



TG - 275

Best practice recommendations from AAPM Task Group 275

- sneak peak -



Luis Fong de los Santos Ph.D.



MAYO CLINIC
Radiation Oncology

TG – 275 Goal

- Using a **clinical process-based** and **risk analysis strategy** (i.e.TG-100)
- Develop recommendations for:
 - Initial Plan Check
 - On-Treatment Chart Check
 - End-of-Treatment Chart Check

How?



Survey

+

FMEA Evaluation

Treatment Modalities

External Beam

Photons

Protons

Brachytherapy

**AAPM - Brachytherapy
Subcommittee**

*Regina K. Fulkerson, PhD
Wayne M. Butler, PhD*

Where are we?

	Survey	FMEA	Crosswalk
Initial Plan Check	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
On-Tx & End-of-Tx Chart Check	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
Proton - Initial Plan Check	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	

	Checklist	FMEA	Crosswalk
Brachy - GYN HDR	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	

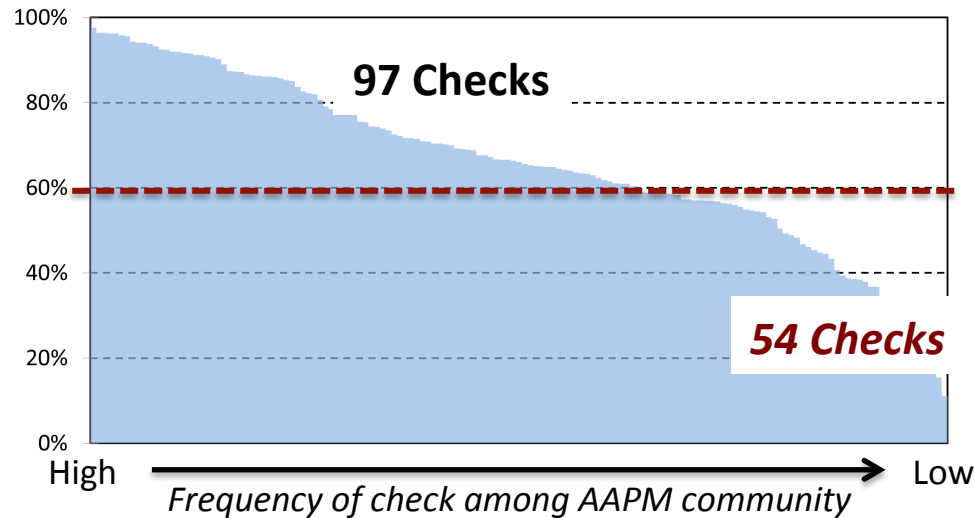
Correlate FM's with Survey Results

- Identified Failure Modes Potentially Found by Each Check

Process	Check Item	Failure Modes	# FM
Treatment Planning- Contouring	Organs-at-Risk (OAR's)	1,7,18	3

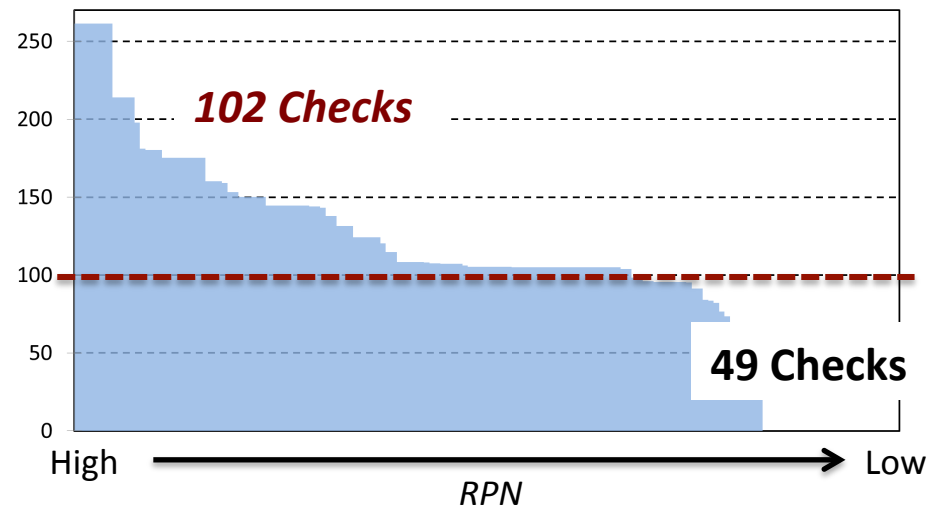
- Checks Could Address Multiple Failure Modes
 - Ranged from 0 – 12
 - Average of 2.9 Failure Mode per Check
 - Identified Highest RPN Failure Mode per Check

