

Review of Current Trends in the Physics Chart Check Process: Results from the TG-275 Survey of Practices

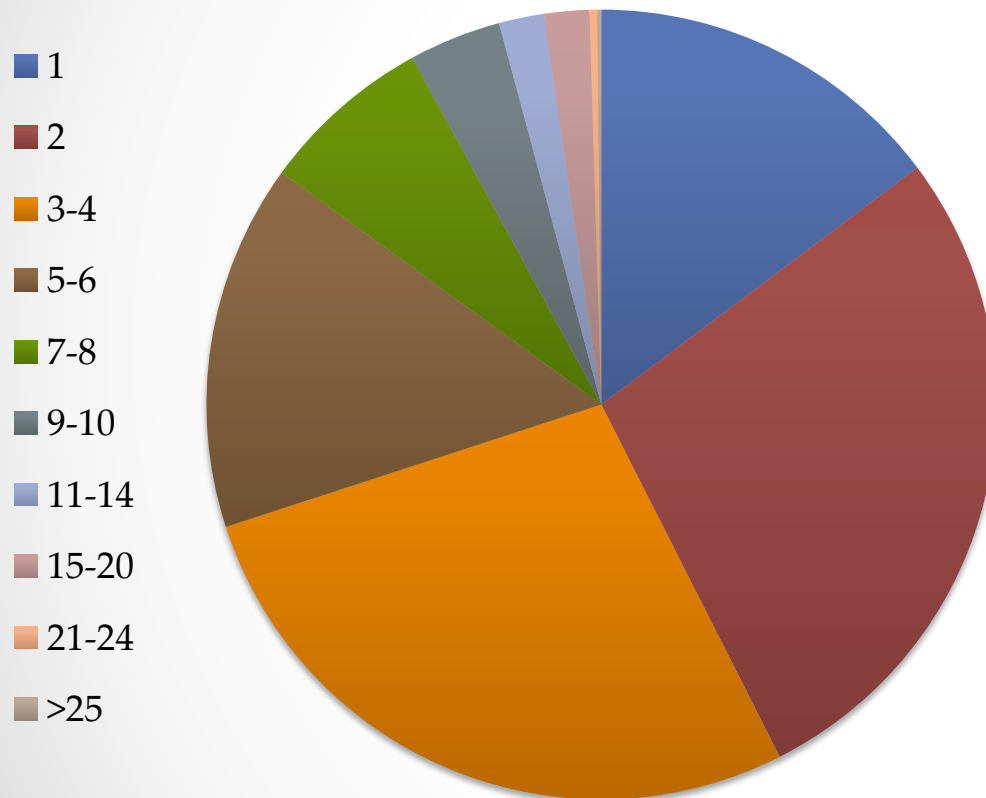
Deborah Schofield, et al.
AAPM Spring Clinical Meeting
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Review of Services Offered

Common	Utilization	Less Common	Utilization
Electrons	96.3%	LDR	45.7%
Photons	95.9%	TBI	28.0%
3D Tx	95.9%	TSE	18.7%
IMRT	95.5%	IORT	14.9%
SBRT	80.8%	Orthovoltage	12.4%
VMAT	79.4%	Specialized Tx	11.5%
HDR	71.8%	Other	8.3%
SRS	67.4%	Protons	6.8%
Brachytherapy	65.0%		

Number of Machines



70% of Respondents have 4 or fewer machines

Almost 40% treat <50 patients per day

Only 8% of Respondents have > 8 Machines

Evaluation of 4000+ incidents found several checks in combination to be highly effective (~97%) in preventing errors including:

- Physics chart review
- MD chart review
- Port films/in-vivo EPID dosimetry
- RTT time out
- Checklists

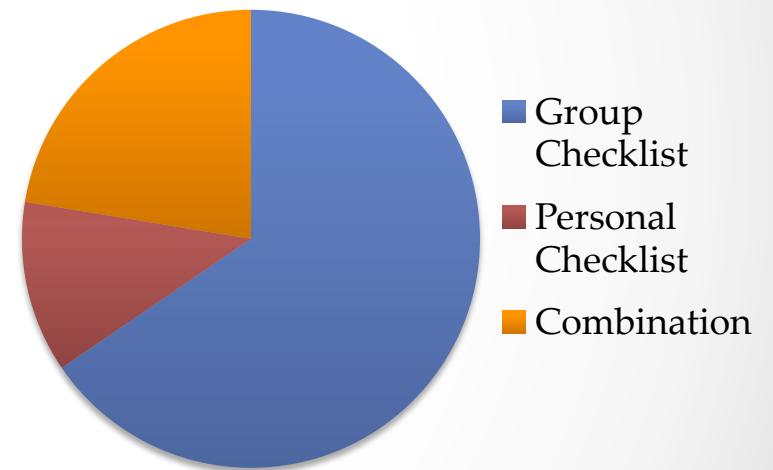
IMRT QA was found to be the least effective check

Ford et al., (2012). Quality Control Quantification (QCQ): A tool to measure the value of quality control checks in radiation oncology, *IJROBP*, 84(3), e263-269.

