Technical Report #1

Executive Summary - Medical Dosimetry Workforce Study

Final Report

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Technical Report #1 – Executive Summary - Medical Dosimetry Workforce Study

Background and Methods

In 2020, Michael D. Mills Ph.D., Brown Cancer Center, Department of Radiation Oncology, School of Medicine, University of Louisville and Christine M. Swanson, Ph.D., Department of Radiation Oncology, Baptist Health Louisville, funded by the American Association of Medical Dosimetrists (AAMD), conducted a series of investigations with selected Medical Dosimetrists and other Radiation Oncology Professionals to identify emerging issues in the field of Medical Dosimetry. This report is an Executive Summary that describes the findings from this Workforce Study.

This report was prepared by Michael D. Mills, Ph.D., with the assistance of Christine M. Swanson, Ph.D. The authors are indebted to the Medical Dosimetrists and other professionals who responded or participated with this project. Special thanks are also extended to the Brian N. Napolitano, CMD and Stacey Wilson, AAMD Executive Director, who were instrumental in survey review and completion. The contributions of the AAMD MedDos Infinity Task group with participation, assistance and input from the Board of Directors and Formal Education Committee of the AAMD are also gratefully acknowledged. Responsibility for the accuracy of the report rests solely with the authors.

The AAMD is a scientific, educational, and professional organization representing Medical Dosimetrists. The purposes of the organization include promoting the application of Dosimetry to radiation oncology, establishing and maintaining professional standards for Medical Dosimetrists, and encouraging interest in the field of Medical Dosimetry. Founded in 1976, the AAMD currently has more than 3,000 members. Questions about this report may be directed to Michael D. Mills, Ph.D. at mdmill03@louisville.edu.

Workforce Study activities included:

- **Technical Report #2 – Membership Workforce Survey of Currently Active Medical Dosimetrists -** a survey of all currently active Medical Dosimetrists and Medical Dosimetrists in training, including students, residents, educators, consultants, and employed Medical Dosimetrists conducted in 2020 (N=3,052, response rate 31.3%);
- **Technical Report #3 – Staffing Model for Medical Dosimetry Practice -** a planning activity-based model to predict Medical Dosimetrist staffing at the median planning efficiency for the radiation oncology industry;
- **Technical Report #4 – Future Trends in the Supply of and Demand for Medical Dosimetrists -** development of simulation models to project supply and demand for Medical Dosimetrists over the next 15 years under a number of training scenarios using data collected in the annual AAMD Salary Surveys, information from the AAMD headquarters, information from the Medical Dosimetrist Certification Board (MDCB) headquarters, and the 2020 Membership Survey;
- **Technical Report # 5 – Survey of Radiation Oncology Professionals** - survey of a number of Radiation Oncology Professionals knowledgeable about the Medical Dosimetry profession and who work directly with Medical Dosimetrists to illuminate how other professionals view the Medical Dosimetry profession;
- **Technical Report #6 – Interviews with Selected Medical Dosimetrists** – interviews with a number of Medical Dosimetrist volunteers who wished to share their views and concerns concerning Medical Dosimetry practice; and
- **Conclusion – Overall Summary of the AAMD Workforce Study**

Reports were produced that described findings from each of these activities. These reports are available from the AAMD. The following is a summary of key findings for the entire project.

Project Goals

The overarching goal of this workforce study is to help the AAMD and other stakeholders understand the current state of the Medical Dosimetry workforce as the profession prepares for future growth and development. The initial task in the study was to compile all existing data relevant to the workforce and education pathways of Medical Dosimetrists, with special attention to identifying any information gaps that must be filled by some sort of data collection process. The six reports were designed to measure the unknown information needed to inform the profession and its leadership. So what did the AAMD get out of these components and objectives?

- Delineation of the current demographic makeup of the Medical Dosimetry workforce
- Expression of the Medical Dosimetrist role in the clinic
- Quantification of the work metrics of the Medical Dosimetrist
- A working assessment of the future supply and demand for adequately trained Medical Dosimetry professionals

Technical Report #2 – Membership Workforce Survey of Currently Active Medical Dosimetrists
Background and Methods

Survey questions asked about demographic information, educational and career pathways to the profession, certification, current professional activity, and future plans. The survey also solicited opinions and attitudes of Medical Dosimetrists on a number of subjects relevant to current professional issues. Each question provided defined response options including, in some cases, an "other" category with the opportunity to describe the meaning of "other" if that response was selected.

The survey asked a comprehensive set of questions, many of which had previously been queried during the compilation of the AAMD's 2012 Workforce Survey. Efforts were made throughout this report to compare and contrast the results of those questions for both efforts. Some questions were targeted to particular segments of the Medical Dosimetry population, as survey respondents were directed to pertinent components based on their responses to key questions. As a result, the following report provides both general information about the entire Medical Dosimetry population as well as particular information about Medical Dosimetrists who consult, who recruit other Medical Dosimetrists, who are directly employed in clinical settings, and about students. Additionally, questions were developed to explore the saturation and utilization of new radiation oncology technologies, such as artificial intelligence (AI), image fusion, special Dosimetry procedures, how chart rounds are performed, peer review, adaptive therapy, and how Medical Dosimetry practice has changed with the advent of the COVID-19 pandemic.

Michael D. Mills, Ph.D., designed the online survey instrument on the Survey Monkey platform. In all, 3,052 members of AAMD were solicited to participate in the survey. The survey was closed on July 28, 2020 with 956 responses, for a response rate of 31.3%. The online responses were downloaded into an electronic database. Standard data editing and cleaning procedures were performed in order to maximize the accuracy and consistency of the data elements at which time the data was placed into an SPSS database for analysis.

