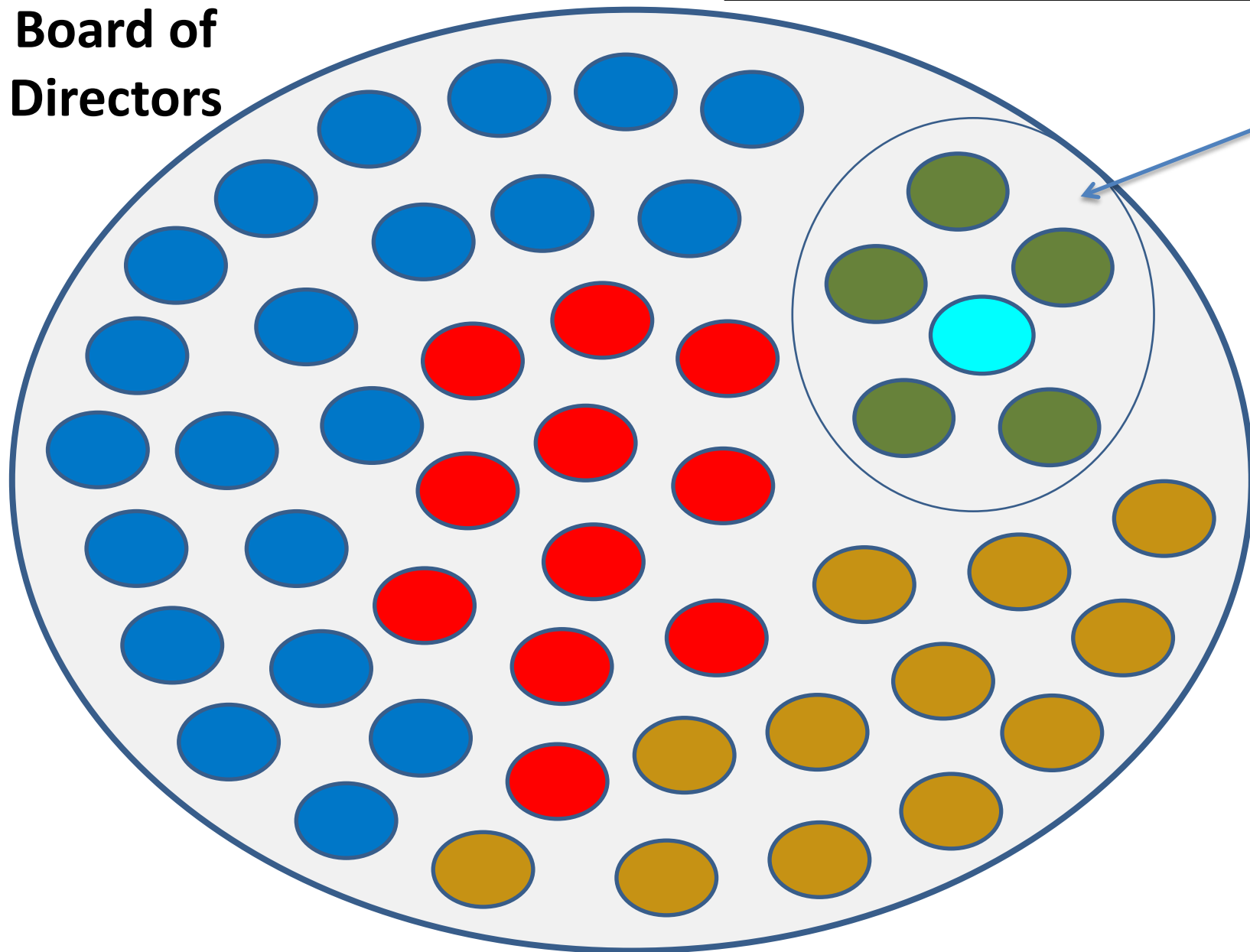
AAPM GOVERNANCE STRUCTURE

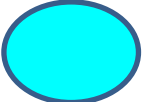






Current AAPM Board Structure

Board of Directors

EXCOM
(reports to the Board)