How Does This Compare With Practice?

Physics plan check:	99.3%
MD approval of plan:	96.0%
Patient specific QA:	90.9%
Use of checklists:	64.2%

Type of Checklists Used



Time Frames For Plan Checks

Evaluation of 189 incidents* found several factors linked with higher numbers of planning or delivery incidents:

- fewer fractions
- fewer days from plan approval to treat
- longer beam duration
- more prescription items

< 1 day for plan check: 33%

1-3 days for plan check: ~ 15%
check plan after patients starts

*Walker, G., et al. (2015). Factors associated with radiation therapy incidents in a large academic institution. *Practical Radiation Oncology*, 5(1), 21-7. •

Heterogeneity in Initial Plan Check

Formal procedure for initial plan check: 72%

Forcing functions used to ensure appropriate checks and approvals: 58%

Record near misses and deviations found during physics check: 51%

Interesting facts. Are they Important?



Demographic Questions

18 Demographic Questions

Practice location	✓
Planning Systems	
EMR Systems	✓
Chart environment	
Modalities Provided	
Clinic Type	✓
Patients treated per day	✓
FTE physicians	
Culture of Safety	✓
Years of Experience	
Incident Learning System	

US and Canada

Evaluate variations based on:

- vendor environment
- Type of clinic/affiliations
- Clinic Size
- Reported culture of safety in the clinic

General Initial Plan Check Questions

20 Questions

When the check is performed

Who is Responsible for Check

Number of Checks

Use of Outside Group for Checks

Days Allowed for Planning

Days Allowed for Plan Check



How the Check is Performed



Use of a Checklist

Physics Approval Needed

Preventative Measures

Near Misses During Checks Recorded

Evaluate variations based on:

- Time frame allowed for check
- Methods used to conduct the check

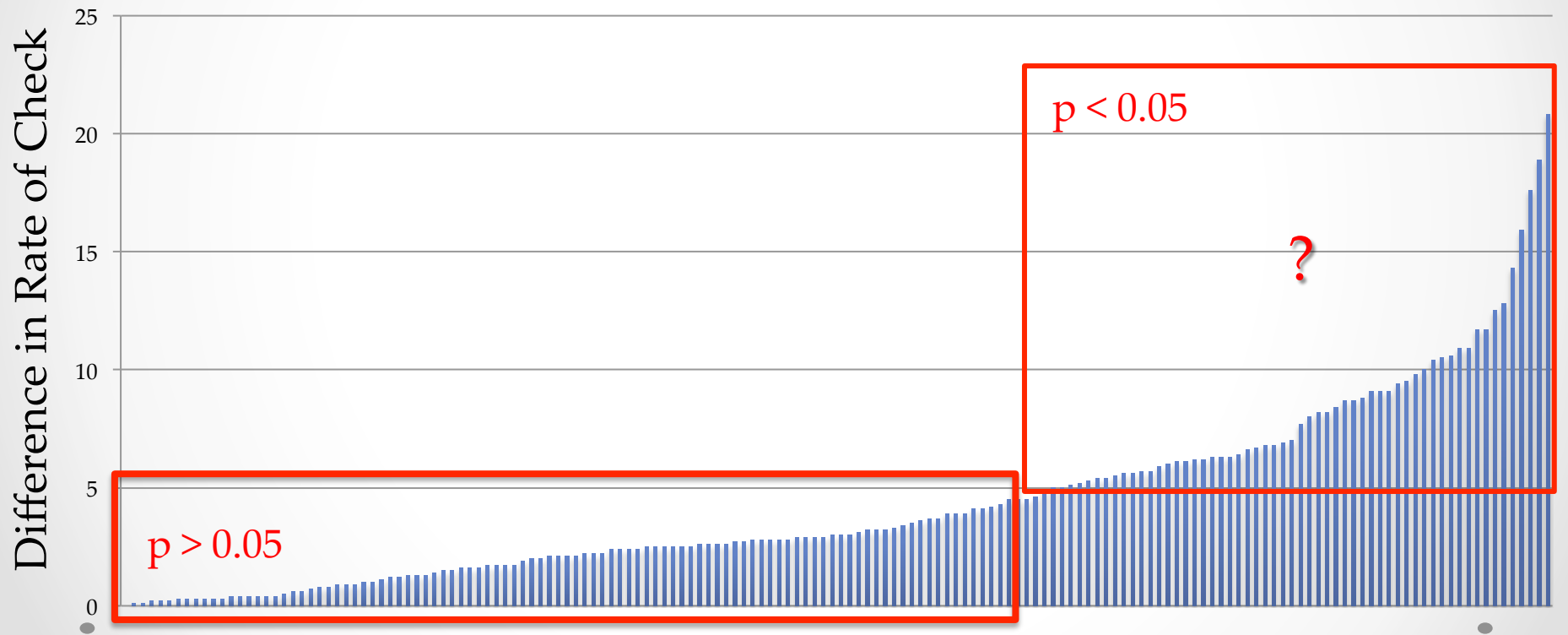
Demographic Groups

	Group 1	Group 2	Group 3
Clinic Type	Academic <i>n=423</i>	Community* <i>n=893</i>	-----
EMR System	Aria <i>n=687</i>	Mosaiq <i>n=581</i>	-----
Culture of Safety	Always <i>n=132</i>	Usually <i>n=444</i>	Sometimes** <i>n=132</i>
Patients Per Day	<50 <i>n=547</i>	51-100 <i>n=458</i>	>100 <i>n=358</i>
Method of Check	Manual <i>n=649</i>	Automatic / Combined <i>n=691</i>	-----
Days for Check	<1 day <i>n=429</i>	>= 1 day <i>n=911</i>	-----

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

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

Difference in Performed Rate of 172 Initial Plan Check Items for Clinic Type Demographic



Initial Plan Check Survey

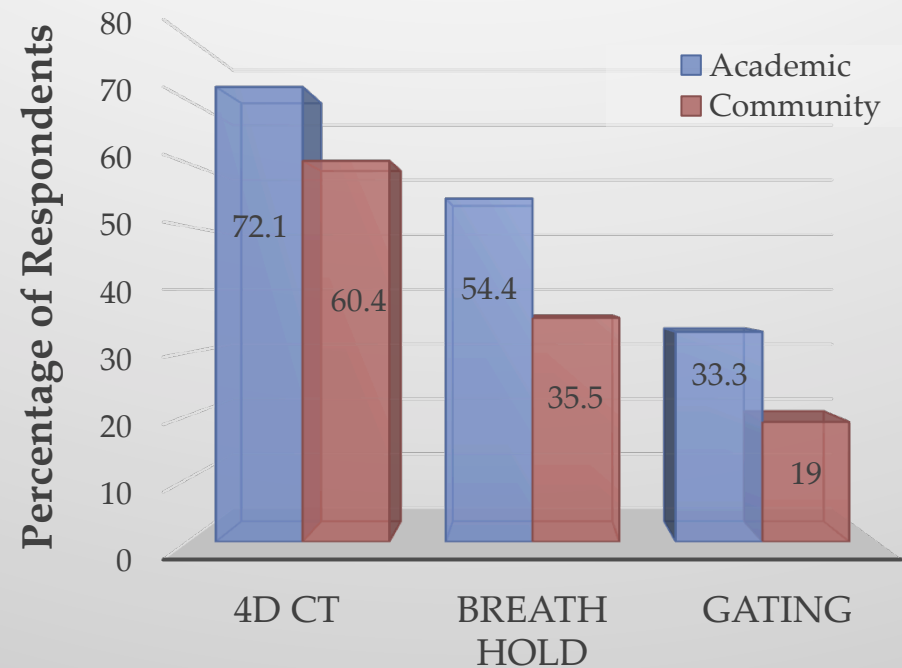
What items are reviewed as part of the motion management process:

4D CT Parameters and data set 63.4%

Breath-hold parameters and data set 40.9%

Gating parameters 23.0%

Clinic Type: Motion Management*



* p<.05

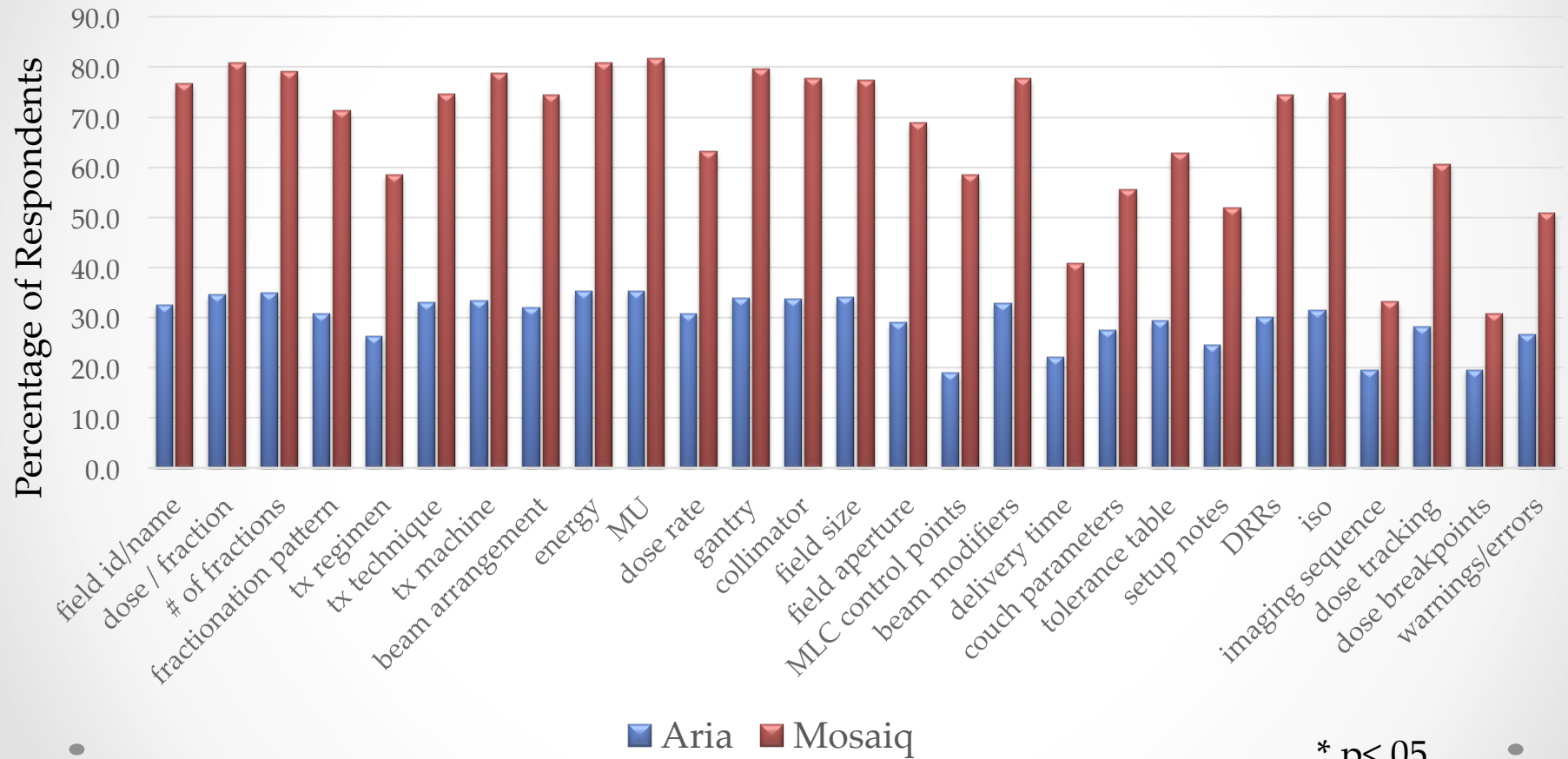
66% check data transfer from TPS to a 3rd party R&V

Items reviewed to verify accurate transfer of information:

Dose/fraction:	100%	Tolerance Table:	80.3%
Number of fx:	100%	Dose Tracking:	76..9%
Energy:	100%	Couch Parameters:	73.7%
MU:	100%	Warnings/Errors:	68.4%
Gantry:	99.7%	MLC Control points:	66.0%
Collimator:	97.9%	Setup Note:	67.8%
Field ID:	96.7%	Delivery Times:	56.0%
DRR's:	89.9%	Imaging Sequence:	46.4%
Dose Rate:	82.8%	Dose Breakpoints:	45.3%

