

A SPECIAL REPORT OF 2020 AAPM THERAPY PHYSICIST WORKFORCE SURVEY RESULTS

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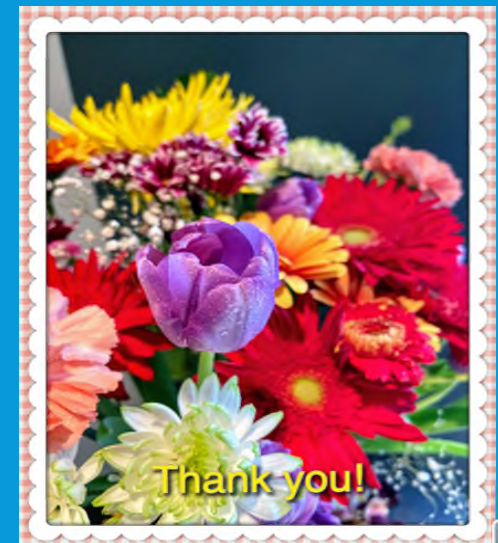
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No Conflict of Interest



LEARNING OBJECTIVES

- Understand the current state of Therapy Physics Workforce
- Review Current and Future Issues that affect the Supply of Therapy Physicists
- Discuss Projections of Demand and Supply for Therapy Physicists
- Summarize major challenges, opportunities and strategies to maintain an Adequate and Well-Trained Therapy Physics Workforce



SCOPE OF THE 2020 AAPM THERAPY PHYSICIST WORKFORCE (TWS) SURVEY

Collect data to understand the current state of practice and develop therapy physicist staffing models that related to:

Who performs and who supervise certain clinical tasks:

QMP, non-QMP, MPA or Dosimetrist

Number of tasks, task intensity, and time required to complete these clinical procedures: IMRT, SRS, SBRT, and HDR

Patient load: Average number of patients per day and annually for:

SRS, SBRT, HDR and LDR/PSI

Workload reported for different practice types and clinical functions:

Administration, education, training and research

Number and type of clinical services provided, and equipment used

METHODS: SURVEY DESIGN AND DISTRIBUTION

This survey was designed by Therapy Workforce Subcommittee. An expert panel developed and evaluated the therapy physicist survey questions. The questionnaire was pilot tested for clarity, relevance and time to complete.

Survey distribution:

- The data for this TWS study was collected using an Internet-based survey tool.
- Personalized emails with a link to the survey were sent to 50% of AAPM therapy physicist members. Survey data was collected from Sept 21, 2020 to Nov 19, 2020. Up to 3 reminder were sent.



DATA ANALYSIS:

- Data analysis was performed at individual, practice, community and geographic levels.
- Face validity was tested by comparing TWS respondents with AAPM's full membership in 5 categories (age, gender, education level, work status and geographic region).
- 2012 ASTRO Radiation Oncology workforce survey, medical physicist survey segment data were used for comparison to identify demographic, technology utilization, patient load, workload and employment shifts



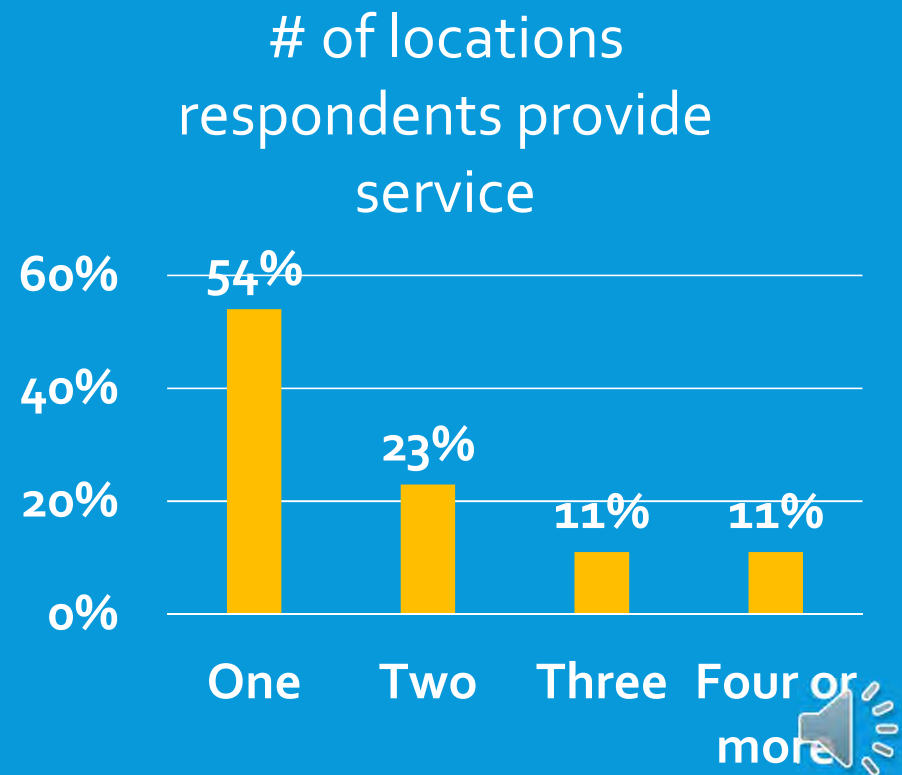
RESULTS: RESPONSE RATE

- A total of 2527 surveys were sent out to 50% of AAPM therapy physicist members with a 70% view rate and 579 returned surveys. Including 136 responses from a MedPhysUSA shared link, there was a total 715 surveys returned from about 670 practices . The response rate was 23% from the AAPM distribution list and the overall response rate was 28%, which is 10% higher than the 2012 ASTRO radiation oncology medical physicist segment response rate of 18%.

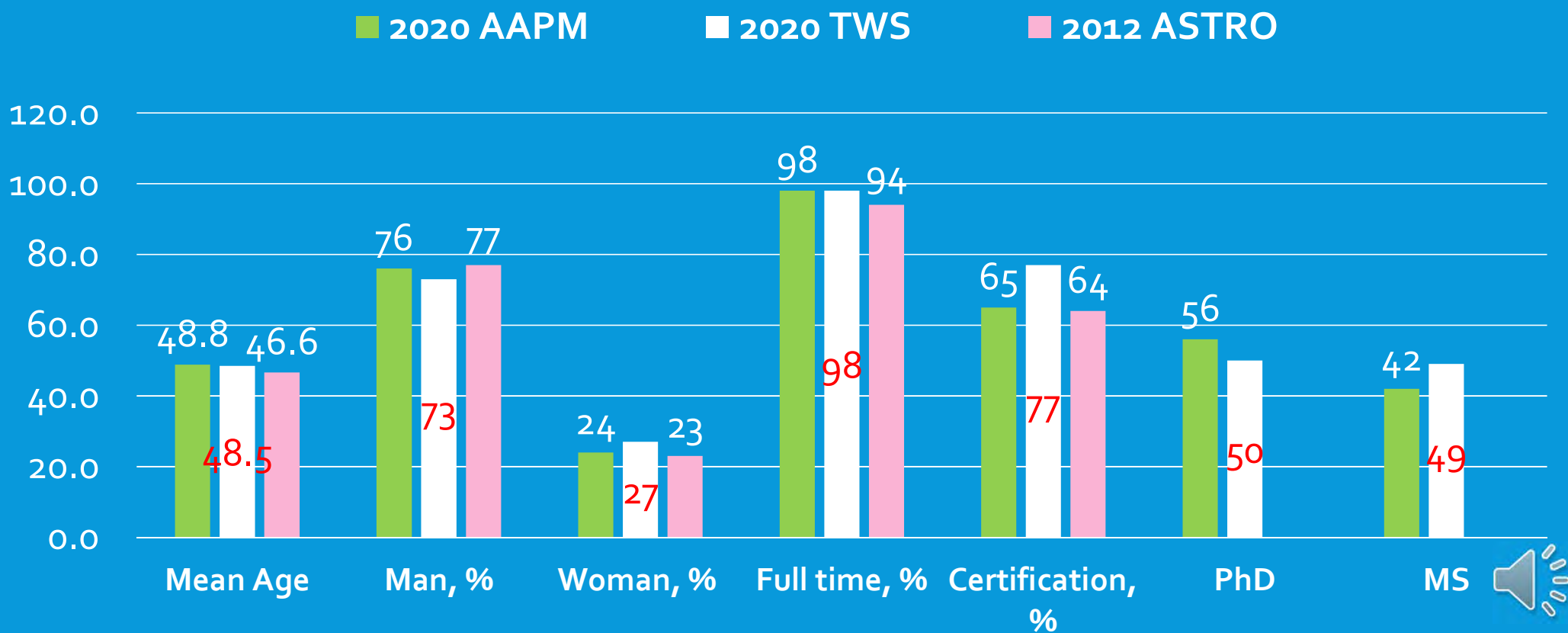


RESULTS: RESPONDENT CHARACTERISTICS

- 77% of respondents reported as QMP, 8% reported as non-QMP while 68% of non-QMP respondents are in the process pursuing ABR certification
- 98% of respondents reported working full-time and the average number of years of FTE experience is 11.4