-  Executive Director
-  Presidential Chain, Treasurer, Secretary (5)
-  Chapter representatives (21)
-  Member-at-Large board member (12)
-  Non-voting board member (11)



PRINCIPAL BOARD RESPONSIBILITIES

- Governance and leadership
 - Evaluate composition, knowledge, and effectiveness of the board
 - Develop future board members and organizational leaders
- Strategic direction, thinking and plan
 - Develop and clarify organizational goals
 - Evaluate opportunities and formulate organizational strategies
 - Assess performance of strategy via critical success factors and benchmarks
- Monitor ethics and financial integrity of the organization
- Ensure needs of the members are being satisfied
- Provide oversight and support of the Executive Director
- Evaluate organizational performance and operational results



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AAPM INITIATIVES IN PATIENT SAFETY



ASPECTS OF PATIENT SAFETY

Addressing patient safety can be:

- Proactive or
- Reactive.
- Overall, the importance of safety culture cannot be overstated.



SAFETY CULTURE

The AAPM developed a Safety Profile Assessment (SPA)

- A member can create an account and answer 92 questions about culture and climate in a facility. It takes about 1h 20m, give or take.
- The tool has four major sections: 1) Institutional Culture, 2) Quality Management, 3) Managing Change and Innovation and 4) Clinical Performance.



SPA USE

- The tool's questions use a 5-point scale based on compliance with standards and gives a measure of culture.
- The score is archived so at future times the culture can be re-assessed to evaluate changes in culture.
- Passwords cannot be retrieved to maintain anonymity!
- The tool lives at

<http://spa.aapm.org>

or on a button on the bottom of your AAPM home page



SHORT LINKS

ONLINE
LEARNING
CENTER

AAPM
PUBLICATIONS

AAPM
VIRTUAL
LIBRARY

QUALITY CT
CT PROTOCOLS

CAMPEP

CME
GATEWAY

SPA

MPPG

ONLINE
NCRP
PUBLICATIONS

ONLINE
ICRU
PUBLICATIONS

RO·ILS

IHE·RO

LINKS
OF INTEREST



QUESTION 1

A section of the AAPM's Safety Profile Assessment is on managing change and innovation.

1. True
2. False



QUESTION 1

A section of the AAPM's Safety Profile Assessment is on managing change and innovation.

