

Building a Better Safety Net

Plan and Chart Review

Michelle Wells, M.S, DABR



**Conflict of
Interest**

Member of TG 275

Member of MPPG 11.a

No other conflicts



Sources...

Xia P, Sintay BJ, Colussi VC, et al. Medical Physics Practice Guideline (MPPG) 11.a: Plan and chart review in external beam radiotherapy and brachytherapy. J Appl Clin Med Phys. 2021;22(9):4–19. <https://doi.org/10.1002/acm2.1336>

Ford E, Conroy L, Dong L, et al. Strategies for effective physics plan and chart review in radiation therapy: Report of AAPM Task Group 275. Med Phys. 2020;47(6):e236-e272.

RO ILS Quarterly Report – Q3-Q4 2018

Slides from fellow committee members



Overview

The Why: Necessity of Plan and Chart Check

The How: TG 275 & MPPG 11.a

The Win: Clinical Improvements



The Why: The Necessity of Plan and Chart Checks



Why Conduct a Physics Plan Check?



Requirement for Accreditation

How many of you are associated with an accreditation practice?

Requirement for Billing

Expected as part of the planning charge; documented as part of 77336

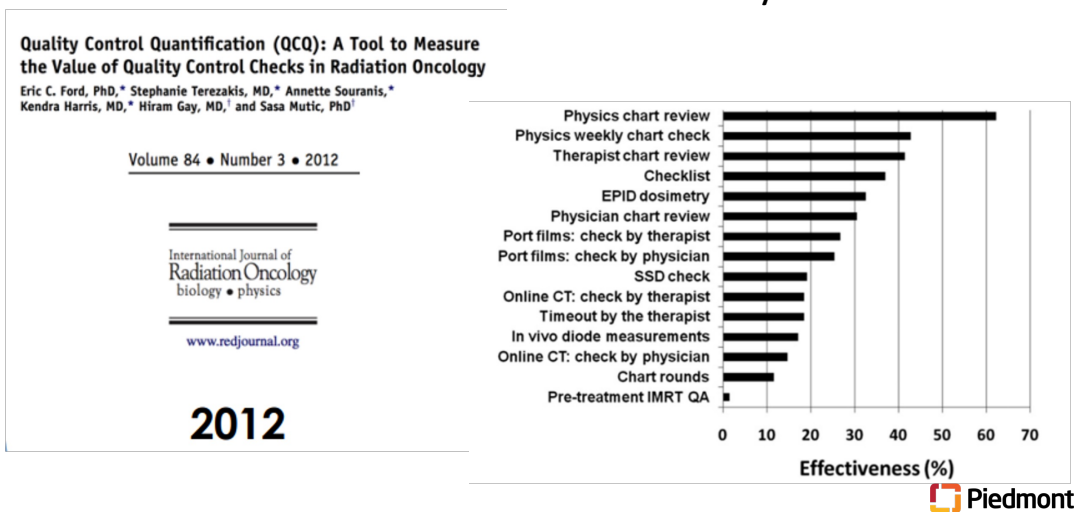


What Did the Literature Say?

- Clark et al (2010): analyze 2,506 incident reports and half of the report originated in the tx preparation process.
- Novak et al (2016): most frequent (33%) near-miss incidents originated from tx planning process.
- RO-ILS Q4 report (2016): tx planning was the most commonly identified process step where events occurred. (from 2,681 incidents aggregate sum)
- Ezzell et al. (2018): 2/3 common errors types originated prior to initial physics plan check & chart review.



What Did the Literature Say?



What Did the Literature Say?

The effectiveness of pretreatment physics plan review for detecting errors in radiation therapy

Olga Gopan, Jing Zeng, Avrey Novak, Matthew Nyflot, and Eric Ford¹
*Department of Radiation Oncology, University of Washington Medical Center, 1959 NE Pacific Street,
Box 356043, Seattle, Washington 98195*

- Based on Incidents from departmental ILS & checklist from TG 275 members
- Sensitivity of 38% for physics plan review
- Indicated a need to improve performance



Why should we complete plan & chart review?