FACE VALIDITY CHECK AND DEMOGRAPHICS CHARACTERISTICS CHANGES

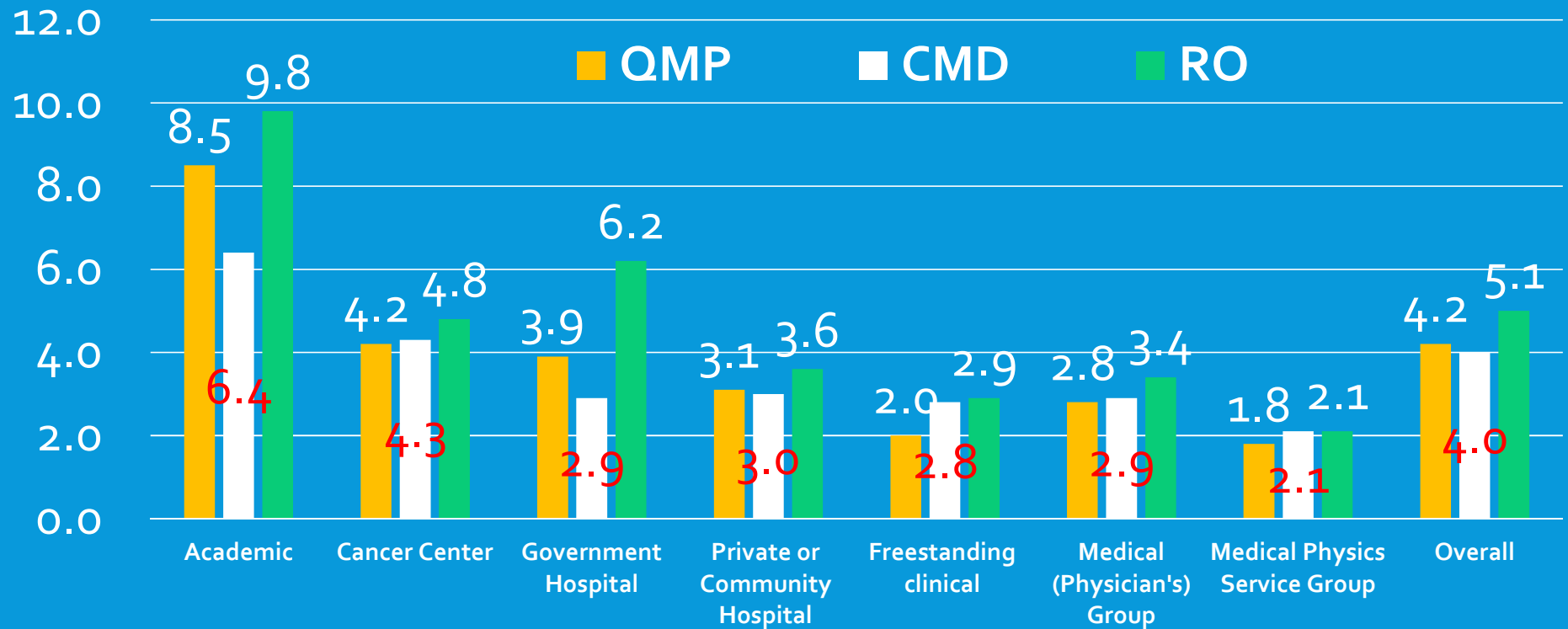


RESULTS: GEOGRAPHIC AND PRACTICE CHARACTERISTICS OF THE RESPONDENTS

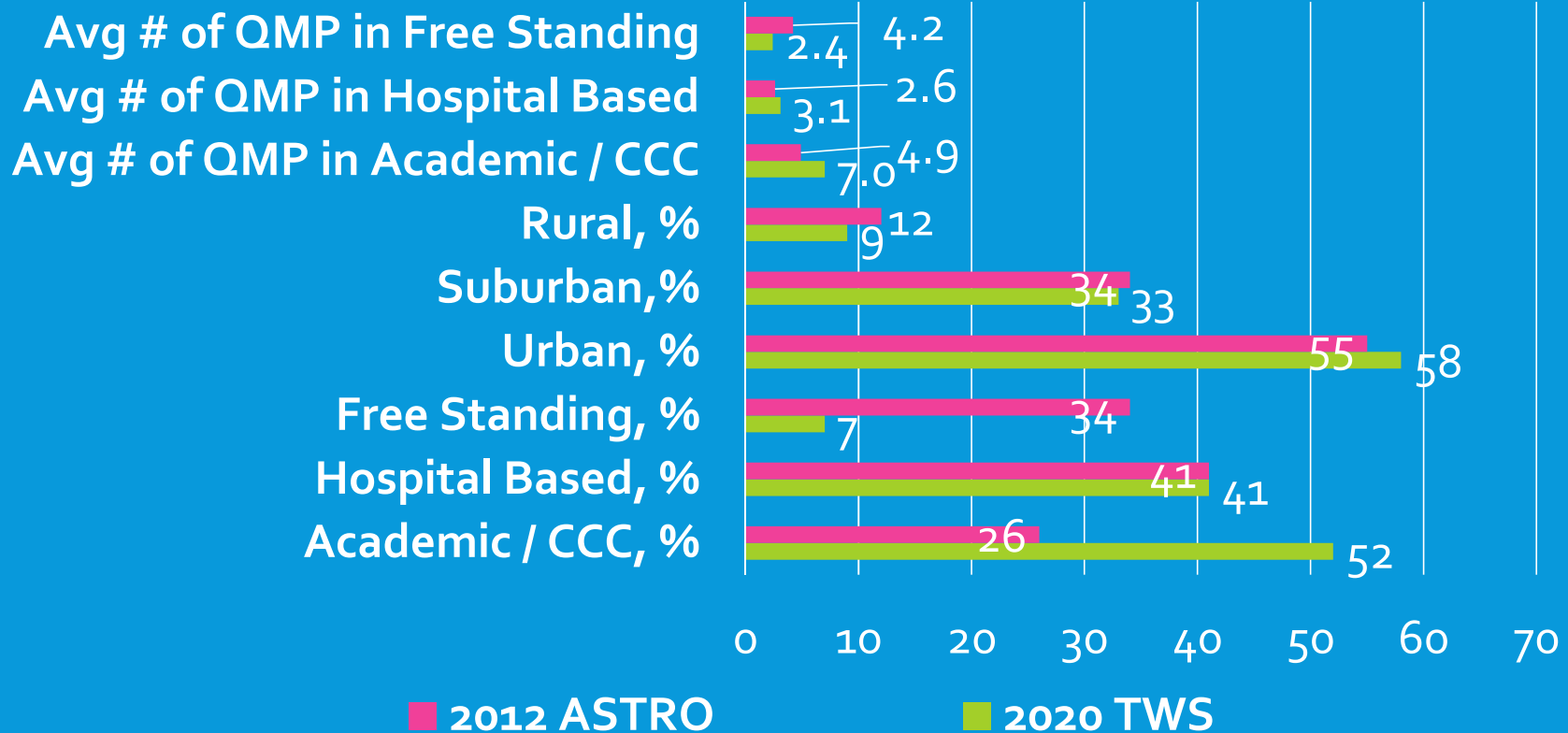
Primary Employer	Response Rate	Region	Response Rate
Medical School or University Hospital	33.9%	West	27.6%
Private or Community Hospital	33.2%	Midwest	25.6%
Cancer Center	13.6%	South	23.8%
Medical Physics Service Group	6.1%	Northeast	23.0%
Government Hospital	3.6%		
Freestanding clinical	3.3%	Community Type	Response Rate
Medical Physician Group	3.1%	Urban	57.5%
Industrial or commercial firm	1.5%	Suburban	33.2%
Individual Consultant	1.2%	Rural	9.3%