- 1. True**
2. False



QUESTION 1 REFERENCE

AAPM's Safety Profile Assessment website

<http://spa.aapm.org>



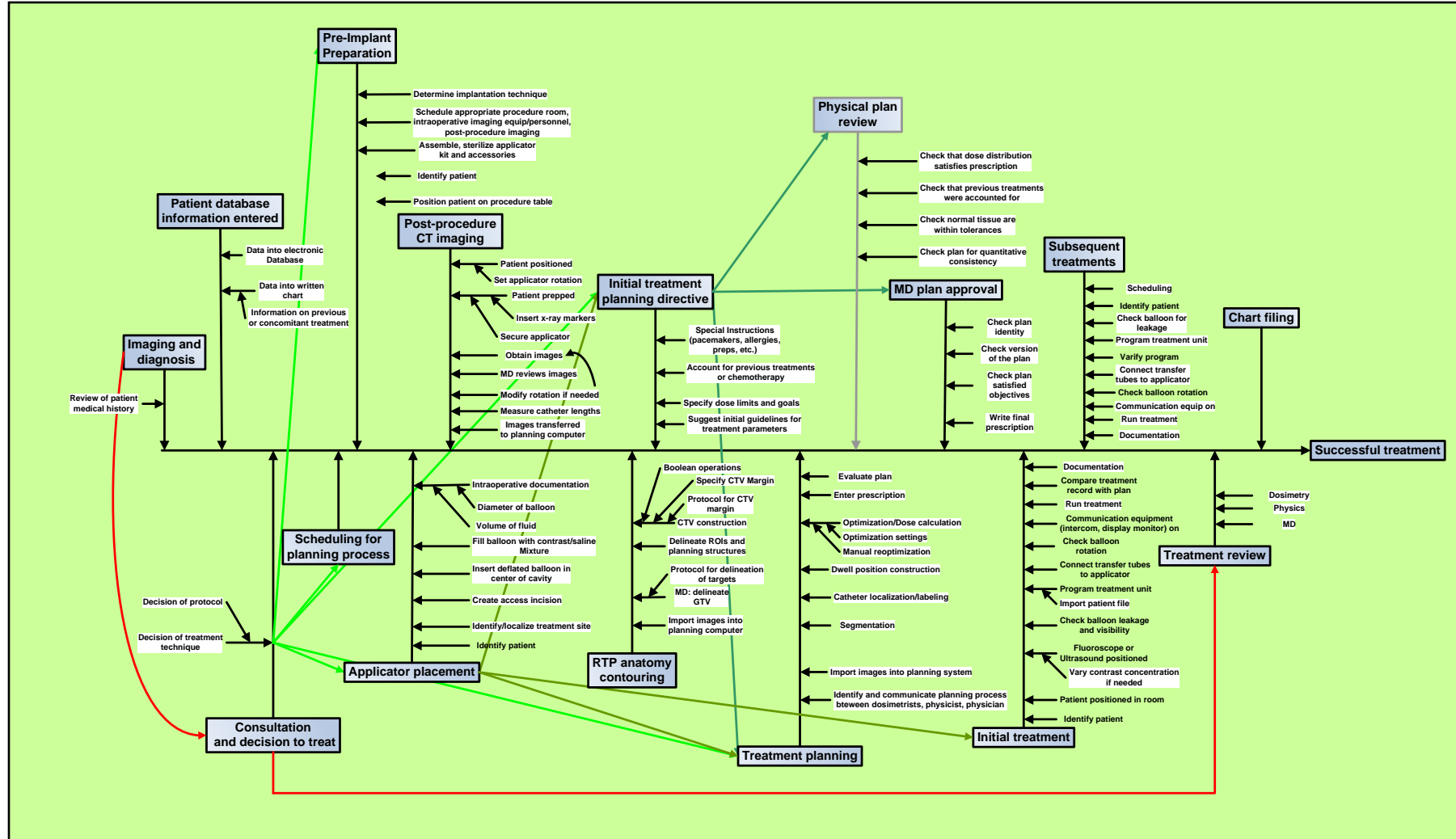
PROACTIVE INITIATIVES

Most of the AAPM proactive initiatives focus on the implementation of the recommendations of TG 100.