Survey Data

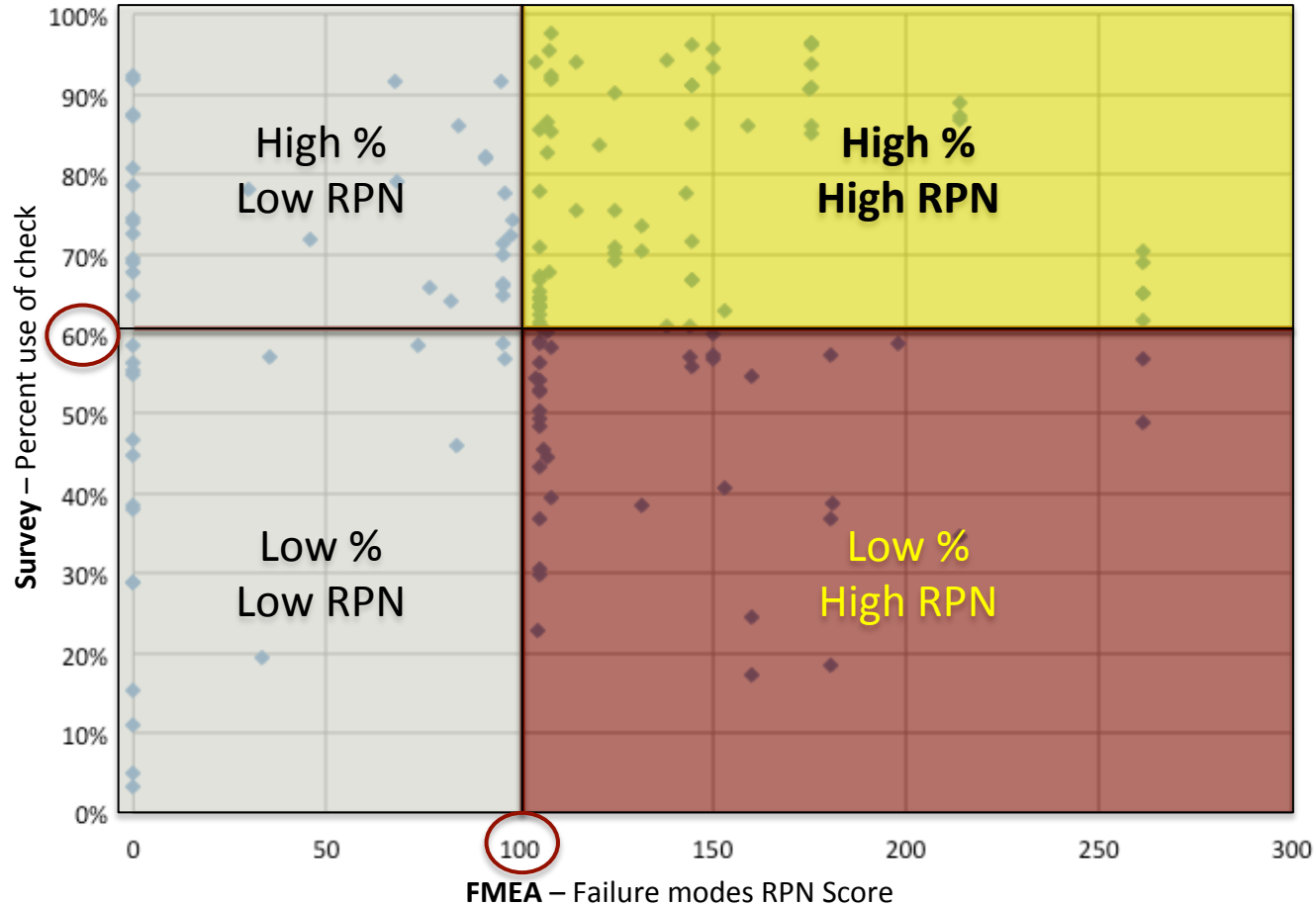


