

A Survey of Current IMRT QA Practices

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Introduction

- IMRT QA is standard for routine verification of treatment plans
 - Numerous devices and criteria used
 - Large variations in action limits and follow-up actions to failing plans (Nelms *et al* 2007)
 - Absence of standard QA device or criteria

Purpose

- To review the patient-specific IMRT QA practices at NCI clinical trial participating IROC Houston institutions via an electronic survey
 - Device(s), action limits, delivery methods, follow-up for failing plans
- Conducted an online survey through the IROC Houston's annual survey
 - More than 1800 institutions received survey, 1057 responded over a year

Results: Plan Verification Tool(s)

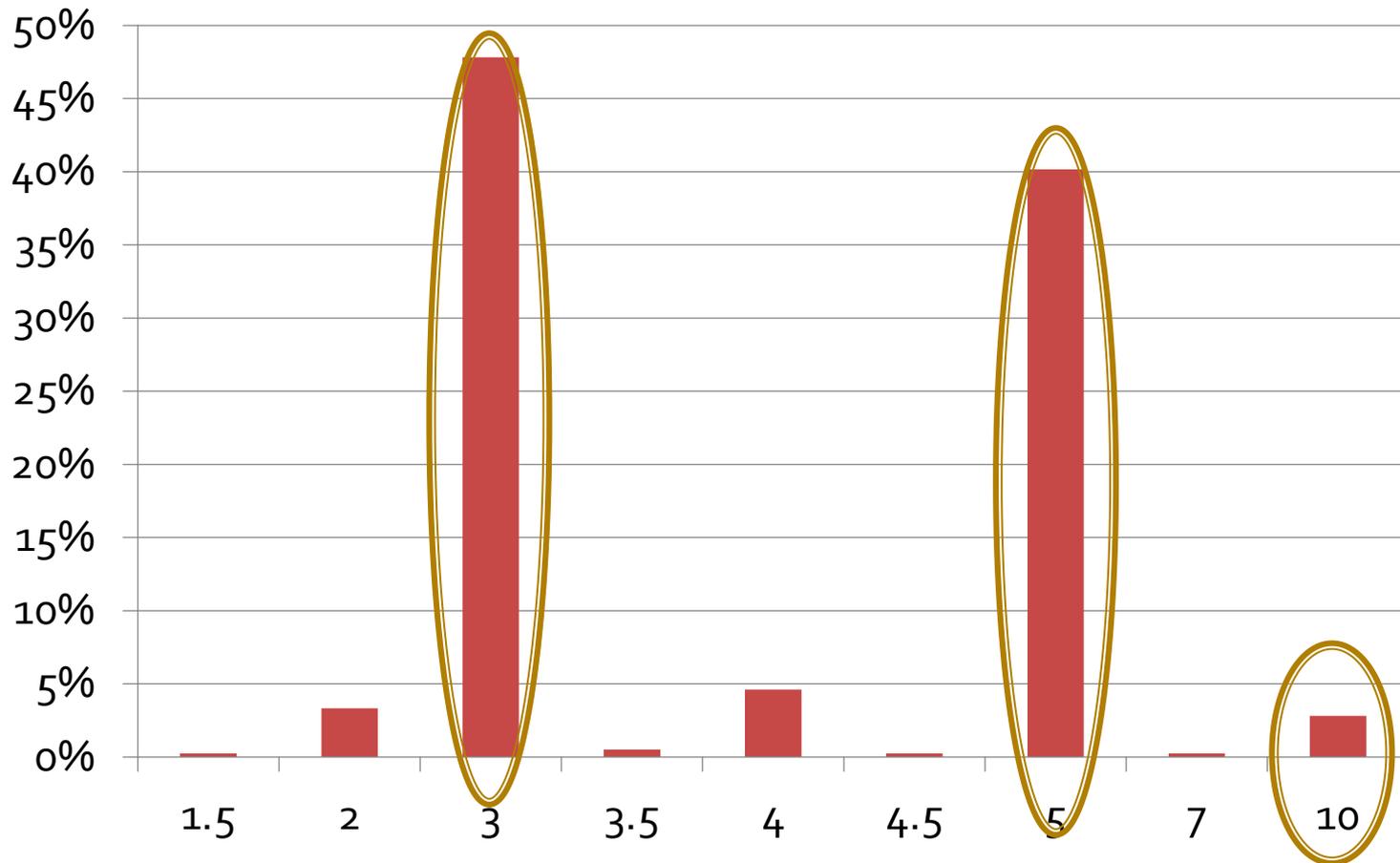
Question	Answer Options (More than One Answer Allowed)
How do you verify that the treatment unit delivers the planned dose for individual patients?	n=1057
51.5%	Diode Array
40.2%	Point(s) measurement
29.6%	Ion Chamber
9.7%	Diode
1.9%	TLD/OSLD
23.3%	Ion Chamber Array
17.7%	Radiographic Film
16.7%	EPID
5.0%	Other
4.8%	2.5D (Pseudo 3D) Array
3.0%	3D Dosimeter

