



Safety – Background

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History of Quality (Safety)

- “ Craftsmanship
 - . Expert and apprentice
- “ European industrial revolution
 - . Subdivided trades into multiple steps
- “ The U.S. departure to Taylor’s system
 - . Significant increase in productivity


A History of Managing for Quality: The Evolution, Trends, and Future Directions of Managing for Quality. Ed. J.M Juran, 1995 ASQC Quality Press



Creating a Telephone system

- “ Engineering department
- “ Production department
- “ Inspection department
 - . Sampling to inspect raw materials/products
 - . Inspection to separate the good & bad

Juran. Early SQC . A historical supplement. 1997.Quality Progress



Parallels with Rad Onc

- ~ Physicists entered the hospital
 - . Craftsman
- ~ Radiation treatments become routine
 - . Industrialization
- ~ Quality = Checking technical aspects
 - . Inspection

Physicists primarily check the technical aspects of radiotherapy (i.e., dosimetric issues and monitoring equipment performance).



Improving Quality

- ~ Bell Telephone Laboratories
 - . Control Chart invented in 1924
 - . Emphasis on the process
- ~ Western Electric
 - . Social science research (~ 1924)
 - . Quality Management

Adams & Butler. Manufacturing the Future . A history of Western Electric.
1999:Cambridge University Press.



Issues in Quality (Safety)

- ~ Two dimensions of quality
 - . High-quality decision making
 - . High-quality performance
- ~ Decision making quality
 - . Peer-review
- ~ Performance quality
 - . Process analysis



Where are we now?

- ~ Measure and inspect against specifications
- ~ Investigate incidents once they have occurred
 - . Does charts rounds really improve quality?
- ~ ~~Measure~~ it ain't broke, don't fix it.
 - . This can lead to latent errors in a process that can be manifested long into the future
- ~ Hard work and best efforts are the main mode of operation to improve quality



Best Efforts

- ~ Working hard in a broken system will not improve quality
- ~ Management must create the optimal system and give the staff the tools to succeed

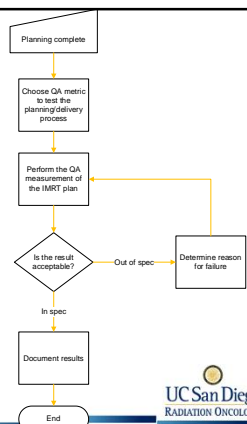
W. Edwards Deming. The New Economics: For Industry, Government, Education. MIT Center for Advanced Engineering Study, Cambridge, MA, 1993.



Typical Approach to Quality

IMRT Example

Within specifications
(don't worry about it)
. or .
Outside specifications
(something is wrong,
fix it, and re-measure)
. or .
Getting close to specifications
(come back to it later)

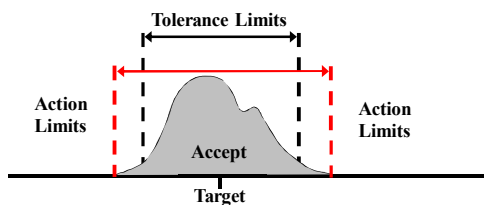


Action Limits



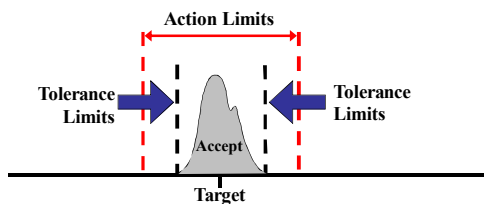
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Tolerance Limits



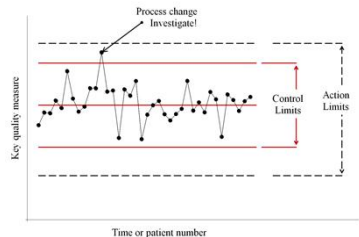
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Quality Improvement



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Quality Improvement



On target with minimum variation.

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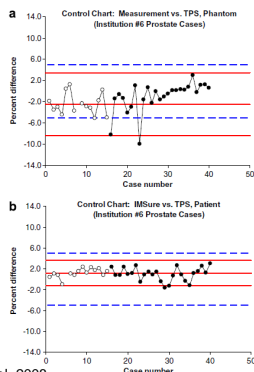
Investigation of IMRT QA

- ~ 7 institutions with active IMRT programs
 - . 4 academic
 - . 3 community
- ~ Each institution followed their in-house IMRT procedures for
 - . Treatment planning
 - . Quality assurance
 - ~ Point dose in phantom + IMSure

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Two Control Charts

- ~ Clinical specifications
 - . Set process requirements
- ~ Control chart limits
 - . Quantify process performance



Pawlicki, Yoo, Court et al. Radiother Oncol 2008

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Summary

- ~ Quality should be universally defined
- ~ A process should be judged against clinical requirements
 - . Action levels \neq Clinical Requirements
- ~ Control charts as the process analysis tool



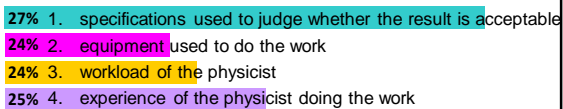
Question 1: In current radiation therapy, what aspects of QA are typically emphasized by the medical physicist?



Answer (c). Pawlicki, T and Mundt, A.J. (2011). Current and Future Quality Practice. In Jatinder R. Palta and T. Rock Mackie (Eds). *Uncertainties in External Beam Radiation Therapy* (pp. 483-504). Madison, WI: Medical Physics Publishing.



Question 2: A quality assurance process performs independent of f .



Answer (a). Pawlicki, Yoo, Court et al. Radiother Oncol 2008



Question 3: What defines quality improvement?

- 19% 1. Always doing your absolute best
- 21% 2. Minimizing variation while being on target
- 21% 3. Always following standard operating procedures
- 21% 4. Continuous learning from guidance documents and meetings
- 19% 5. None of the above

Answer (b). W. Edwards Deming. The New Economics: For Industry, Government, Education. MIT Center for Advanced Engineering Study, 1993.