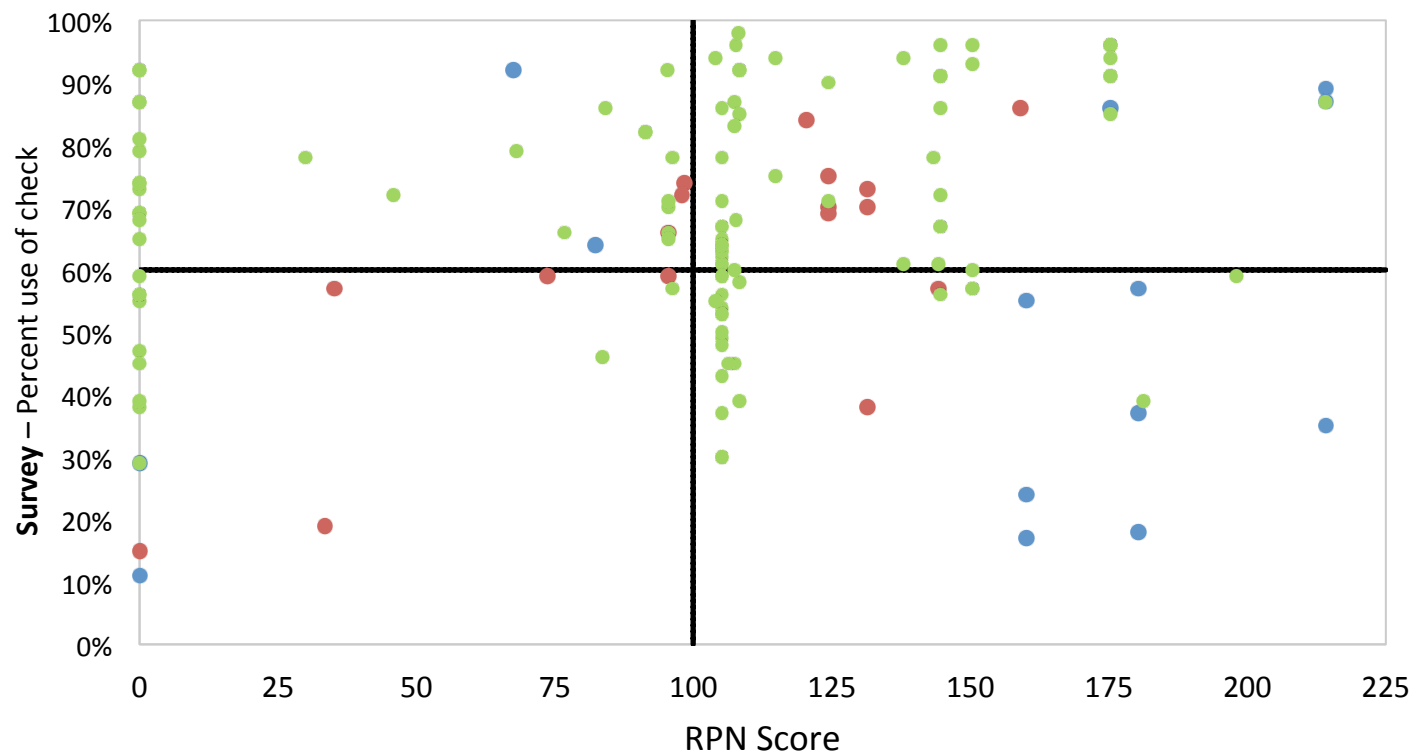
**Number of Checks during
Initial Plan Check: 151**