Majority of error are occurring in the treatment planning part of the process

Physics Plan Review is one of the most effective quality control checks

Sensitivity for physics plan review is only low - room for improvement



The How: TG 275 & MPPG 11.a



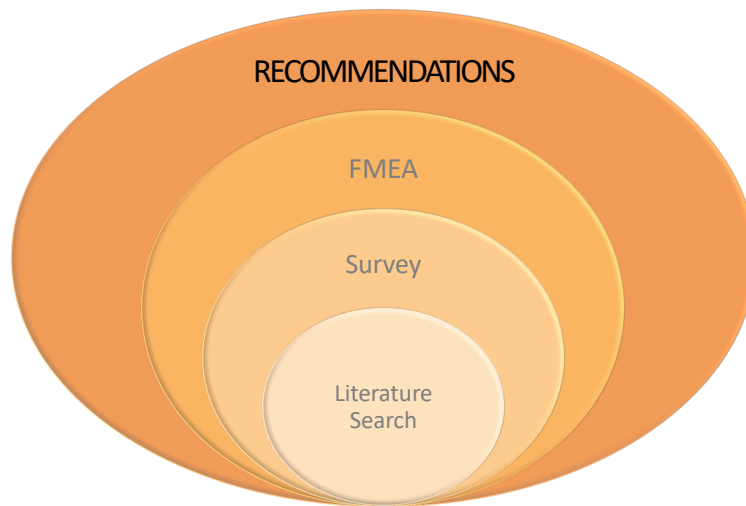
The Charge

TG 275 (Medical Physics)	MPPG 11.a (Journal of Applied Clinical Medical Physics)
Review existing data and recommendations that support the use of physics plan and chart review and to review the current recommendations on the qualifications for performing these	To define the roles of dosimetrists, radiation therapists, medical physicists, and qualified medical physicists as they pertain to the treatment plan/chart review process for external beam radiotherapy (EBRT) and brachytherapy
Provide survey information on current practices in the community with respect to physics plan and chart review	To define a minimum level of practice support for initial, weekly, and end of treatment (EOT) plan/chart reviews organized in the form of lists
Provide risk-based recommendations for the effective use of the following physics reviews: initial plan and chart check, weekly chart check, and end-of-treatment chart check	To make recommendations on the timing of the initial, weekly, and EOT plan/chart review
Provide recommendations to software vendors for systems design and operations that best facilitate physics plan and chart review*	

*will not consider the vendor sections in this review



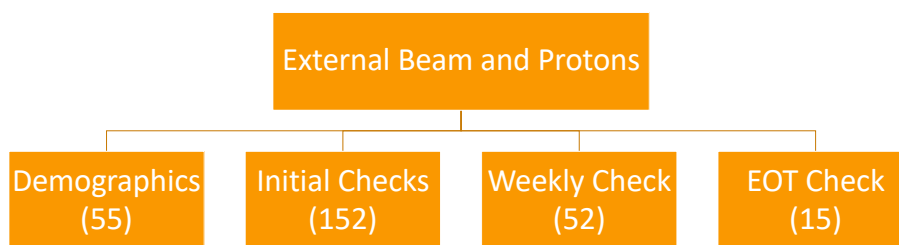
How did TG 275 tackle comprehensiveness?



From TG 275



The Survey Basics



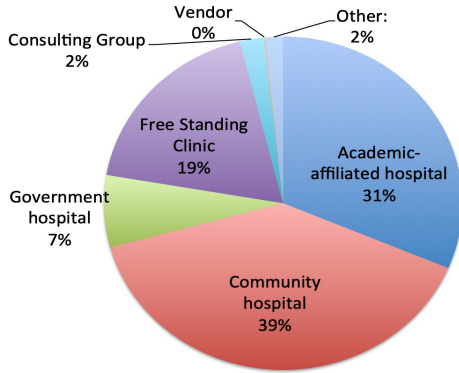
- Average Completion Time: 24 minutes
- Raw Survey Results: ~2200 entries
- Problems with Raw Data: duplicate entries, entries with no clear source

From TG 275 Survey



Did the Data Represent the Membership?