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Results: Point(s) Measurement

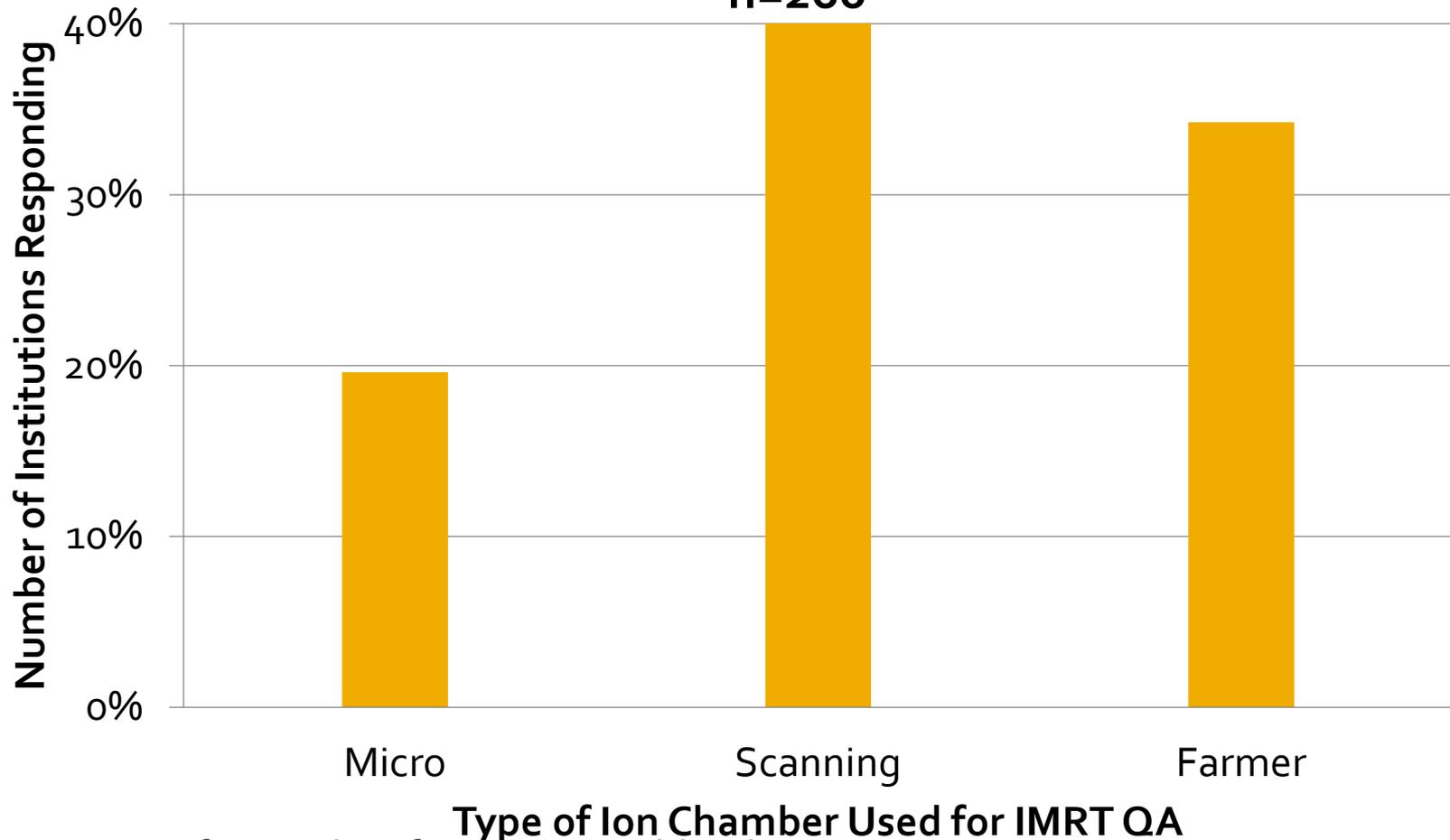
Ion Chamber Percent Dose Difference Tolerances