Item Check mapped to Failure Modes



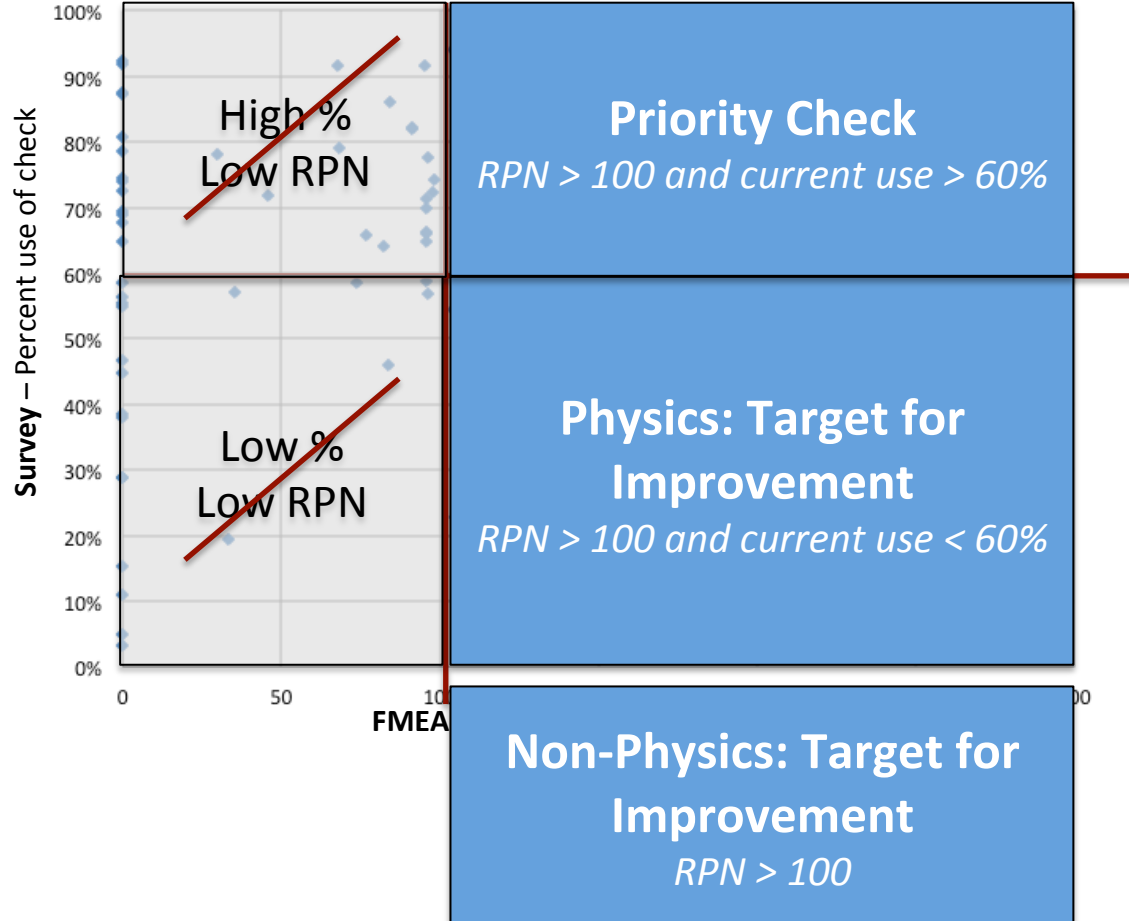
FMEA vs. Survey crosswalk

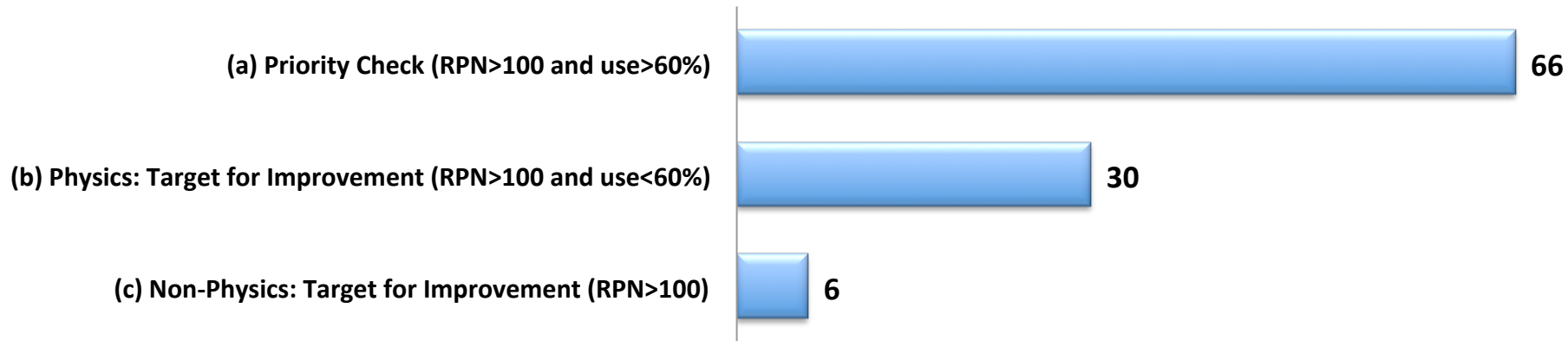




● Patient Assessment ● Simulation ● Treatment Planning

Classification of Checks for Recommendations





	Patient Assessment ▶	Simulation ▶	Treatment Planning
Priority Check	3	8	55
Physics: Improvement	2	3	25
Non-Physics: Improvement	5	1	0

(a) Priority Check (RPN>100 and use>60%)