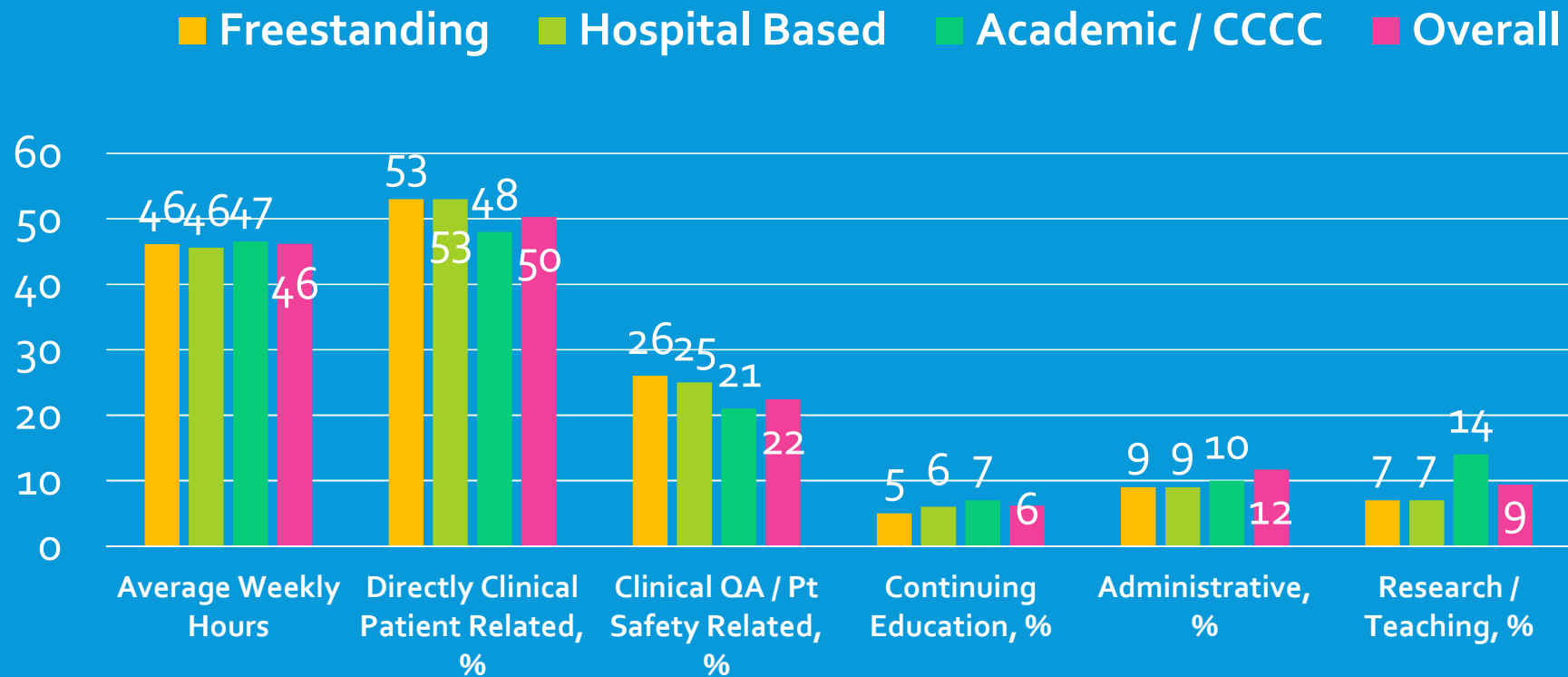
MEAN NUMBER OF QMPS, DOSIMETRISTS AND RADIATION ONCOLOGISTS BY PRACTICE TYPE



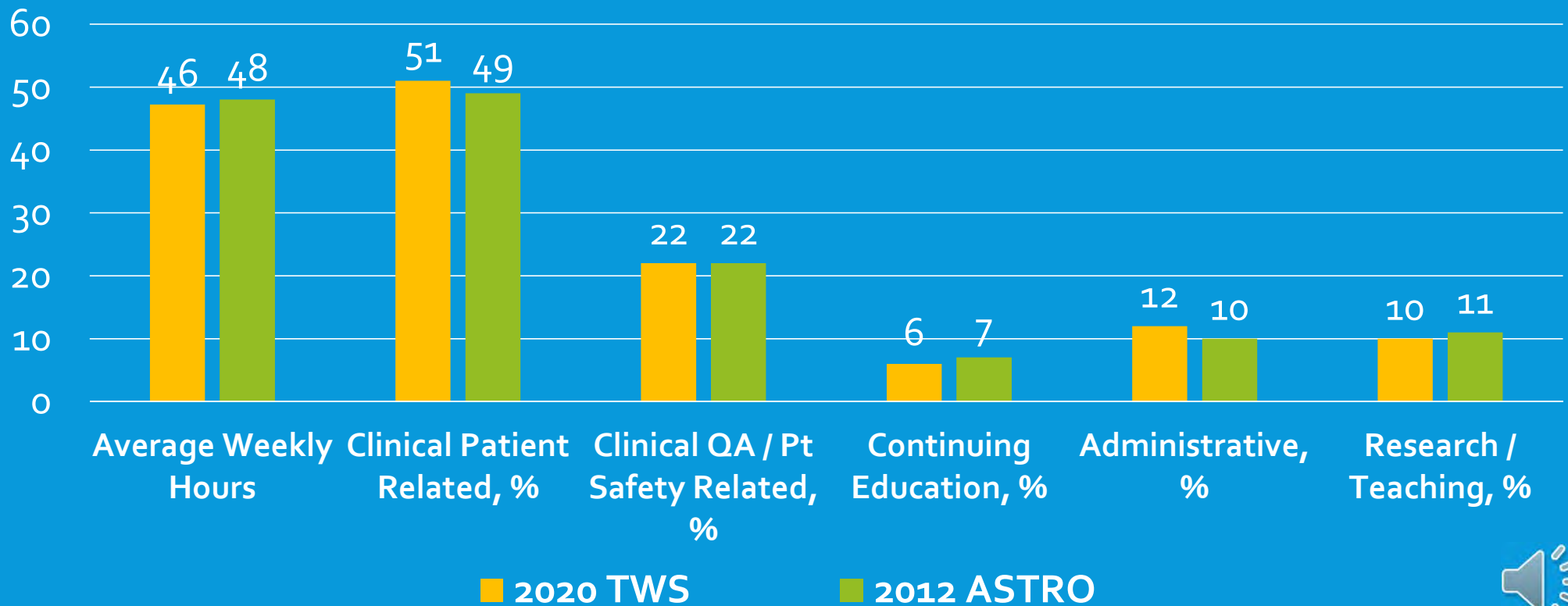
GEOGRAPHIC, COMMUNITY AND PRACTICE CHANGE



RESULTS: WEEKLY WORKING HOURS AND ACTIVITY TYPE

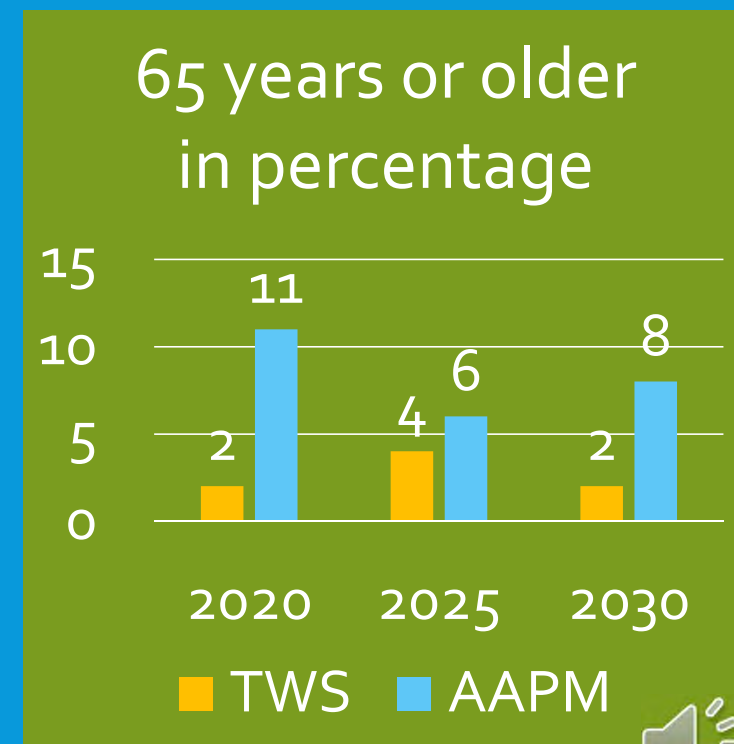


THE DISTRIBUTION OF SERVICE TIME AND TOTAL TIME IS LARGELY UNCHANGED BETWEEN 2012 AND 2020



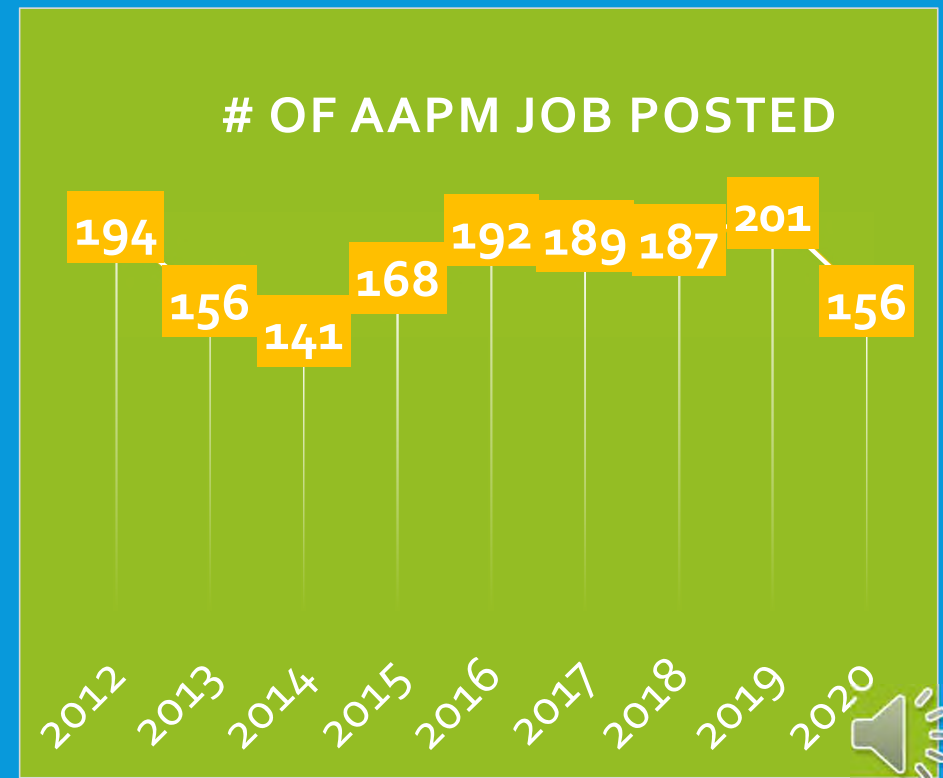
CURRENT STATE OF SUPPLY

- There is a total of 339 therapy physics residents, 150 admitted in 2018 and 149 admitted in 2019. 133 graduated in 2018 and 140 graduated in 2019. Resident number increased 12% in last 4 years
- 15% of responders plan to retire and 8% will be 65 or older within 10 years. 4% plan to retire within 5 years, 5% plan to retire within 6 to 8 and 6% plan to retire within 9 to 10 years
- 25% of AAPM members will be over 65 years of age by 2030



CURRENT STATE OF DEMAND

- America Cancer Society has reported that there is about 2% annual increase in cancer cases per year and data shown a 10% cancer case increase from 2012 to 2020.
- There were 201 unique positions in 2019, 156 unique positions in 2020. There was only 4% job posting increase from 2012 to 2020.



THE FACTORS AFFECTING SUPPLY AND DEMAND

- There are an increase in the number of CAMPEP residency programs and residents .
- Automation and AI technology adoption may improve efficiency and save time in long run but during implementation and adoption process, it will require more QMP time to commission, quality control and training.
- 50% of therapy physicist tasks can be performed remotely which saving travel time. QMP will be able to cover multiple sites easily.
- Market pressure, hypofractionation, radiation oncology reimburse model change, and there are very few sign up bonus observed with current job postings.
- 23% of respondents reported that they plan to increase their QMP to non-QMP ratio.