Type of Institution



From TG 275 Survey

From AAPM Website:

Therapy Members

- ▶ 39.5% community hospitals
- ▶ 32.3% academic-affiliates



Do We Check Plans Differently?

	Group 1	Group 2	Group 3
Clinic Type	Academic n=423	Non-Academic* n=893	-----
EMR System	Aria n=687	Mosaiq n=581	-----
Culture of Safety	Always n=132	Usually n=444	Sometimes** n=132
Patients Per Day	<50 n=547	51-100 n=458	>100 n=358

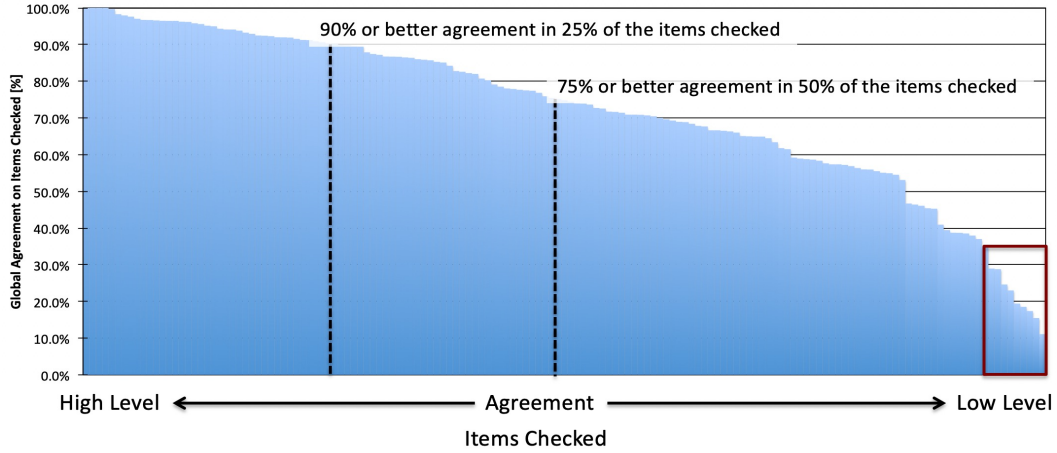
* Group 2 = respondents from community hospitals, government hospitals and free-standing clinics

** Group 3 = respondents who answered sometimes, rarely and never

From TG 275 Survey



Overview: Initial Plan Check Items When Sorted by Agreement



From TG 275 Survey



Are the checks where we see variations important?

TG-275 Top 10 Failure Modes

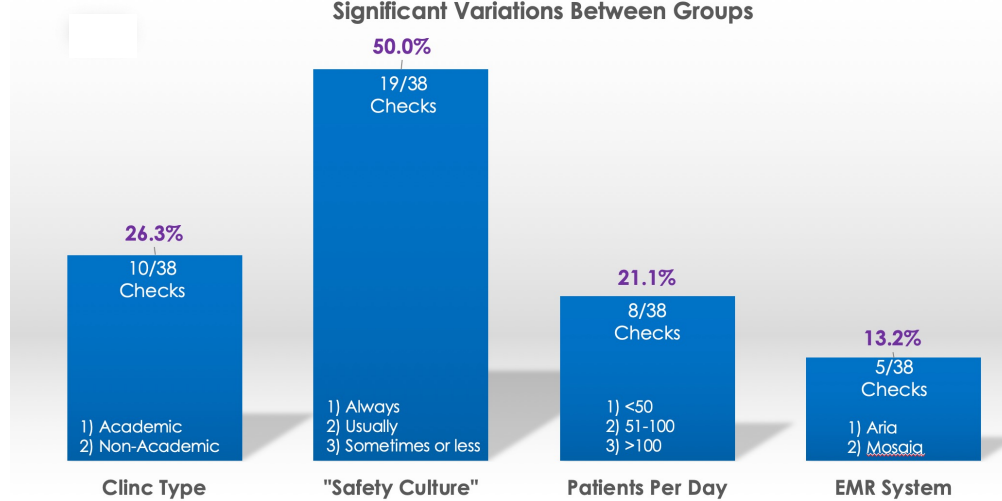
FM	Number of Checks	RPN
Wrong or Inaccurate physician contours	7	261.3
Miscommunication about prior dose, pacemakers, pregnancy	4	214.1
Improper margins for PTV	2	198.0
Unintentional re-irradiation of previously treated area	3	181.2
Incorrect or missing pathology	3	180.3
Dose in plan does not match intended	7	175.3
Wrong or inaccurate dosimetrist contours	5	175.2
Suboptimal treatment plan related to communication or coordination with multidisciplinary care	4	160.2
Plan does not reflect intent: target extent (i.e. prostate vs prostate/SV)	0	159.1
Unable to assess potential overlap of prior and current treatment fields	3	155.9