Process	Check Item	# FM	RPN	% Use
Treatment Planning- Contouring	Organs-at-Risk (OAR's)	3	261.3	69%
Treatment Planning- other checks	Registration/Fusion of image sets (CT, PET, MRI, etc.)	4	261.3	65%
Treatment Planning- Contouring	Target(s)	4	261.3	65%
Treatment Planning- other checks	Special Considerations for radiotherapy (e.g. pacemakers, ICDs, pumps, etc.)	10	214.1	89%
Patient Assessment	Previous radiotherapy treatments	6	214.1	87%

(b) **Physics**: Target for Improvement (RPN>100 and use<60%)

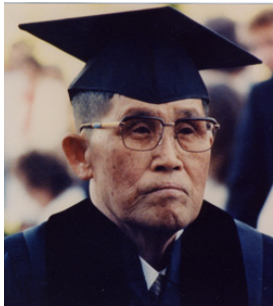
Process	Check Item	# FM	RPN	% Use
Treatment Planning- Contouring	Body/External contour	2	261.3	57%
Treatment Planning- replanning	Deformed or New Contours	1	261.3	49%
Treatment Planning- Contouring	PTV and OAR Margin	3	198.0	59%
Treatment Planning- MD Intent vs. Rx	Prescription vs consult note	6	181.2	39%
Patient Assessment	Medical Chart to confirm laterality, site, etc.	3	180.3	57%

(c) **Non-Physics**: Target for Improvement (RPN>100)

Process	Check Item	# FM	RPN	% Use
Patient Assessment	Consult Note	8	214.1	35%
Patient Assessment	Diagnosis definition including imaging and outside records	6	180.3	37%
Patient Assessment	Pathology Report	1	180.3	18%
Patient Assessment	Utilization of other treatment modalities (i.e. chemo, surgery)	2	160.2	24%
Patient Assessment	Peer review of treatment decision (e.g. tumor board, peer-to-peer evaluation, etc.)	7	160.2	17%

Structure of Recommendations

- List of clinical **process-** and **risk**–based checks
- Performing the check:
 - At the **right time** in the process
 - By the **right people**