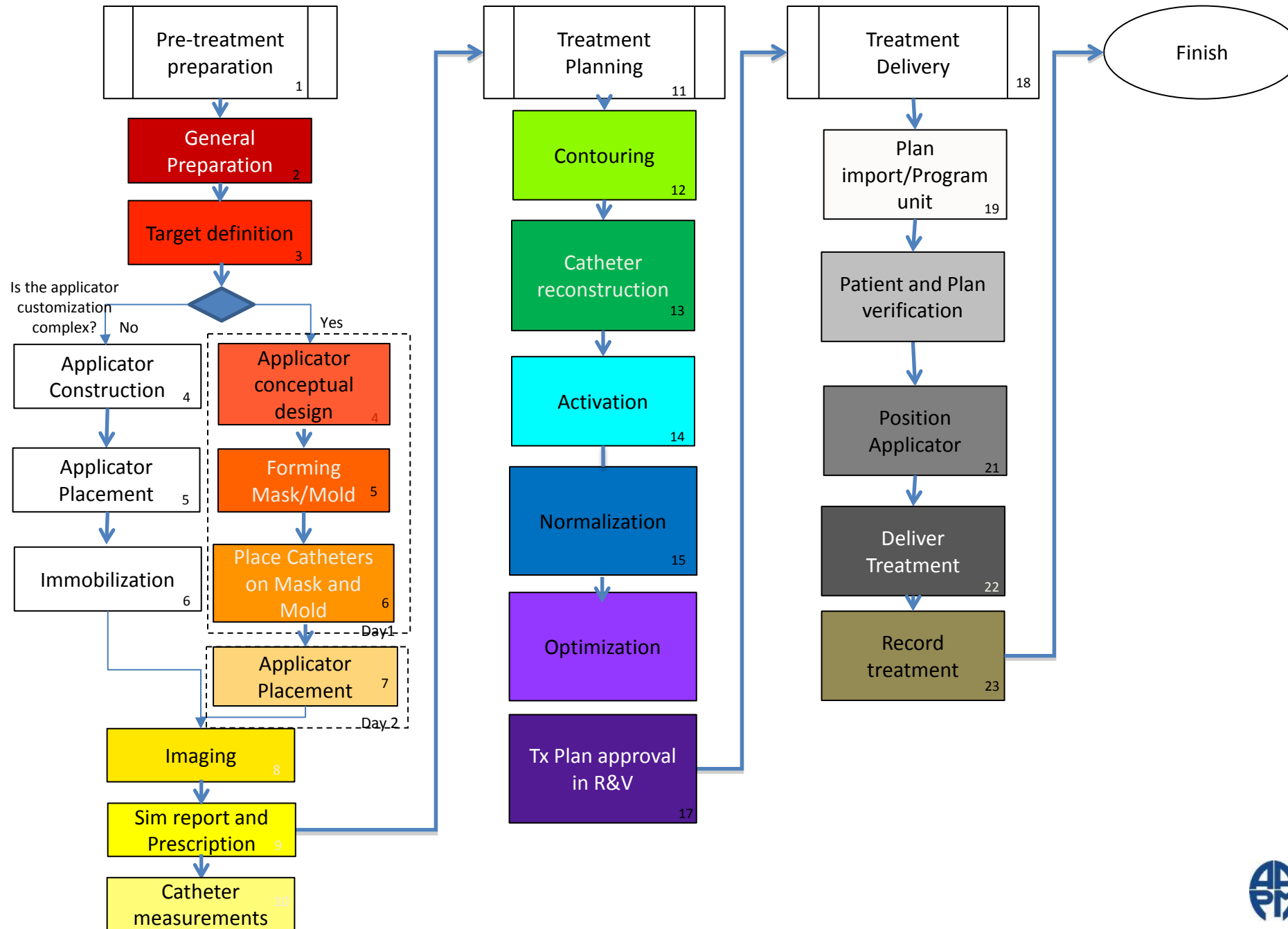
Recap (since you have had presentations on this before)

- Scope-Start small, probably stay small
- Methodology
 - Assemble a team of representatives from each discipline involved.
 - Map the process (can use any type of mapping to help understand what is done)

APBI with Contura Process Map



Radionuclide Mold/Custom Made Applicator Brachytherapy Process





PROACTIVE INITIATIVES

Recap of TG-100 Methodology

- Assemble a team of representatives from each discipline involved.
- Map the process and identify potential failures at each step.

Radionuclide Custom Made Applicator Potential Failure Modes

General Preparation	General Preparation
Target definition	<ol style="list-style-type: none"> 1. Wrong treatment depth, 2. Wrong treatment site or margins
Applicator conceptual design	Applicator conceptual design
Forming Mask and Mold	<ol style="list-style-type: none"> 1. Inappropriate materials, 2. Poor alignment, 3. Inappropriate thickness, 4. Poor conformality
Place Catheters on Mask and Mold	<ol style="list-style-type: none"> 1. Catheters not at desired spacing, 2. Catheters at wrong depth, 3. Catheters run wrong direction for connection, 4. Catheters unnecessarily exposure normal tissue, 5. Catheters not stable and secure, 6. Catheters not clearly identified
Applicator Placement	<ol style="list-style-type: none"> 1. Applicator not placed as fabricated, 2. Applicator placement not documented adequately
Imaging	<ol style="list-style-type: none"> 1. Imaging not show patient and applicator adequately, 2. CT slice thickness too large for accurate catheter reconstruction
Sim report and Prescription	<ol style="list-style-type: none"> 1. Incorrect positioning of patient or applicator, 2. Incorrect dose distribution or fractionation
Catheter measurements	Length to first dwell incorrect