Results: Point(s) Measurement

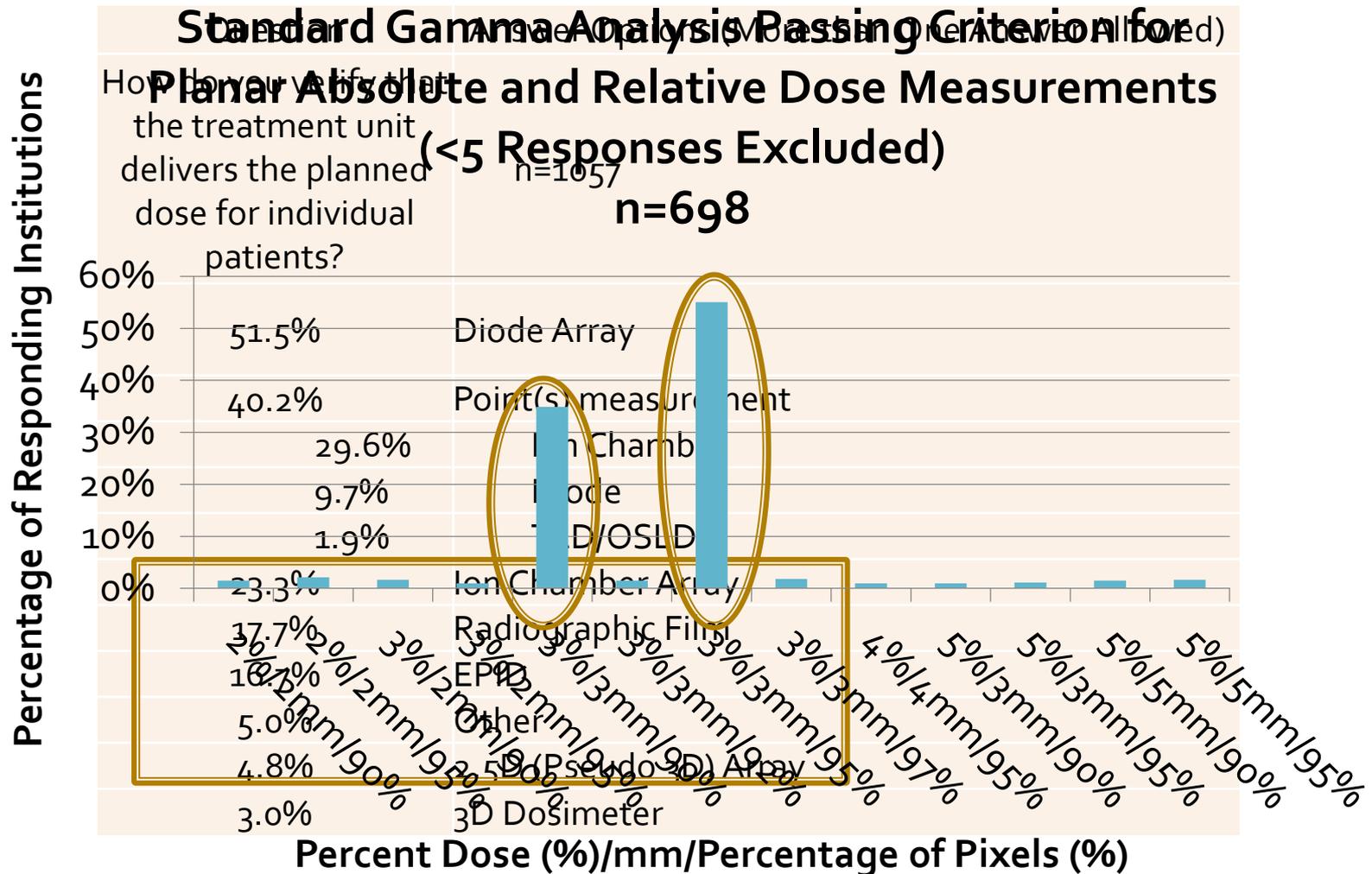
Ion Chamber Size Used for Routine IMRT QA