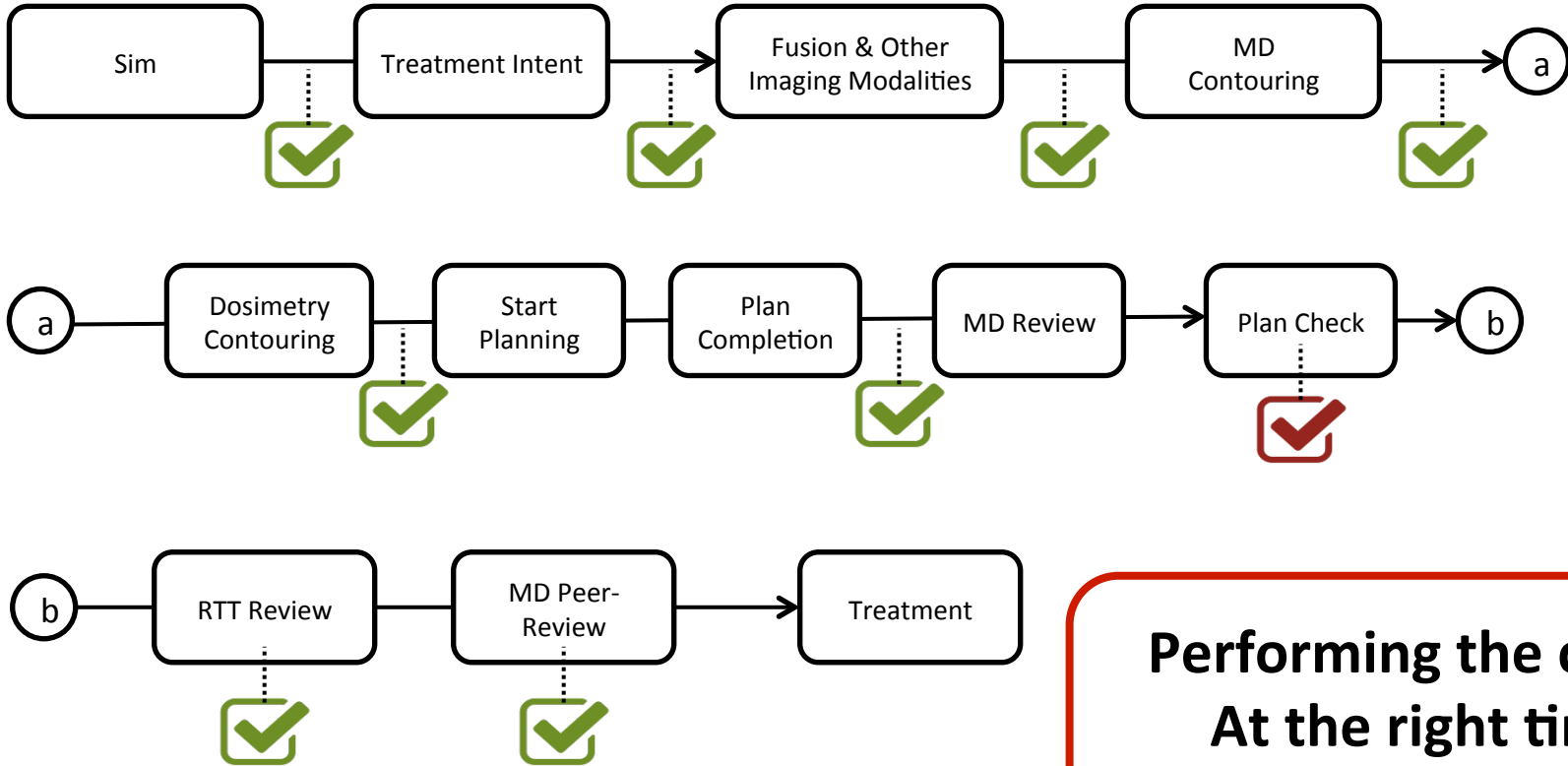
Shigeo Shingo

1960's – Japanese Industrial Engineer

Zero Quality Control (ZQC)

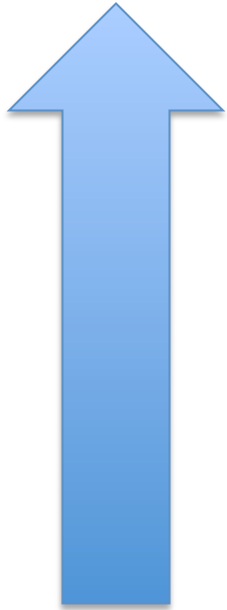
- Stop Errors at or Very Close to Source
- Simple & Inexpensive Processes
- Self Checking