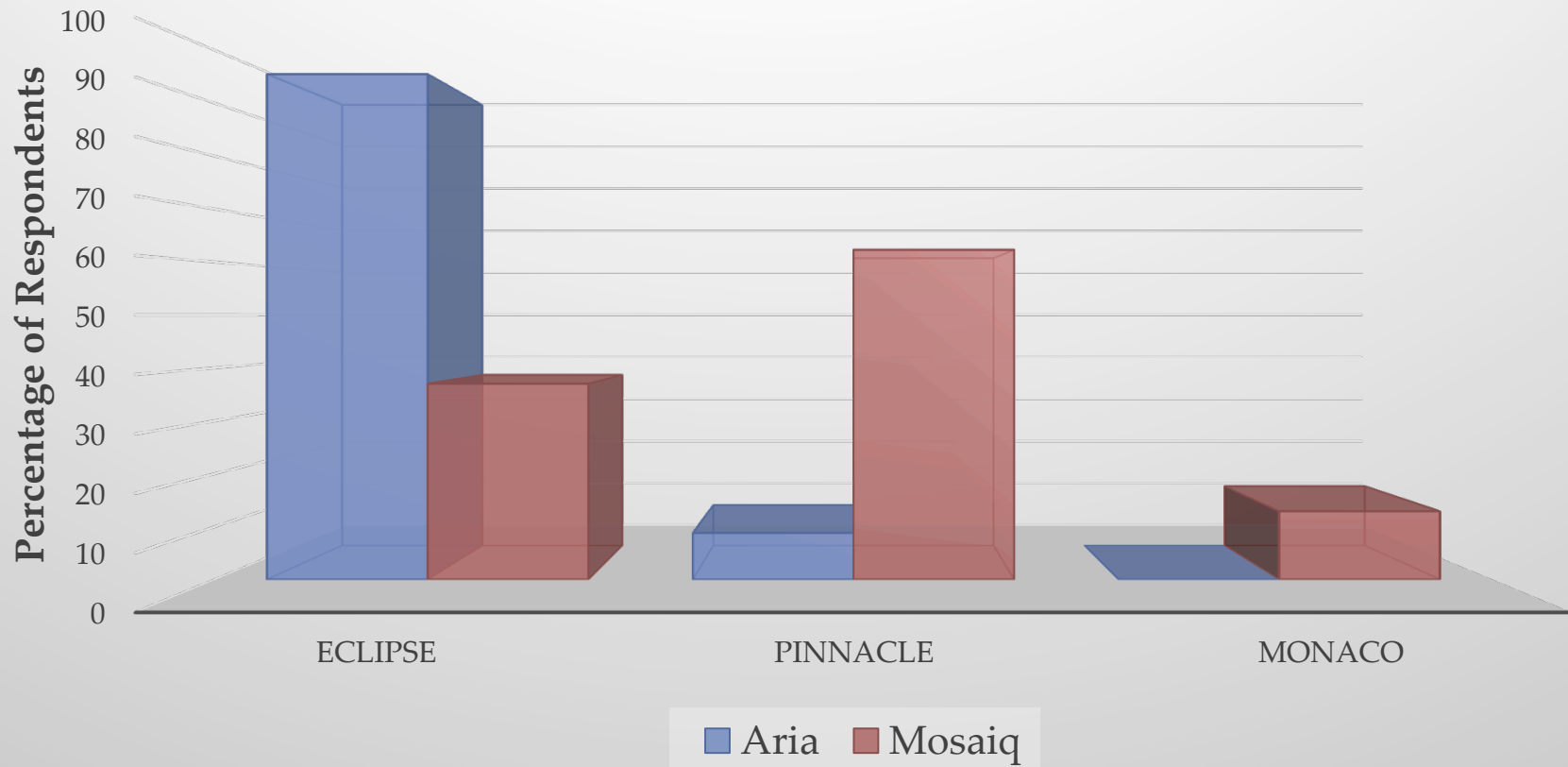
Does the R&V system impact the checks performed?