n=260



*Assignments of size taken from TG-51 Addendum

Results: Planar Based Comparisons



Results: Planar Comparisons

- When you analyze, what mode do you use? (n=970)
 - 75% Absolute, 25% Relative
- Do you deliver beams at planned beam angles? (n=974)
 - 41% Yes
 - 59% No, deliver AP

Results: Planar Comparisons

- Do you usually assess your plans for passing or failing based on FBF or composite analysis? (n=973)
 - 45% FBF, 55% Composite

Results: Comparison Data Sets

Question	Answer Options (More than One Answer Allowed)
<u>What do you compare to the absolute dose?</u>	
46.4%	2D Diode Array Measurement vs Calculation in Phantom
1.0%	Measurement Mapped on Patient CT Dataset (DVH Analysis)
21.6%	2D Ion Chamber Array Measurement vs Calculation in Phantom
0.95%	Measurement Mapped on Patient CT Dataset (DVH Analysis)
14.5%	EPID Measurement vs Calculation in Phantom
2.0%	Measurement Mapped on Patient CT Dataset (DVH Analysis)
4.7%	2.5D (Pseudo 3D) Array/Multi-Plane Array Measurement vs Calculation in Phantom
0.4%	Measurement Mapped on Patient CT Dataset (DVH Analysis)

- 95% use phantom comparison

- 5% use CT Dataset

Results: IMRT vs VMAT QA

- Is your routine QA for IMRT different than that for VMAT?
 - 13% Yes
 - 34% (n=122) used Arc Check for VMAT only
 - Other devices (Delta 4, Monte Carlo) also reported
 - Use rotated delivery for VMAT vs single gantry angle for IMRT

Results: QA Failure Follow-Up

- 1. Re-Measure at the same point
- 2. Measure at a new point
- 3. Order a Re-Plan
- 4. Document and Treat
 - 32% reported changing criteria
 - 25% reported using relative mode to analyze
 - 12% reported using MU scaling
 - 10% reported using a fixed gantry angle delivery

Discussion/Conclusions

- Found 3% is still the most prevalent % dose difference (5% is close) and 3%/3mm is still most used for planar
- Most use an AP delivery (59%) but Pulliam *et al* 2014 and McKenzie *et al* 2013 showed that AP deliveries can underrepresent failing plans
- The community remains varied in IMRT QA practices
 - Should we be uniform?
 - If yes, then we must address the differences in sensitivities

References

- McEwen M *et al* Addendum to the AAPM's TG-51 protocol for clinical reference dosimetry of high-energy photon beams. *Med Phys* 41 (4) 2014.
- Nelms *et al* A survey on planar IMRT QA analysis. *JACMP* 8 (3) 2007.
- Pulliam *et al* A review of more than 13,000 IMRT QA results from 13 different treatment sites. *JACMP* 2014 in press.
- McKenzie *et al* An evaluation of the consistency of IMRT patient specific QA techniques. GSBS Digital Commons 2014.

Questions?