PROACTIVE INITIATIVES

Recap of TG-100 Methodology

- Assemble a team of representatives from each discipline involved.
- Map the process
- **Assess the risks.**
 - AAPM suggests FMEA only because it has a good track record in health care and many hospital staff know it.
 - It really only serves to give an understanding of the relative risks of potential hazards.
 - It does tell you when the risks are too low to bother addressing

Failure Modes and Effects Analysis - FMEA

Step	Function	Potential Failure	Potential Cause of Failure	Potential Effects of Failure	Current Controls	O	S	D	RPN
				Local					
				Intermediate					
				End (Patient)					



CAN WE DESIGN QM FROM THE FMEA

- Many articles stop at FMEA and make the QM from that.
- The FMEA assumes that failures have single causes
 - Real incidents always have multiple causes.
- Most often the analysts only address the highest PRN items
 - Often the low-value PRN items contribute to events.
- FMEA is just to give an understanding of risks



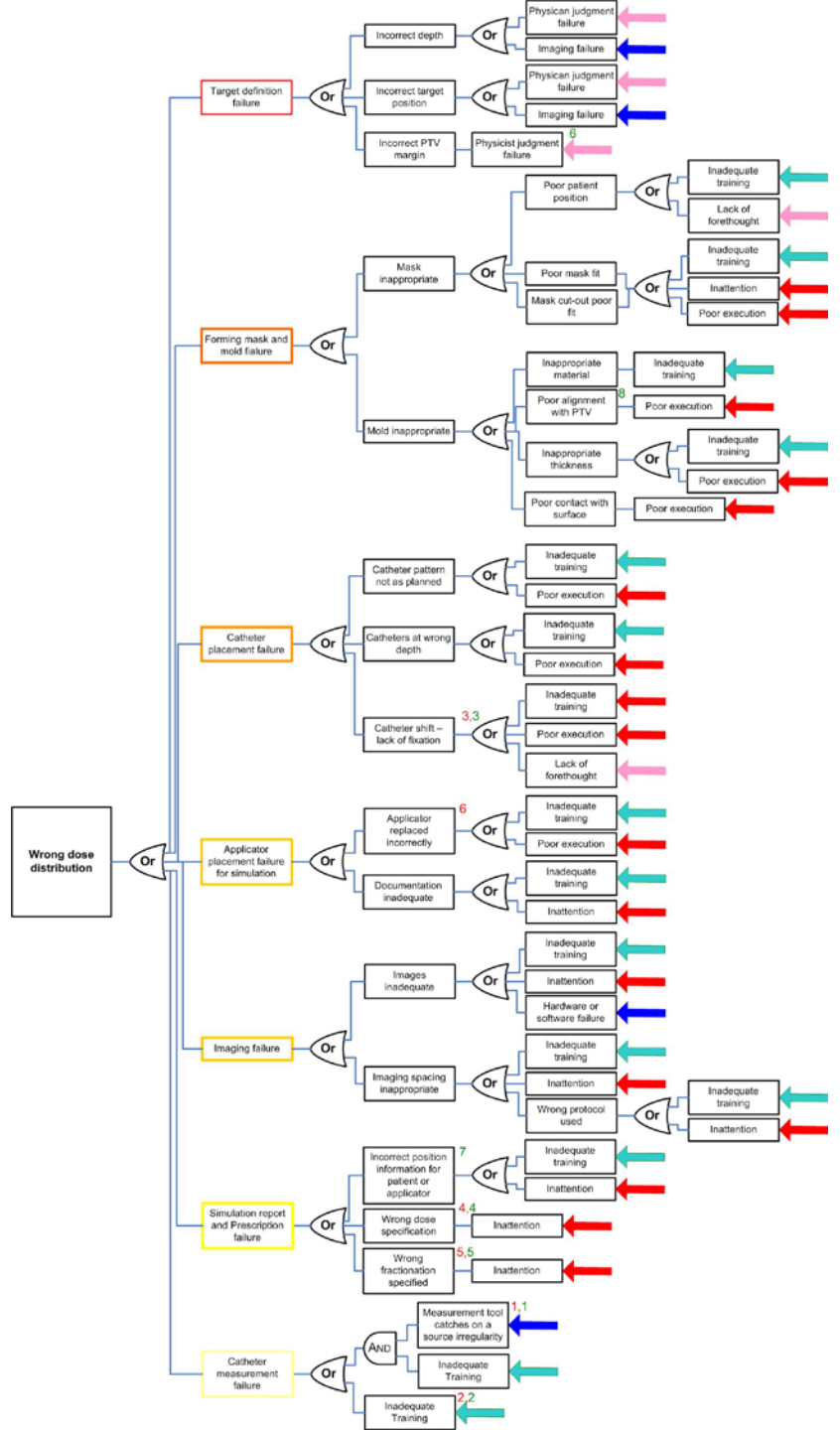
PROACTIVE INITIATIVES

Recap of TG-100 Methodology

- Assemble a team of representatives from each discipline involved.
- Map the process
- Assess the risks
- **Make a fault tree**

Brachytherapy Custom Mold Preparation Fault Tree

(Please, don't try to read it)





PROACTIVE INITIATIVES

Recap of TG-100 Methodology

- Assemble a team of representatives from each discipline involved.
- Map the process
- Assess the risks
- Make a fault tree
- Insert interventions to eliminate causes or intercept the propagation of failures



KEY CORE COMPONENTS IDENTIFIED BY AAPM TG 100

- Standardized procedures
- Adequate staff, physical and IT resources
- Adequate training of staff
- Maintenance of hardware and software resources
- Clear lines of communication among staff



REDESIGN

- The best way to avoid potential errors at some step is to redesign the procedure so that error is not possible.
- Re-evaluate after a redesign because new possible errors may have been produced.