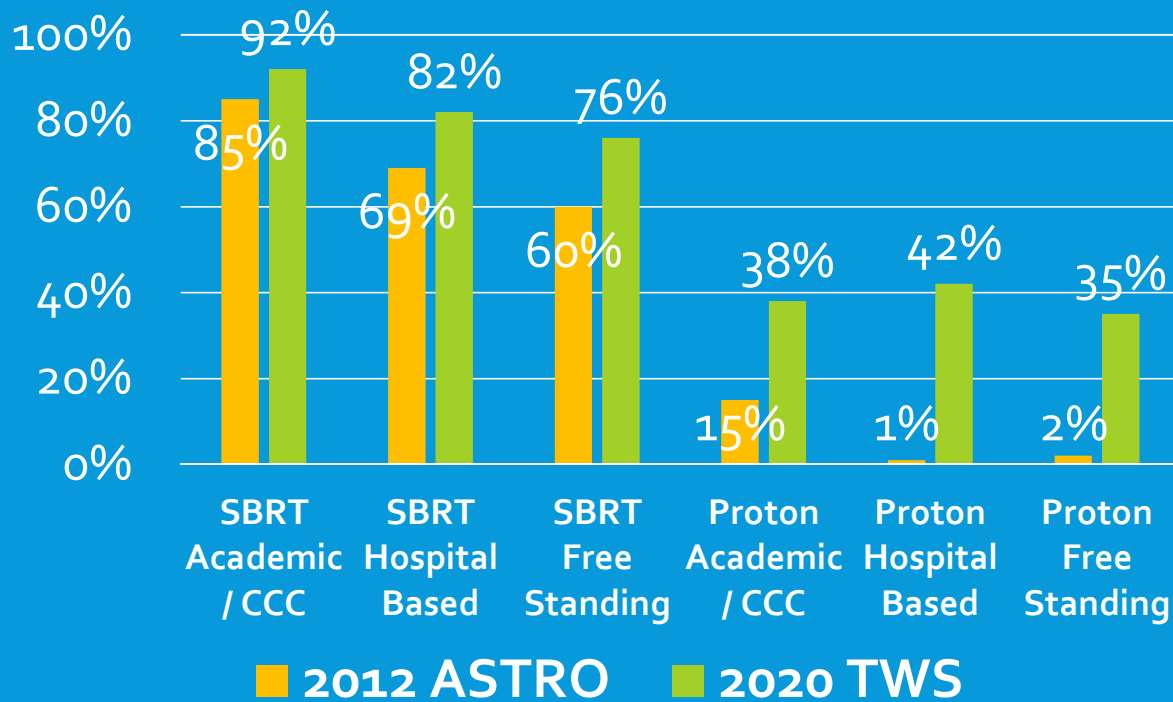


RESULTS: EQUIPMENT OWNERSHIP

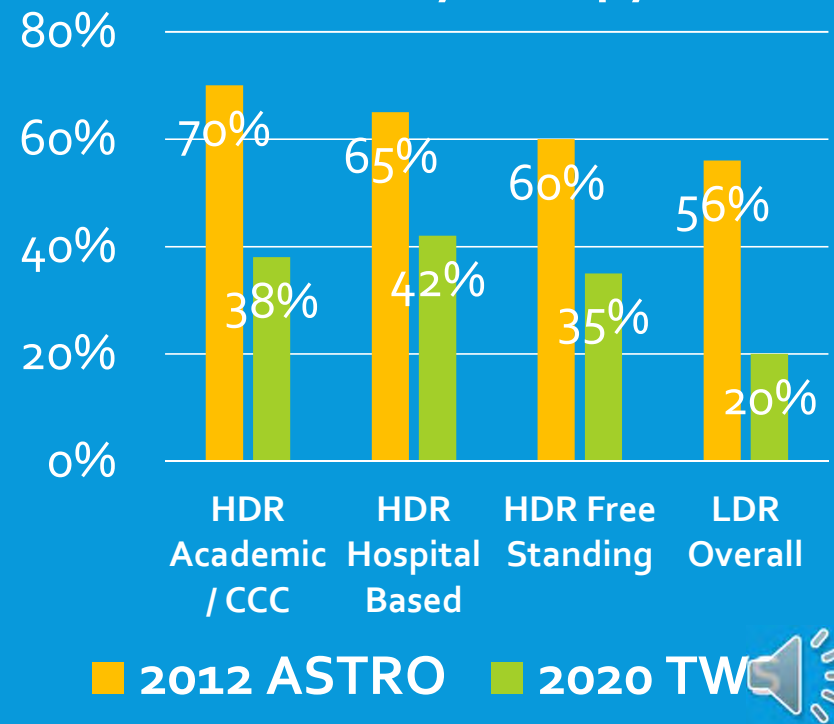
	Mean # of Linear accelerator with electron	Dedicated stereotactic linear accelerator	Tomotherapy or Halcyon	Proton units	Cyberknife Gamma knife	MR linear accelerator	HDR units	LDR+PSI	CT Simulator	PET/CT Simulator	MR Simulator
Academic / CCC	3.9	18%	11%	23%	17%	5%	38%	18%	64%	11%	9%
Hospital Based	2.6	13%	7%	2%	10%	0%	42%	26%	74%	10%	3%
Free Standing	1.3	19%	0%	0%	3%	0%	35%	14%	62%	35%	3%
Over All	2	19%	8%	13%	12%	2%	38%	20%	64%	12%	6%

TECHNOLOGY UTILIZATION CHANGES

SBRT and Proton



Brachytherapy

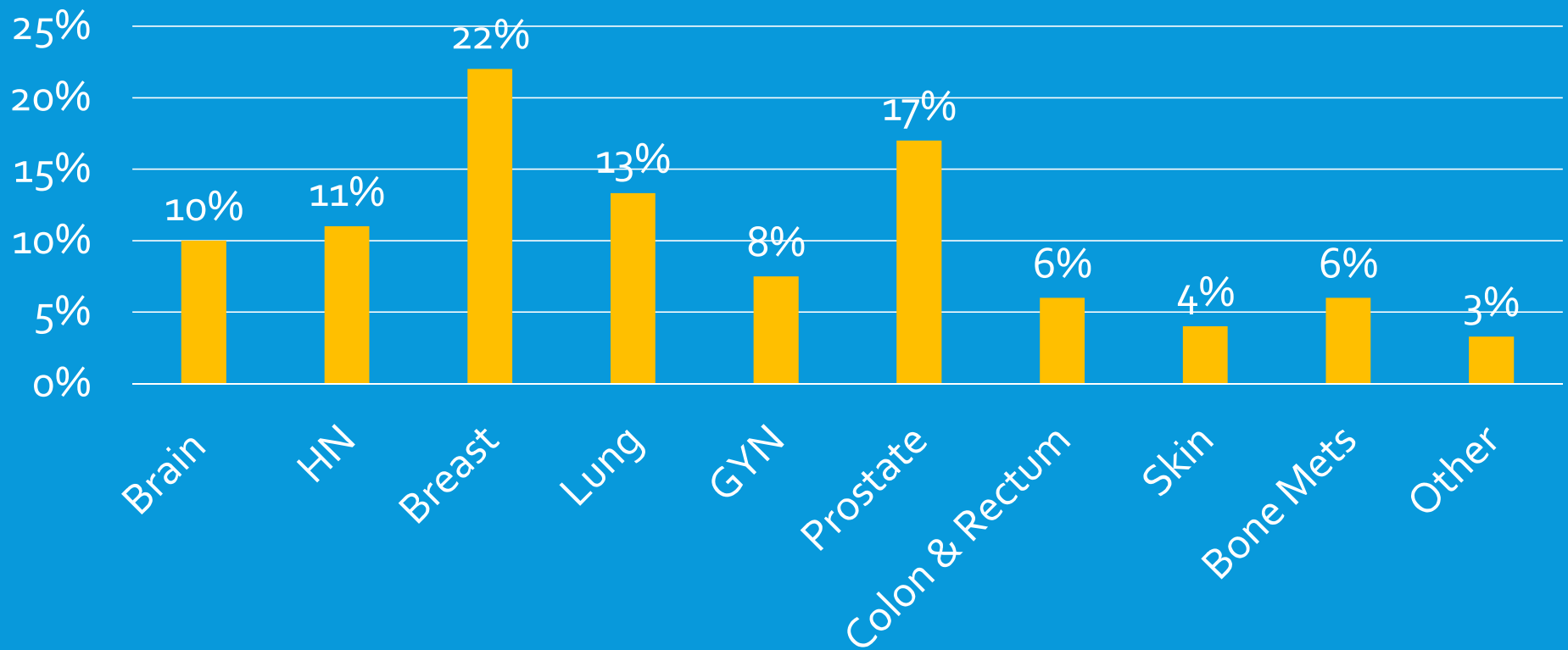


RESULTS: 2019 PATIENT LOAD

	Academic / CCC	Hospital Based	Free Standing	Urban	Suburban	Rural	Overall	Typical +/- 3%	More than Typical	Less than Typical
Less than 200	2%	3%	0%	2%	3%	3%	6%	55%	10%	35%
200 to 399	7%	17%	1%	9%	10%	5%	24%	45%	21%	23%
400 to 599	6%	9%	1%	8%	7%	2%	16%	44%	12%	44%
600 to 799	4%	6%	1%	5%	4%	1%	10%	61%	0%	39%
800 or more	28%	14%	1%	30%	10%	1%	43%	56%	14%	29%
Overall	48%	48%	4%	54%	34%	12%	100%	52%	11%	34%