Plan Check New Paradigm

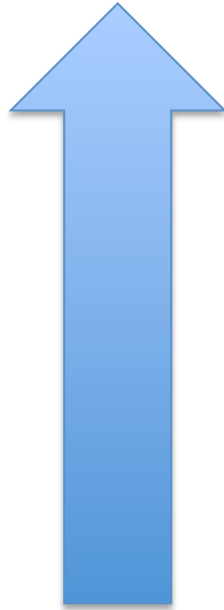


**Performing the check
At the right time
By the right people**

New Challenges in our Everyday Practice



Amount of Tasks

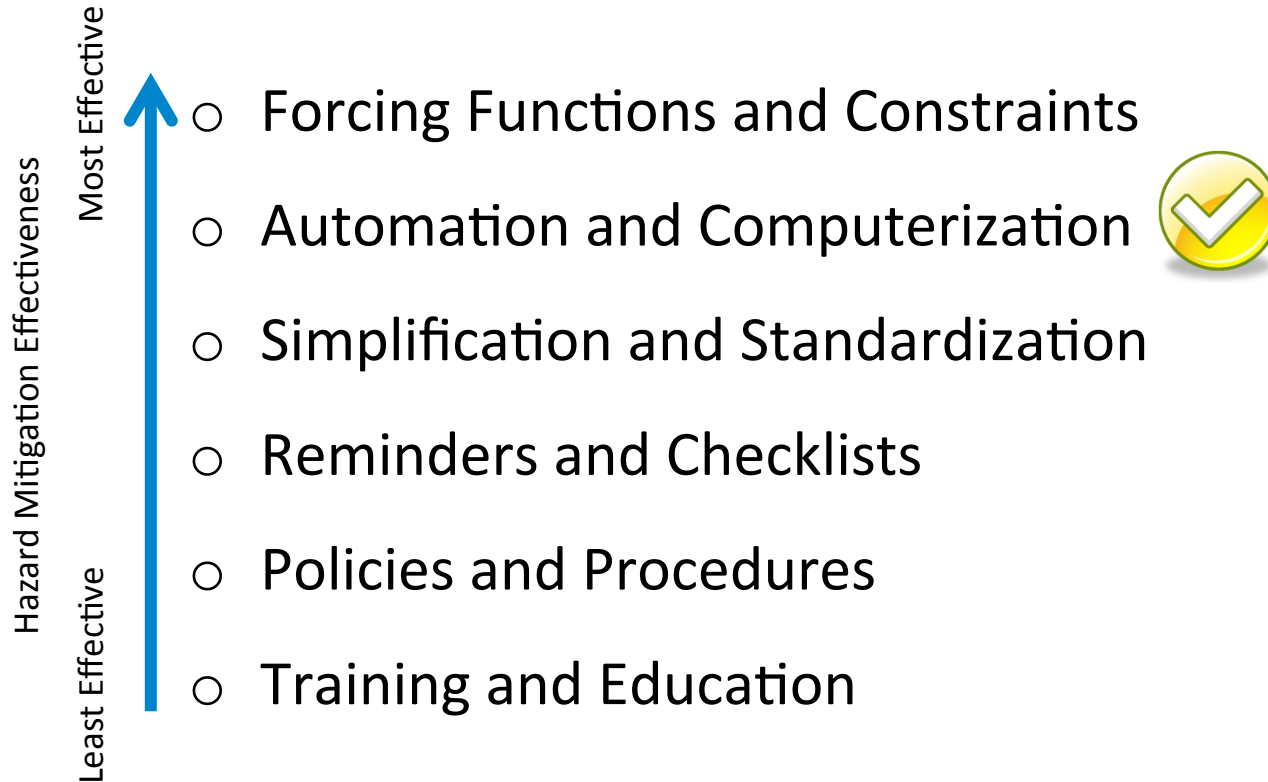


Complexity of Tasks



Time to perform the Tasks

Hazard Mitigation Effectiveness



Automation

- Driven by a need to increase efficiency and safety
- Shortage of medical physicists entering the field
- Some items simply better to check using automated methods

A computer aided treatment event recognition system in radiation therapy

Junyi Xia, Christopher Mart, and John Bayouth

Cite

Vision 20/20: Automation and advanced computing in clinical radiation oncology

Kevin L. Moore
JOURNAL OF APPLIED CLINICAL MEDICAL PHYSICS, VOLUME 10, NUMBER 1, WINTER 2009

Medica

Automating the initial physics chart-checking process

Detailed review and analysis of complex radiotherapy clinical trial planning

Martin A. Ebert^{a,b},
Rhonda Coler

Automated radiotherapy treatment plan integrity verification

W
Deshan Yang and Kevin L. Moore
Medical Physics 39, 1542 (2012); doi: 10.1

Technical Note: Electronic chart checks

Deshan Yang, Yu Wu, Ryan S. Brame, Sridhar Yaddanapudi, Goddu, and Sasa Mutic

Citation: Medical Physics 39, 4726 (2012); doi: 10.1

Automating checks of plan check automation

Tarek Halabi ✉, Hsiao-Ming Lu

Journal of Applied Clinical Medical Physics,

Vol.

JOURNAL OF APPLIED CLINICAL MEDICAL PHYSICS, VOLUME 17, NUMBER 6, 2016

Improving treatment plan evaluation with automation

Elizabeth L. Covington,¹ Xiaoping Chen,¹ Kelly C. Younge,¹ Choonik Lee,¹ Martha M. Matuszak,¹ Marc L. Kessler,¹ Wayne Keranen,² Eduardo Acosta,² Ashley M. Dougherty,¹ Stephanie E. Filpansick,¹ and Jean M. Moran^{1a}

Department of Radiation Oncology,¹ University of Michigan, Ann Arbor, MI; Varian Medical Systems,² Palo Alto, CA, USA
jmmoran@med.umich.edu