From TG 275

Σ 38 checks



Percentage of Checks Associated with Top 10 Failure Modes with Significant Variations Between Groups



From TG 275 Survey



Weekly and Final Chart Checks

92.4% perform a weekly chart check

~70% have a formal procedure

56% use a checklist

1 in 4 do not have a mechanism to ensure checks aren't missed

1 in 5 caught a reportable event

83.9% perform a final chart check

~95% perform task within 5 days

54% produce a document

From TG 275 Survey



TG 275 Recommendations for Initial Plan Check

Table 51.A.11. Example checklist for pharmaceutical DRUG initial plan/chart review. These are adapted from the checks in Table A1.1. All checks with letters indicate that DRUG is included and that, unless otherwise specified, it is indicated with an asterisk (*). This checklist is provided as an example only and is not meant as a definition of all of the items to be checked in any given chart.

- ☐ Patient assessment and history
- ☐ Special considerations for radiotherapy (e.g., pacemakers, ICDs, pumps, etc.)*
- ☐ Previous radiotherapy treatment*
- ☐ Simulation
- ☐ Physician directive for imaging technique, setup and immobilization (this may include: contrast, scanning orientation, immobilization device, etc.)*
- ☐ Description of target location on physician planning direction (e.g., BEV, tang, MBE, SL, etc.)*
- ☐ Patient set up, positioning and immobilization* (a) Appropriate for site and/or per clinical standard procedures, (b) Written or photographic documentation of patient positioning, immobilization and auxiliary devices, including setup time
- ☐ Image quality and stability: CT Scan Artifacts, Scan output Range includes Enough Data, Scan PTV encompasses all required information, Use of Contrast
- ☐ Motion management* (a) MBE direction, (b) breath hold parameters, (c) gating parameters, (d) 4D-CT parameters and data set
- ☐ Respiratory motion of target area (e.g., PTV, MBE, etc.)*
- ☐ Patient Orientation: CT orientation matches patient setup
- ☐ Transfer and selection of image set to treatment planning system*
- ☐ Treatment planning
- ☐ Contouring checks
- ☐ Target(s)*, e.g., discernible organ, existing disease, metastasis, gross anatomical deviations.
- ☐ Organ at risk (OAR)*
- ☐ PTV and OAR margins* as specified in the chart and/or per protocol
- ☐ Body/Internal contour*
- ☐ Density contours applied as needed (e.g., High-Z material, contrast, softtiss, etc.)
- ☐ Contouring of Supporting Structures (i.e., couch, immobilization and auxiliary devices, etc.)
- ☐ Prescription check (physical devices vs. treatment plan)
- ☐ Final plan and prescription approved by physician*
- ☐ Prescription with respect to standard of care, institutional clinical guidelines or clinical trial if applicable*
- ☐ Site and laterality (incl. medical chart) in contour hierarchy*
- ☐ Prescription to consult with* (e.g., physician report or FIM) on plan (per treatment)
- ☐ Total dose, distribution, number of fractions*
- ☐ Fractionation pattern and regimen (e.g., daily, BID, QD, etc.) regular plan follow by basis, etc.)*
- ☐ Energy number prescription*
- ☐ Modality (e.g., electron, photon, proton, etc.)
- ☐ Technique (e.g., 3D, MBE, VMAT, IMRT, etc.) includes prescription
- ☐ Risk*
- ☐ Additional checking* (e.g., are there irregular shapes, are any applicable)
- ☐ Standard operating procedures of practice followed or currently used
- ☐ Treatment volume (e.g., BE, MBE, VMAT, IMRT, etc.)*
- ☐ Delivery system (e.g., medical linear, CyberKnife, Brachytherapy, etc. as applicable)
- ☐ Beam arrangement*
- ☐ Beam identification
- ☐ MRI, energy, dose rate*, field delivery time*
- ☐ Field size and position, beam collimator/beam modifiers* (e.g., wedges, electron and photon blocks, trays, etc.)
- ☐ Treatment plan warnings/errors
- ☐ Field ID or name
- ☐ Course and plan ID
- ☐ Treatment table
- ☐ Potential for collision
- ☐ Setup with one standard setup
- ☐ Physics consult (e.g., evaluation of dose to parasternal, previous treatment, etc.)
- ☐ Beam distribution and overall quality of the plan
- ☐ Target coverage and target planning objectives*
- ☐ Sparring of OARs and OAR planning objectives*
- ☐ Plan transfer to clinical trial (as applicable)*