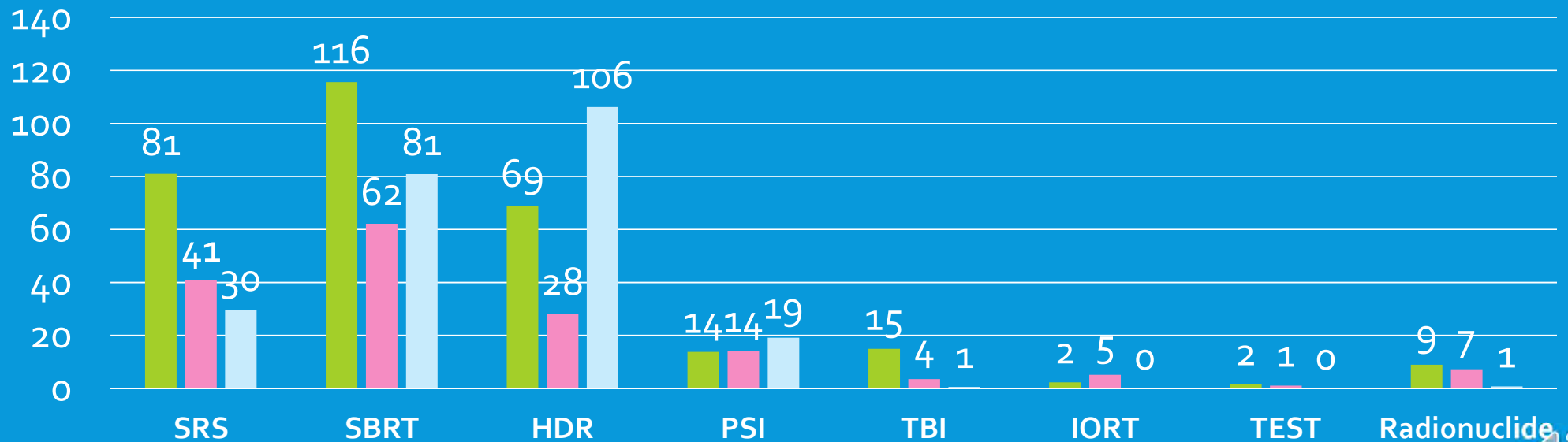


PERCENTAGE OF EACH CANCER TYPE TREATED IN 2019



RESULTS: NUMBER AND TYPE OF CASES TREATED IN 2019 PER PRACTICE TYPE

■ Academic / CCC ■ Hospital Base ■ Freestanding

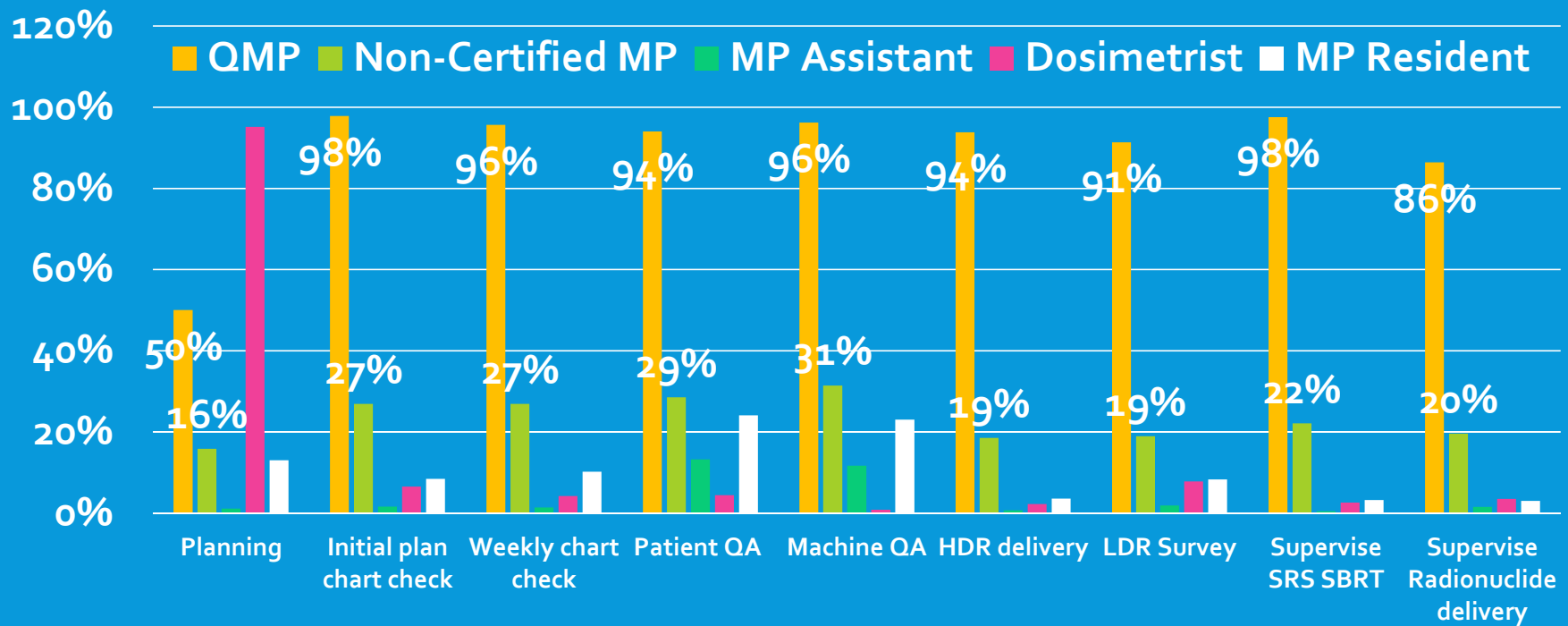


RESULTS: PATIENT TO TECHNICAL STAFF RATIO PER PRACTICE TYPE

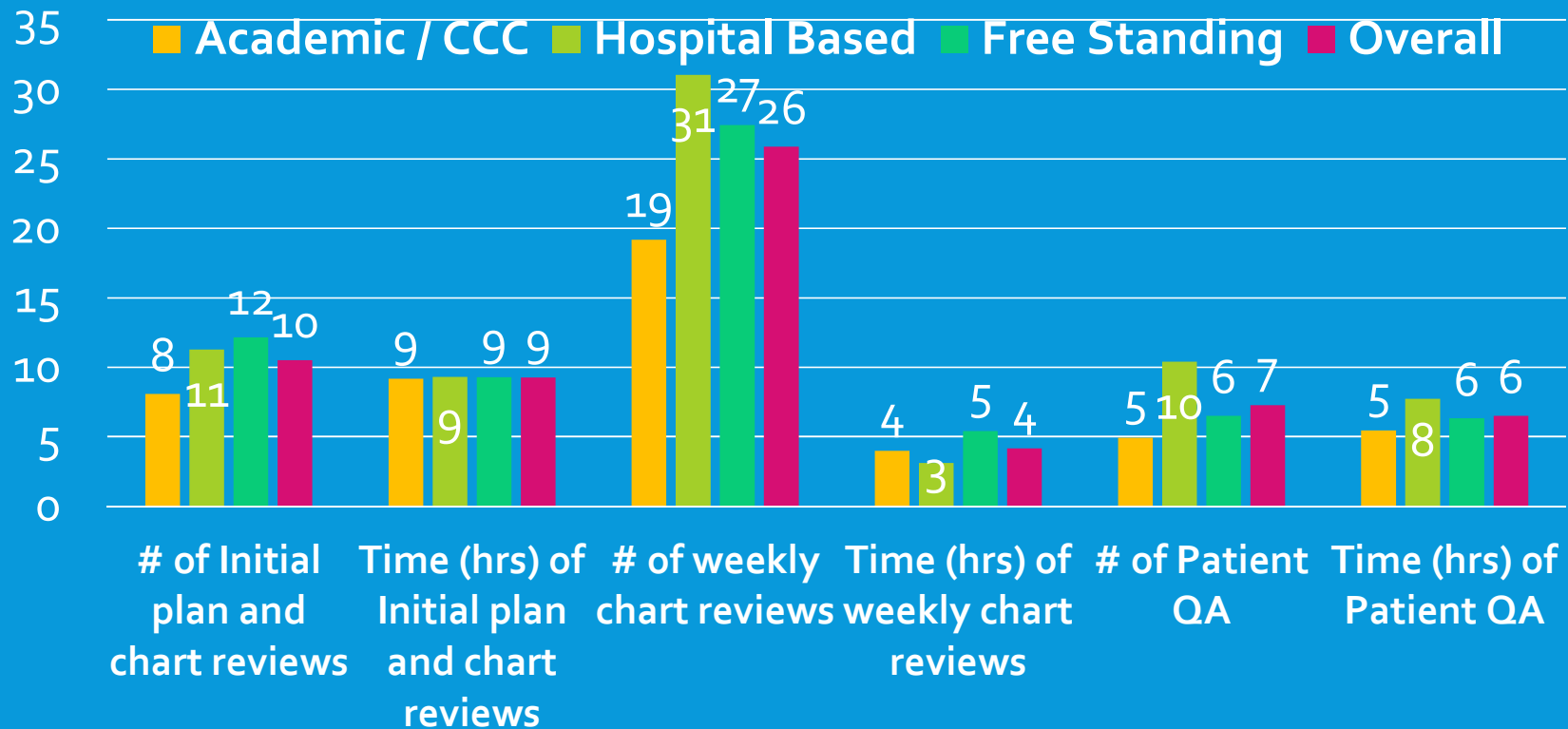
	Weekly Patient on RT per QMP	Weekly Patient on RT per Dosimetrist	Weekly Patient on RT per Radiation Oncologist
Overall	20.0	18.6	15.8
Cancer Center	22.7	19.0	16.3
Freestanding clinical	29.3	20.6	22.3
Government Hospital	15.9	19.0	10.3
Individual Consultant	25.0	25.0	25.0
Medical (Physician's) Group	25.8	23.9	25.5
Medical Physics Service Group	22.5	18.7	16.3
Medical School or University Hospital	13.6	15.9	11.4
Private or Community Hospital	21.6	19.5	17.8
Other (please specify):	22.5	22.5	12.5



RESULTS: WHO PERFORMS WHAT TASKS?