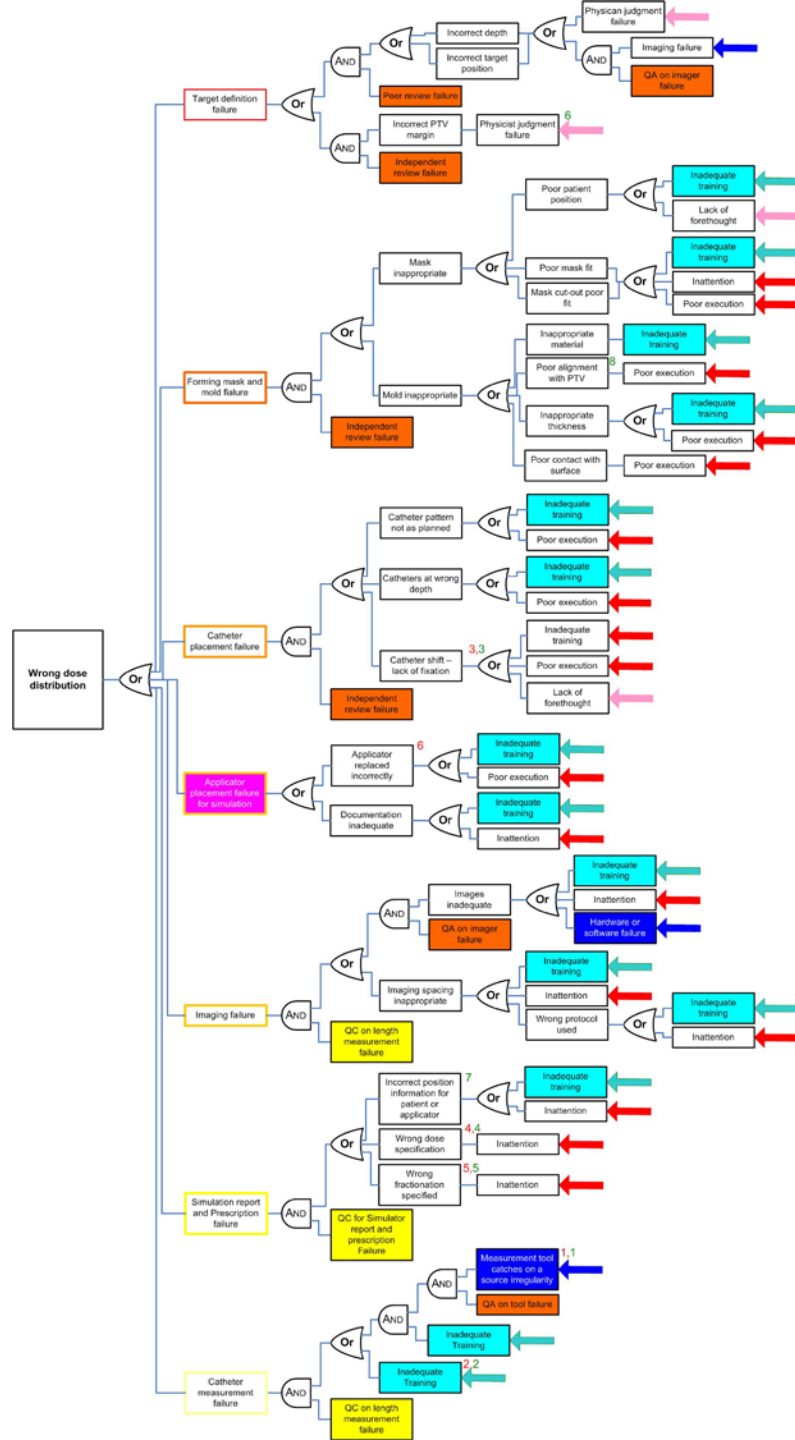
FIRST INTERVENTIONS

- Correct any environmental problems – that usually is a relatively inexpensive but effective operation.
- Fix technical problems.



THEN ADD QA AND QC

- TG 100 describes how to do this
- Work off the fault tree



Mold Brachytherapy Fault Tree with Correctives



PROACTIVE INITIATIVES

- Training Sessions
 - 2013 Summer School
 - Training workshops at the Annual and Spring Clinical Meetings and several Chapters
 - Participants usually pick up the techniques quickly and feel confident doing them in their facility
 - Sessions at the ASTRO, RSNA, ABS and Chapter Meetings



PROACTIVE INITIATIVES

- Training Sessions
- Implementation Guide in preparation
- Videos to walk through the steps

<https://www.dropbox.com/s/heph33cutu5ybme/Process%20Maps%20v1.mp4?dl=0>



PROACTIVE INITIATIVES

- Training Sessions
- Implementation Guide in preparation
- Videos to walk through the steps
- Liaisons to all relevant organizations
- Working with CRCPD to bring them along
- Working to place vetted model analyses on the website
- Working to provide access to tools



QUESTION 2

Which of the following is a key core component for safety identified by TG 100?

1. Fault-tree analysis
2. Value-stream mapping
3. Failure Modes and Effects Analysis
4. Standardized procedures



QUESTION 2

Which of the following is a key core component for safety identified by TG 100?

1. Fault-tree analysis
2. Value-stream mapping
3. Failure Modes and Effects Analysis
4. **Standardized procedures**



QUESTION 2 REFERENCE

- Huq, M. S., B. A. Fraass, P. B. Dunscombe, J. P. Gibbons, Jr., G. S. Ibbott, A. J. Mundt, S. Mutic, J. R. Palta, F. Rath, B. R. Thomadsen, J. F. Williamson, and E. D. Yorke. 2016. "The report of Task Group 100 of the AAPM: Application of risk analysis methods to radiation therapy quality management." *Med Phys* 43 (7):4209-4262. doi: 10.1118/1.4947547.



QUESTION 3

Following the TG-100 approach through the FMEA is sufficient to guide the development of a quality management program.

1. True
2. False



QUESTION 3

Following the TG-100 approach through the FMEA is sufficient to guide the development of a quality management program.