- ☐ Treatment and dosing optimization*
- ☐ Physician signed approval*
- ☐ Data distribution*
- ☐ Site visit*
- ☐ Contouring and plan normalization
- ☐ Calculation algorithm and resolution per site
- ☐ Plan before a "final" plan have been plan*
- ☐ Data verification
- ☐ Transfer calculation check order (per protocol)*
- ☐ Verification plan for patient specific QA measurement
- ☐ Required for time delivery
- ☐ Success checks (documentation of treatment location, e.g., IMRT, multiple treatment)
- ☐ Transfer parameters and warnings between patient marking and setup measurement
- ☐ Additional checks*
- ☐ Multiple treatment
- ☐ Setup for image guidance and auxiliary systems
- ☐ Marking measurement (e.g., EPID, 2D or 3D and MBE device for IGRT)*
- ☐ Marking orientation*
- ☐ Reference*
- ☐ Assessment of electron transport, 2D or 3D*
- ☐ DRB assessment
- ☐ DRB setup quality
- ☐ Image guidance*
- ☐ Image guidance (e.g., daily, weekly, daily follow the weekly, etc.)*
- ☐ Parameters and setup for specialized devices (e.g., Sun-Ther, VisionTE, etc.)*
- ☐ Transfer to operational device (e.g., VisionRT, Sun-Ther, etc.)*
- ☐ QA schedule
- ☐ Scheduling of radiotherapy units (e.g., weekly, that checks, IMRT QA, etc.)*
- ☐ Checks for a regular, which plan or verification plan (i.e., original plan or new CT)
- ☐ Field size for new plan generated
- ☐ OARs CT registration*
- ☐ Treatment parameters
- ☐ Delivered or dose correct*
- ☐ DRB compliance*
- ☐ CT/EPID coverage
- ☐ Operator and dose limit*
- ☐ Treatment
- ☐ Any unexpected deviations covered in the chart review system

From TG 275



MPPG 11.a Guidance



key elements that should be considered in plan/chart documentation



minimum professional qualifications for completing a chart review



appropriate timeliness for completing the review

MPPG 11.a



Qualifications as Defined by MPPG 11.a

QMP - Qualified Medical Physicist

Defined by AAPM Professional Policy 1-J

Met academic and training requirements

Granted certification in a specific subfield(s) of medical physics by an appropriate certification body

Competent to independently provide clinical professional services in therapeutic medical physics