EMR System: Transfer to R&V*



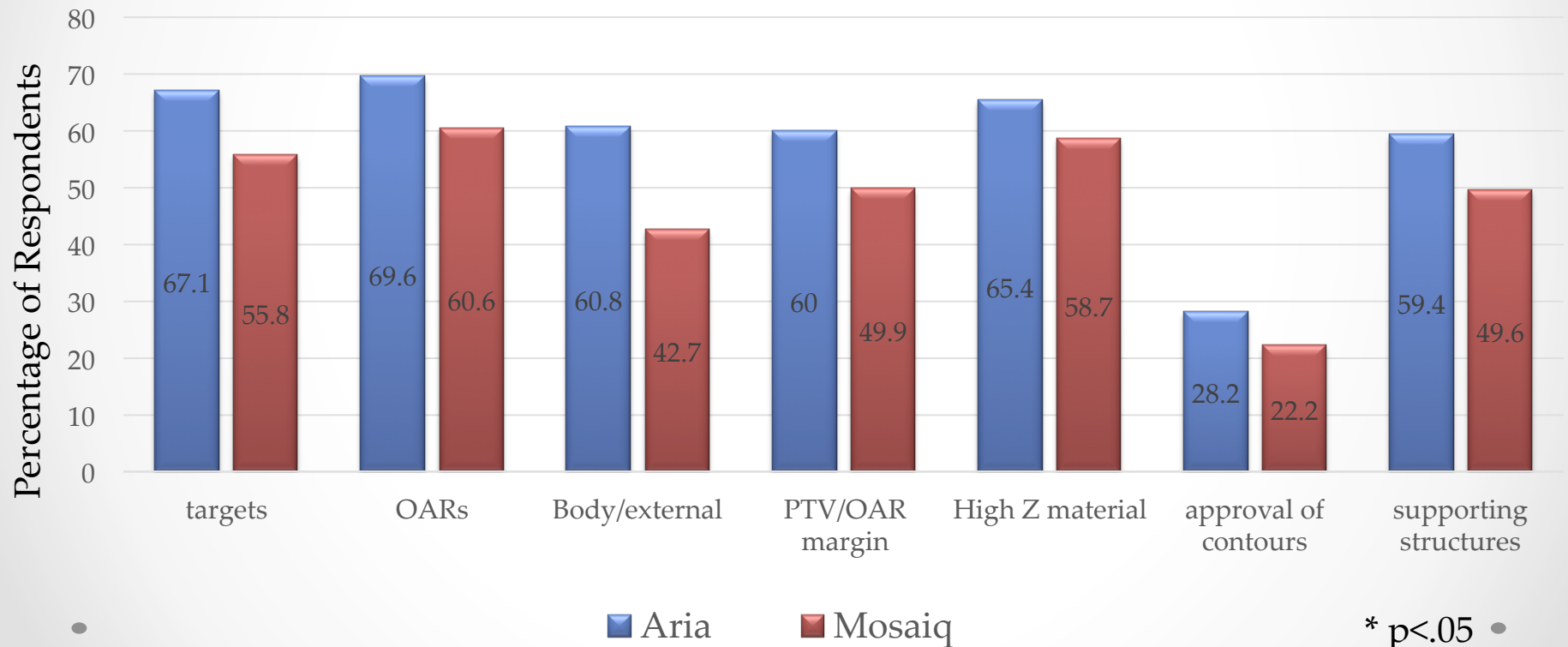
* p<.05

Treatment Planning Systems

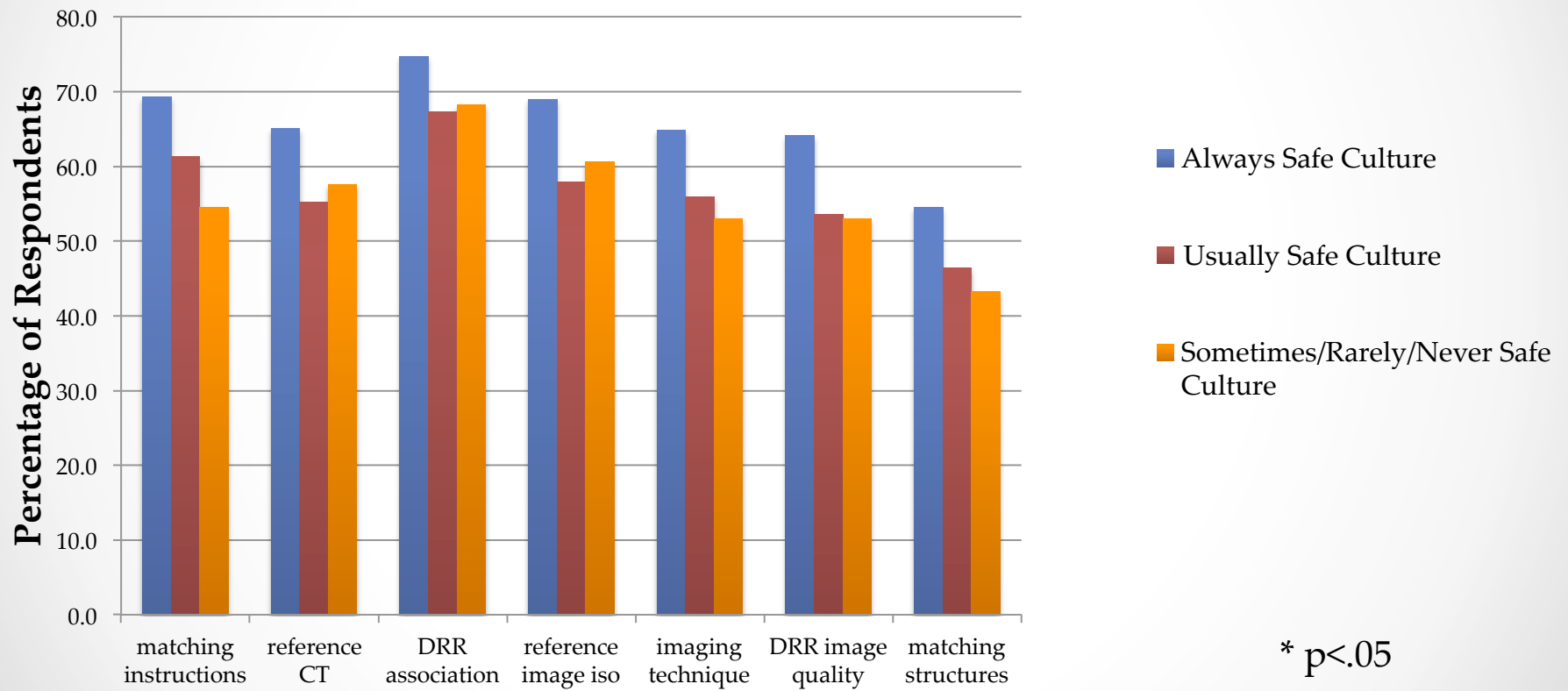


77% of respondents review items related to contouring

EMR and Contouring*