1. True

2. False



QUESTION 3 REFERENCES

- Huq, M. S., B. A. Fraass, P. B. Dunscombe, J. P. Gibbons, Jr., G. S. Ibbott, A. J. Mundt, S. Mutic, J. R. Palta, F. Rath, B. R. Thomadsen, J. F. Williamson, and E. D. Yorke. 2016. "The report of Task Group 100 of the AAPM: Application of risk analysis methods to radiation therapy quality management." *Med Phys* 43 (7):4209-4262. doi: 10.1118/1.4947547.
- Thomadsen, B. 2015. *Elements of Quality and Safety in Health Care*. San Diego, CA: Cognella Academic Publishing.



QUESTION 4

Proactive patient safety activities include which of the following?

1. Incident reporting
2. Process mapping
3. Review of charges to CMS
4. Five whys?



QUESTION 4

Proactive patient safety activities include which of the following?

1. Incident reporting
- 2. Process mapping**
3. Review of charges to CMS
4. Five whys?



QUESTION 4 REFERENCES

- Huq, M. S., B. A. Fraass, P. B. Dunscombe, J. P. Gibbons, Jr., G. S. Ibbott, A. J. Mundt, S. Mutic, J. R. Palta, F. Rath, B. R. Thomadsen, J. F. Williamson, and E. D. Yorke. 2016. "The report of Task Group 100 of the AAPM: Application of risk analysis methods to radiation therapy quality management." *Med Phys* 43 (7):4209-4262. doi: 10.1118/1.4947547.
- Thomadsen, B. 2015. *Elements of Quality and Safety in Health Care*. San Diego, CA: Cognella Academic Publishing.



REACTIVE INITIATIVES

- “Reactive” should not be seen as a pejorative. It only means addressing issues uncovered by analysis following some deviation from an intended treatment for a patient.
- Much can be learned from such an analysis.
- Often referred to as a root-cause analysis, the intention is to delve deeper than the the immediate actions that caused an incident to find the weaknesses in the procedures and environment of a facility (the system) that led the those actions and did not protect the patient from them.



QUESTION 5

Reactive activities for patient safety should not be necessary if the proactive activities are performed adequately.

1. True
2. False



QUESTION 5

Reactive activities for patient safety should not be necessary if the proactive activities are performed adequately.

1. True
- 2. False**



QUESTION 5

Reference

- Huq, M. S., B. A. Fraass, P. B. Dunscombe, J. P. Gibbons, Jr., G. S. Ibbott, A. J. Mundt, S. Mutic, J. R. Palta, F. Rath, B. R. Thomadsen, J. F. Williamson, and E. D. Yorke. 2016. "The report of Task Group 100 of the AAPM: Application of risk analysis methods to radiation therapy quality management." *Med Phys* 43 (7):4209-4262. doi: 10.1118/1.4947547.
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ROOT-CAUSE ANALYSIS

- While mastering the TG-100 methodology is accomplished easily, root-cause analysis has a long learning curve.
- Most facilities do not have sufficient incident rate to get good at it.
- Most interventions narrowly address what would have prevented the given incident but not the deeper issues.



AAPM REACTIVE INITIATIVES

- With ASTRO, established RO-ILS, the second radiotherapy incident reporting database, through the PSO Clarity
- Has ROHAC to look for trends over time and major issues
- Has WROILS to look at the operation of RO-ILS
- Subsidizes RO-ILS so it is free for member's facilities
- Has a TG to provide guidance for writing narratives
- Is working at establishing an imaging incident taxonomy to extend a reporting system to radiology



AAPM PATIENT SAFETY GROUPS

- Working Group for the Prevention of Errors in Radiotherapy
- Working Group for the Implementation of TG 100
- Both work through many committees and councils



SUMMARY

- The AAPM has many initiatives to assist members improved the quality and safety of radiotherapy.
- The AAPM is a very active and happy organization, but we are trying to make it happier and better.
- You have the responsibility to let us know how you think the AAPM could improve.