Bayesian network models for error detection in radiotherapy plans

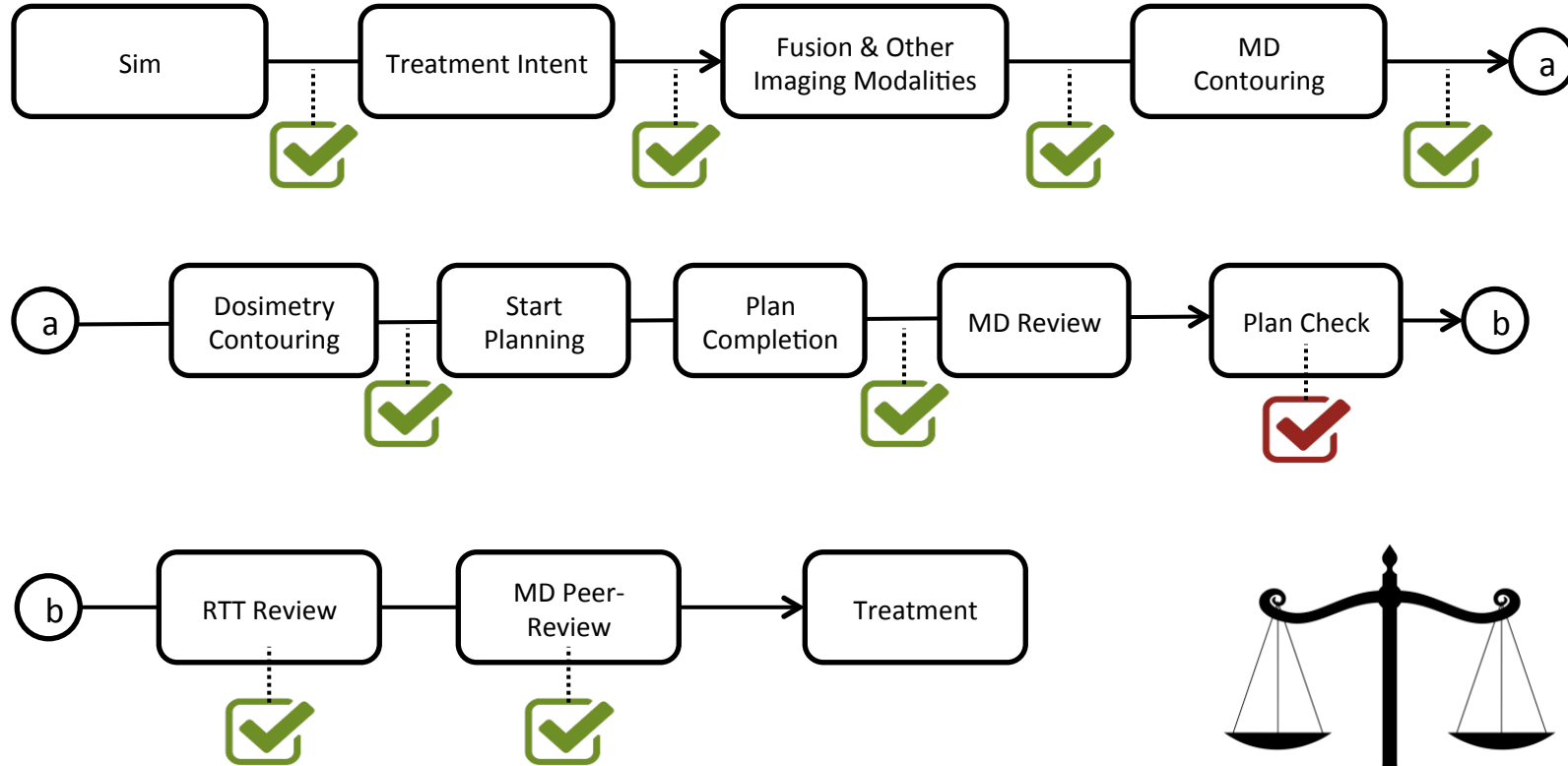
Alan M Kalet^{1,2}, John H Gennari², Eric C Ford¹ and Mark H Phillips^{1,2}

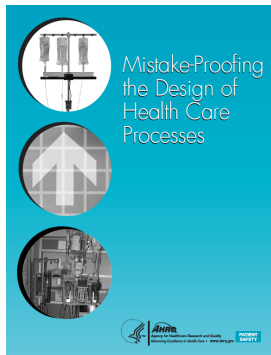
¹ Department of Radiation Oncology, University of Washington Medical Center, Seattle, WA 98195-6043, USA

² Department of Biomedical Informatics and Medical Education, University of Washington, Seattle, WA 98019-4714, USA

Phys. Med. Biol. 60 (2015) 2735–2749

Plan Check New Paradigm





Safety by Design

- Actions that **prevent** errors from happening.
- Actions that make errors quickly and easily **detectable** when they occur.
- Actions that **mitigate impact or fail safely.**

- Grout, J.R. (2006). "Mistake proofing: Changing designs to reduce error." Qual Saf Health Care 15(SUPPL. 1):i44–i49
- Grout JR. Mistake-Proofing the Design of Health Care Processes. May 2007. Agency for Healthcare Research and Quality, Rockville, MD.
 - <http://archive.ahrq.gov/professionals/quality-patient-safety/patient-safety-resources/resources/mistakeproof/index.html>

Getting very close!



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Acknowledgements

- TG 275 Members and Volunteers

AAPM Community



Thank you!!