RESULTS: DIRECT PATIENT CARE ACTIVITIES AND TIME USED TO COMPLETE THESE TASKS PER WEEK

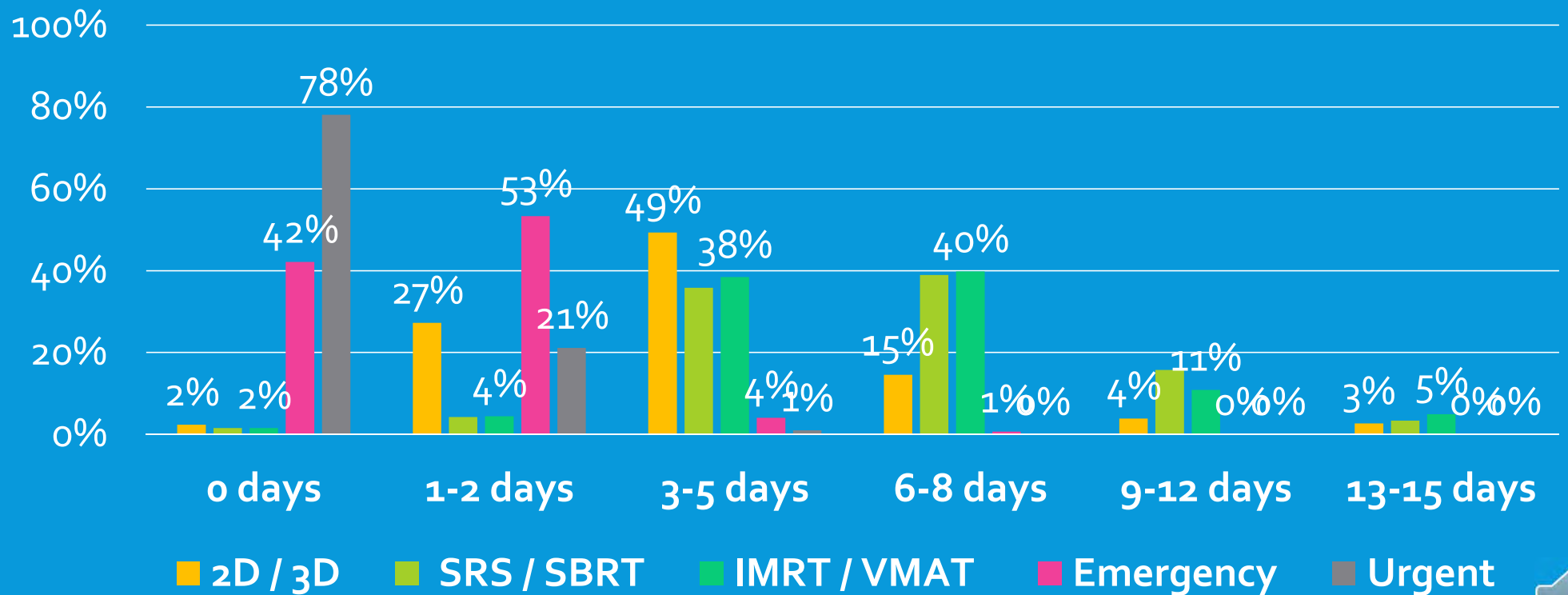


RESULTS: WORKLOAD - WEEKLY CLINICAL ACTIVITY AND DAILY PATIENT LOAD PER LINAC

	# Consults per week	# Simulations per week	# Patient on treatment	Patient / Linac	# of Linear accelerators
Academic / CCCC	28	24	78	20	3.9
Hospital Based	16	18	59	22	2.6
Freestanding clinical	11	10	41	22	1.3
Urban	25	23	77	22	3.5
Suburban	16	15	55	21	2.7
Rural	13	10	36	20	1.8
Overall	18	17	58	21	2.0