Impact of Safety Culture on Checks of Image Guided Setup*



* p<.05

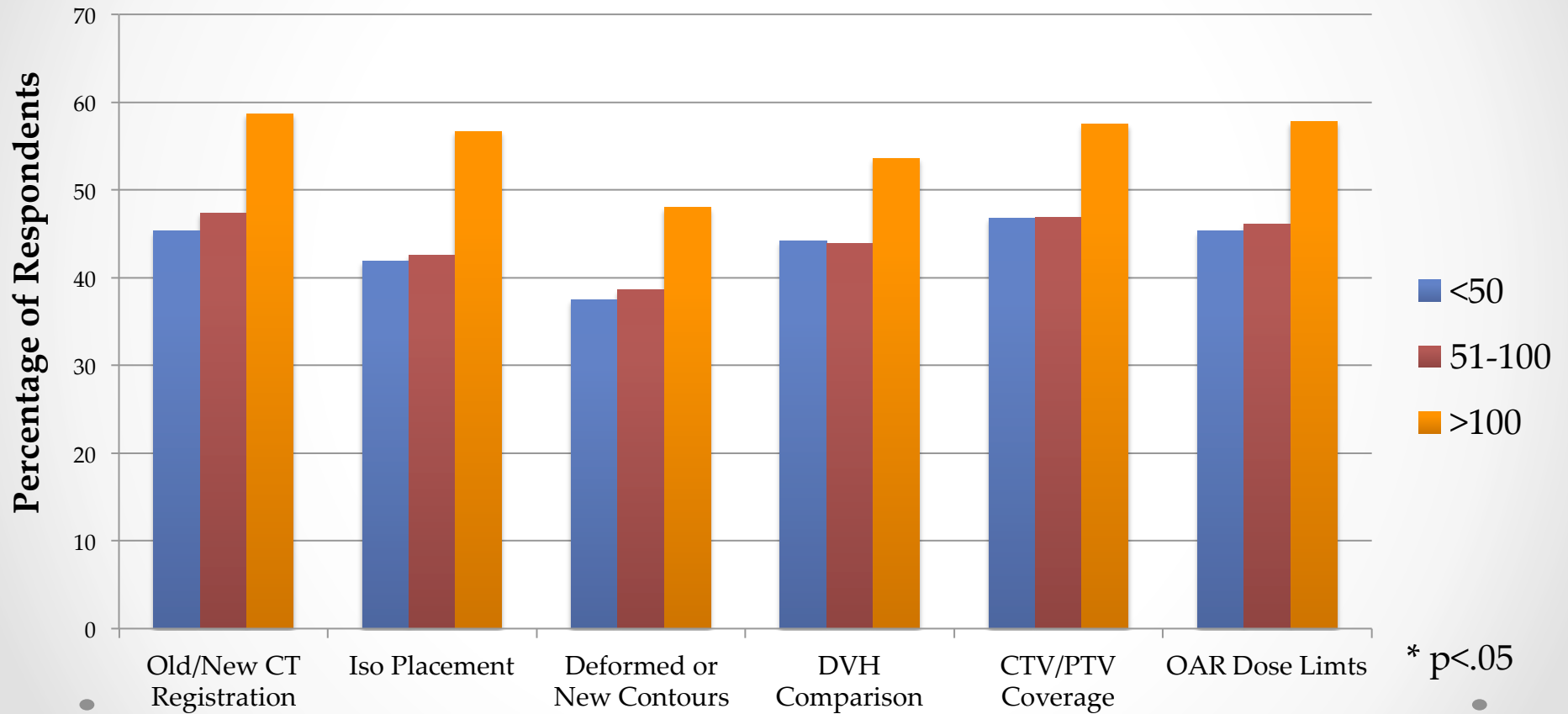
63% confirms that the original plan continues to meet the intent by verifying the original plan on a new CT. Specific items checked:

Old/new CT registration:	96.7%
Isocenter placement:	89.9%
Deformed/New contours:	77.4%
DVH comparison:	90.2%
Target coverage:	96.5%
OAR dose limits:	95.1%

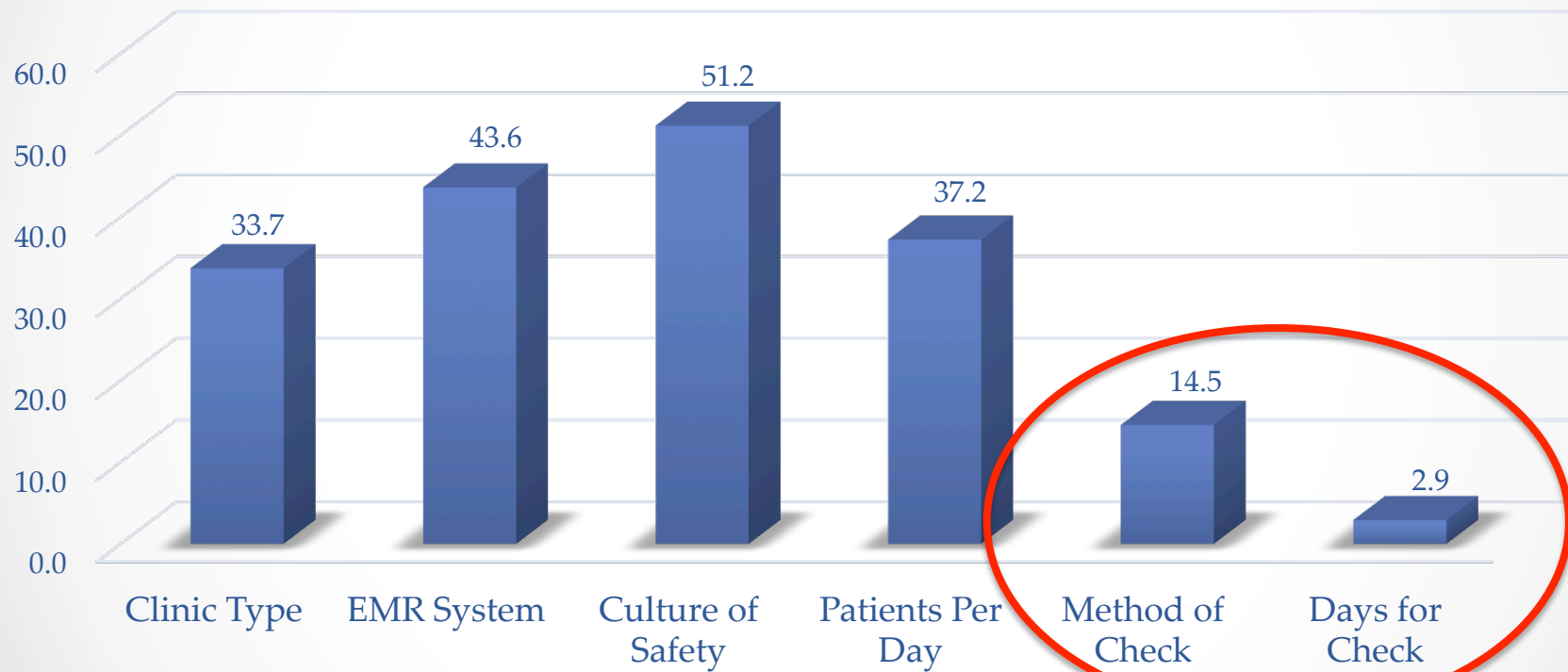
Does the size of the clinic impact the checks performed?



Impact of Patients/Day on Treatment Verification*



Percentage of 172 Initial Plan Check Review Items with Statistically Significant* Variations



* p = .05

Summary

- Large, comprehensive survey conducted
- Over 1500 respondents from almost 40 countries and all sizes/types of clinics
- Provides an overview of current practices on physics plan checks
- Allows for evaluation based on demographics



Summary

Of the 6 demographics evaluated:

- the culture of safety resulted in the largest number of plan check items with statistically significant variations
- The number of days for plan check resulted in the least number of plan check items with statistically significant variations



Future Directions

- Evaluate weekly and end of treatment checks
- Cross-Compare patterns of checks performed verses FMEA
- Manuscript related to the survey and trends in physics checks
- Task group report and recommendations
 - Expected: ~ June 2017 for review
 - ~ mid-2018 for publication

Acknowledgements

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TG-275 members

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AAPM



Questions?