QMP Designee

Medical physicist or a certified medical dosimetrist

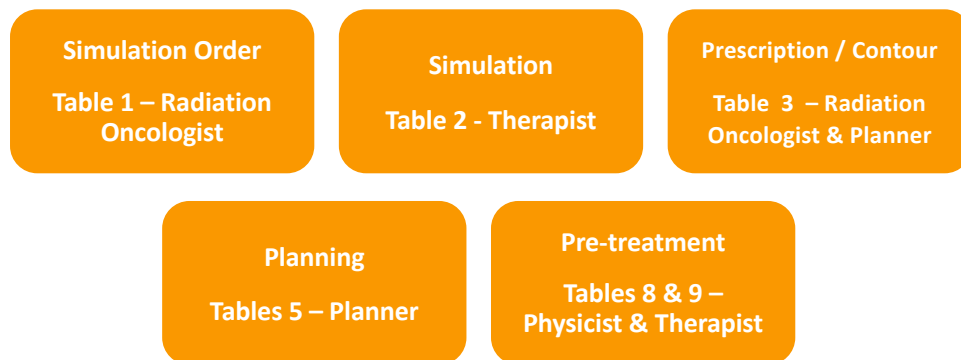
Demonstrated competency in a specific task

Performs the task under general supervision of a QMP

MPPG 11.a



Key Elements for External Beam Workflow



Note: Tables 4 and 7 are for brachytherapy.

MPPG 11.a



Qualifications of Initial Plan Reviewer



Qualified Medical Physicist (QMP) or designee



Dosimetrist under the direction of a QMP if practice has a single physicist who created the plan



QMP completes review prior to the first fraction

MPPG 11.a



AFTER HOURS TREATMENT

On-call medical physicist reviews the treatment plan remotely or in-person

For institutions without on-call physics, radiation oncologist may conduct the initial plan/chart review.

QMP or QMP-designated medical physicist should check the plan on the next business day, or prior to the treatment on the next business day if additional fractions are prescribed.

MPPG 11.a



Minimum Standards for Weekly Chart Review



Within every five fractions or before the next block of five fractions begins



May be performed more frequently than once a week or less than once a week. Non-conventional treatment schedule with less than five fractions, ideally once near the beginning of the course



Table 10 – 15 required items, 6 optional items

MPPG 11.a



Minimum Standards for Weekly Chart Review



Qualified Medical Physicist (QMP) or QMP designated medical physicist



QMP designated dosimetrist on a rotating basis. Medical physicist to review dosimetrist weekly chart check documentation



QMP or designee alternates to prevent the same person from checking the chart during the entire course of treatment

MPPG 11.a



"A wise man changes his mind, a fool never will."

Icelandic Proverb

MPPG 11.a

PLAN CHANGES

Any change that affects the dosimetry of a treatment plan should be handled as a new treatment plan.

A new plan report of the modified plan should be created.

The modified plan should undergo an initial plan/chart review.



Minimum Standards for End of Treatment Check



Within five days of the patient's last delivered fraction



QMP and / or their designated medical physicist



Table 11 – 5 required items, 2 optional items

MPPG 11.a



Ring the Bell



MPPG 11.a

END OF TREATMENT CHECK

For a single fraction treatment course, ideally, the EOT chart review should be conducted on the same day of the treatment or on the next business day.

If the prescribed treatment course is not completed, clearly document the aborted treatment in a highly visible location in the chart.



How should we complete chart review?

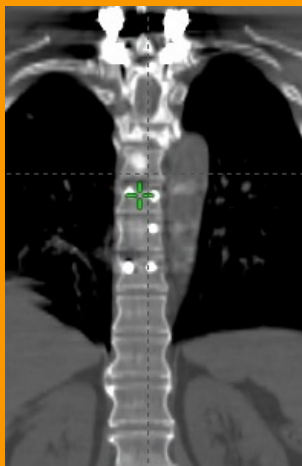
Each clinic should develop standardized policies & procedures based on a risk analysis of local processes

Incorporate physics reviews as early in the workflow as possible

Plan and chart review is a team effort



The Win: Clinical Improvements



RO ILS Quarterly Reports

Spinal vertebral misalignments reported in RO ILS, noted during weekly chart check.

Multiple mitigation strategies suggested.

1. Contour adjacent structures
2. Increase the FOV
3. Institute maximum shift tolerances
4. Index immobilization devices
5. Include alignment structures on imaging orders



What are the “wins” from plan and chart review?

Error prevention & mitigation
Clinical process improvement
Plan & chart review modifications



THANK YOU!