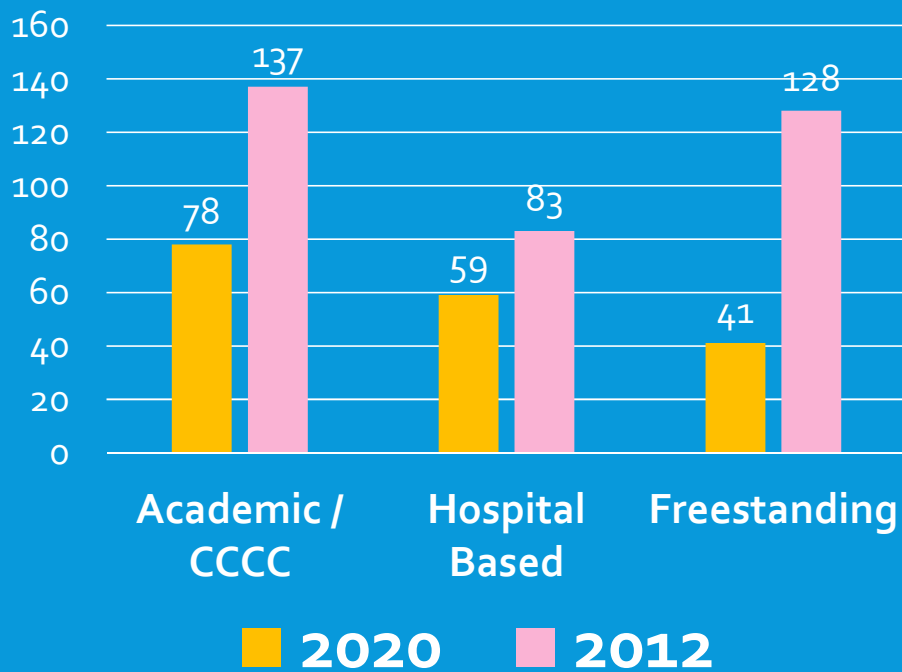


RESULTS: SIMULATION TO TREATMENT TIME

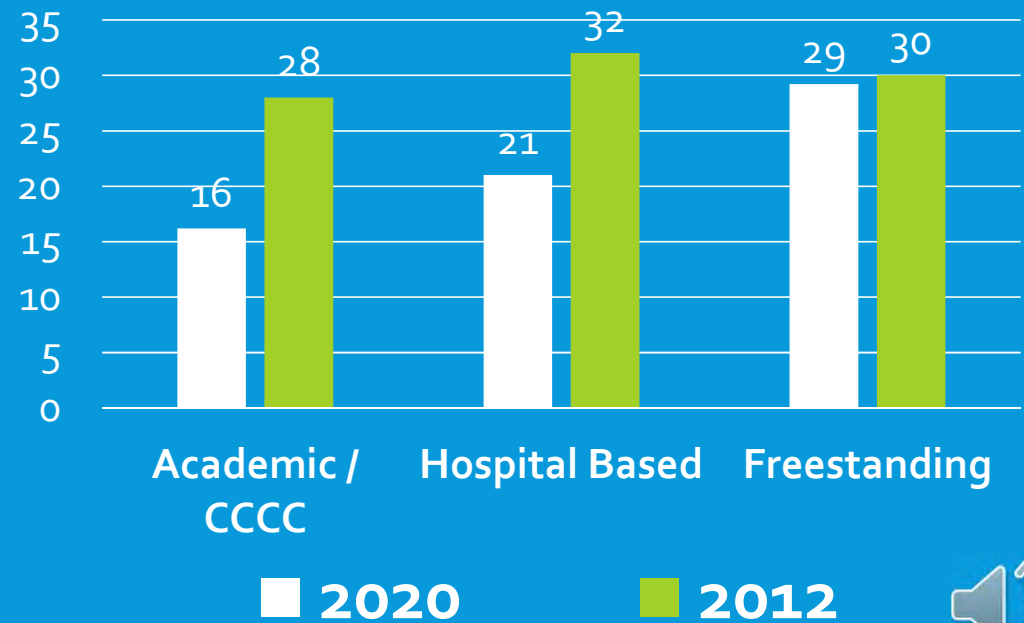


WEEKLY ON TREATMENT PATIENT VOLUME CHANGES

Patient on treatment



Patient on treatment per QMP



RELATIONSHIP BETWEEN STRESS LEVELS AND PATIENT LOAD

	Overall Response	Very Heavy > 130%	Heavy 116% to 129%	More than Average	Typical +/-3%	Below Average	Light 70% to 84%	Very Light < 70%
No Challenges	13.5%	8.2%	18.4%	20.4%	42.9%	4.1%	4.1%	2.0%
Minimal Challenges	29.7%	4.6%	13.0%	19.4%	46.3%	11.1%	4.6%	0.9%
Some Challenges	42.6%	2.6%	5.2%	21.9%	57.4%	8.4%	2.6%	1.9%
Major Challenges	11.0%	5.0%	5.0%	25.0%	50.0%	10.0%	5.0%	0.0%
Overwhelming Challenges - Burnout	3.3%	0.0%	0.0%	33.3%	50.0%	8.3%	8.3%	0.0%



WORK – LIFE BALANCE COMPARISON

Due to COVID 19 more respondents reported have some challenges to balance work and life but compare to 2012 dissatisfied to very dissatisfied, there are less reported having major challenge, overwhelming and burnout challenge.

Work-Life Balance	no challenges	minimal challenges	some challenges	major challenge	overwhelming - burnout
2020 TWS	13%	30%	43%	11%	3%

Time available for family and personal life	Very Satisfied	Satisfied	Neutral	Dissatisfied	Very Dissatisfied
2012 ASTRO	4%	34%	22%	32%	8%

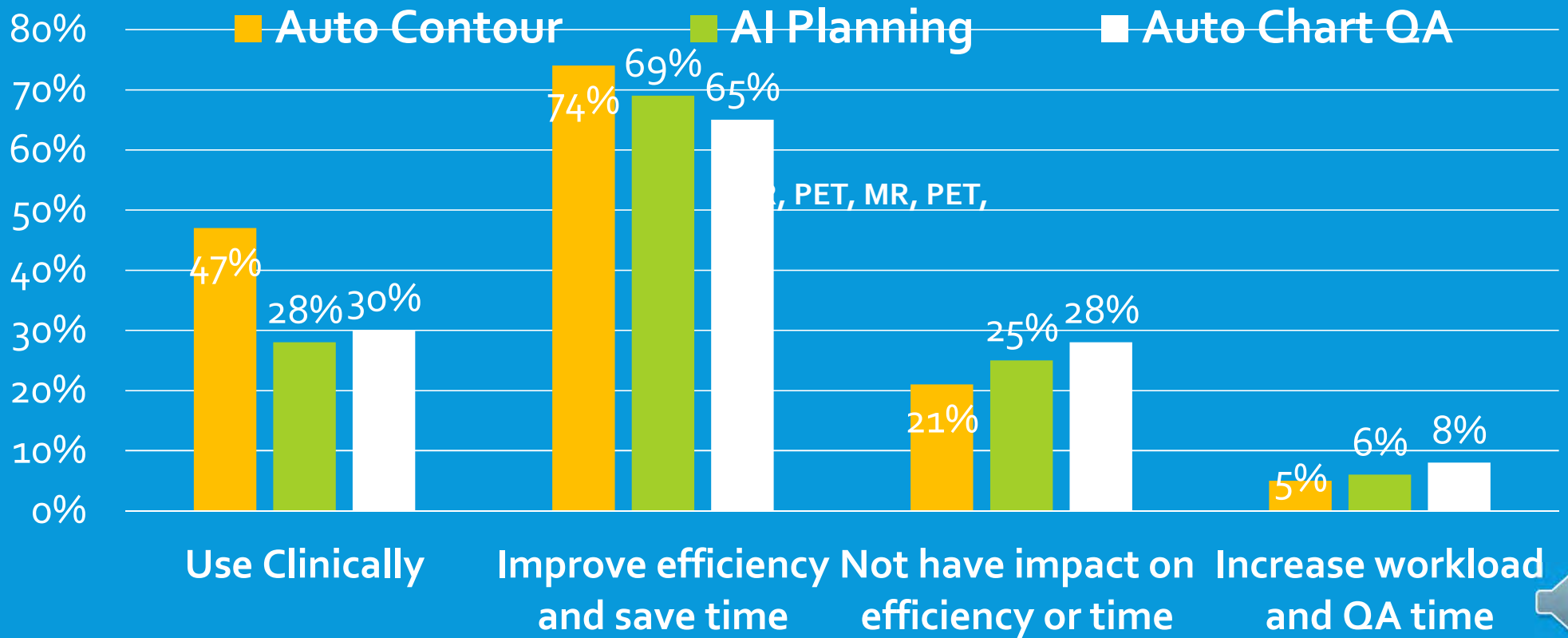


RESULTS: KNOWLEDGE AND EDUCATION IN ADVANCED PROCESS ANALYSIS TOOLS FOR PATIENT SAFETY

I lack advanced process analysis knowledge and I need to be educated	17%
I have some advanced process analysis knowledge; I need more continuing education	44%
I have adequate knowledge of advanced process analysis tools used clinically	22%
I am comfortable using advanced process analysis tools for research and development	10%
I don't want to answer this question	7%



RESULTS: DO AUTOMATION AND AI TECHNOLOGY ADOPTION IMPROVE CLINICAL EFFICIENCY AND SAVE TIME?



SUMMARY:

- Compare to 2012, the practice type has shifted more toward Academic and Comprehensive Cancer Center(CCC) in urban area and the number of therapy physicists practicing within the same group has grown larger. Overall there are 4.2 QMPs, 5.1 Radiation Oncologists and 4.0 Dosimetrists per practice.
- There are great increase in utilization of CBCT, SRS, SBRT, Proton, MR, PET, automation, and AI technologies. There is a 33% decrease in brachytherapy utilization.
- The average weekly working hours is 46 hours. Due to hypofractionation, average on treatment patient load has decreased to 20 per QMP, 1/3 less than 30 per QMP in 2012, while patient plan complexity has greatly increased.



SUMMARY AND DISCUSSION:

- The majority of respondents, 52% reported that they have typical patient load and 43% reported that there are some challenges to manage is this typical patient load.
- Current QMP supply and demand is balanced. Cancer cases will increase at 2% per year. By 2030, 25% therapy physicists will be 65 or older and plan to retire within 10 years.
- The supply and demand of radiation therapy QMPs will be highly influenced by the rate of increase of the number of residency programs, automation, clinical adoption of AI technology, implementation of remote clinical support and market pressure from hypofractionation and reimbursement model change.



SUMMARY AND DISCUSSION:

- QMPs spent 51% of their time on direct patient-related clinical work and 22% of their time on patient QA tasks. There reflects very little change on the time spent on each type of activity from 2012.
- On average a QMP spent 9.2 hours to perform 10 initial plan and chart reviews, 4.2 hours to perform 26 weekly chart checks and 6.5 hours to perform 7 patient QAs per week.
- Enable safely and effectively implement automation and AI technology, QMP need more education in advanced process analysis and 61% reported they need more continuing education in this area.



CHALLENGES, OPPORTUNITIES AND STRATEGIES

- Population getting older faster and cancer cases may increase faster than 2% per year and may be more than 25% therapy physicists will retire or leave healthcare field within 10 years.
- Hypofractionation, reimbursement model changes and increase the ability to remotely support the clinic create market pressure to reduce labor costs .
- Develop and increase automation & clinical adoption of AI technology require more QMP manpower in early stage.
- Increase number of therapy physics residents 3% per year for next 10 years could keep QMP supply and demand well in balance.
- Need collect more data in 5 years to reassess the rate of automation, AI technology adoption and reevaluate the supply and demand of QMP.





Question?

Thank you !