Summary of Results

- Demographics – Between 2012 and 2020, the median age of Medical Dosimetrists increased slightly from 46.5 to 47.0 years. In 2020, 86.1% of respondents were US Citizens; in 2012 this number was 89.8%. There is a growing percentage of Medical Dosimetrists who hold citizenship in countries other than the United States or Canada. Medical Dosimetry is largely comprised of white individuals with significant Asian diversity. In 2020, a majority (83.3%) indicated white race, 5.3% indicated Hispanic origin, 2.9% indicated Black, African American, 2.4% indicated Chinese, and 2.5% indicated Asian Indian. In 2012, a majority (88.2%) indicated white race, while 2.7% indicating Hispanic origin, 2.4% indicated Black, African American, 1.8% indicated Chinese, and 1.5% indicated Asian Indian.

- Entry into Medical Dosimetry – In 2020, although a majority (53.5%) of Medical Dosimetrists were trained on-the-job, there is a large plurality (43.9%) of Medical Dosimetrists who completed a formal education and training program. In 2012, a large majority (80.8%) of Medical Dosimetrists were trained on-the-job, with a small cohort (8.2%) indicating they completed a formal education and training program. In 2020, free-text responses indicate the most common occupation (approximately 50%) before entering Medical Dosimetry was Radiation Therapy, with various other technical professions mentioned. Approximately 25% indicated some sort of previous career in healthcare, and 25% entered the Medical Dosimetry profession from outside the healthcare industry. This is essentially the same finding as in 2012. For both 2020 and 2012, approximately half of the Medical Dosimetry workforce has worked in Medical Dosimetry for 7 years or fewer. In 2020, over half of respondents indicated learning about Medical Dosimetry during their undergraduate education. This correlates with some of the young ages of respondents indicating they completed their education programs and were first employed as Medical Dosimetrists. In 2012, the results were very similar with just over a majority of Medical Dosimetrists indicating they learned about the profession as a student. In 2012, 34.0% of Medical Dosimetrists indicated that they learned about the Medical Dosimetry profession during other employment.

- Education and Training – In 2020, over 90% of Medical Dosimetrists have achieved or are enrolled in a program at the Bachelor's level or higher. In 2012, 66.0% of Medical Dosimetrists were enrolled or achieved a Bachelor's level or higher. The educational advancement of Medical Dosimetrists over these eight years is significant and very impressive. The existing standard is for Dosimetry programs to be Joint Review Committee for Education of Radiologic Technology (JRCERT) accredited. Even though this is a relatively recent requirement, over 75% of respondents graduated from or are currently enrolled in a JRCERT accredited program.   In 2020, clinical training for the Medical Dosimetrist community is still dominated (over 60%) by those who participated in on-the-job training. This percentage is expected to decrease slowly over time. In 2012, the vast majority (slightly over 80%) of Medical Dosimetrists were trained on-the-job.

- Certification – In 2020, MDCB Certification is the de-facto established credential for a career in Medical Dosimetry and almost 99% of Medical Dosimetrists either have or plan to obtain it. Only a little over 1% of respondents do not plan to acquire this credential. In 2012, 92.0% of Medical Dosimetrists were certified in Medical Dosimetry and an additional 2.0% were in the process of certification. In 2020, it is notable that over two-thirds (67.0%) of respondents indicated they hold the ARRT R.T. (T.) Radiation Therapy certification. This matches almost exactly the percentage of respondents (68.2%) who indicated they held this certification in 2012.   About 80% of Medical Dosimetrists acquired MDCB certification in the year 2000 or afterward. This implies the Medical Dosimetry workforce is contemporary with respect

to its credentialing.

- Current Professional Activity – Medical Dosimetrists indicate over 70% of their work is photon or electron external beam. Most small percentages are associated with external beam particle therapy, Linac radiosurgery, brachytherapy, simulation and quality assurance. In 2020, about 15% of Medical Dosimetrist employment still allows non-certified professionals to perform the work of a Medical Dosimetrist. In 2012, about 24% of respondents indicated that their place of employment allowed Medical Dosimetrists to be employed without MDCB Certification. The 2020 Survey of Radiation Oncology Professionals reported that 67% of respondents strongly agree and 27% of respondents agree that Certification by the MDCB should be a requirement to practice Medical Dosimetry.

- Supervision – In 2020, about 33% of Medical Dosimetrists in a supervisory role do not supervise any Medical Dosimetrists. About 33% supervise 4 or fewer Medical Dosimetrists. About 33% supervise 5 or more Medical Dosimetrists. In 2012, about 22% of Medical Dosimetrists in a supervisory role did not supervise any Medical Dosimetrists. About 69% supervised 4 or fewer Medical Dosimetrists, and around 9% supervised 5 or more Medical Dosimetrists.

- Work Effort – Before the COVID-19 pandemic, the average Medical Dosimetrist worked 41.0 hours per week in their primary work setting. More than 30% of Medical Dosimetrists worked more than 40 hours per week, while only about 10% of Medical Dosimetrists work less than a 40-hour week. During the COVID-19 pandemic, the average Medical Dosimetrist works 34.6 hours per week in their primary work setting. Almost 40% of Medical Dosimetrists are working a 40-hour work week, 20% work more than 40 hours per week, and about 40% work less than a 40-hour week.

- Consulting – Approximately 5% of Medical Dosimetrists provide consulting services in addition to primary employment. Most consulting Medical Dosimetrists provide up to 10 hours per week consulting or contracting services. Academic centers are less likely to employ consulting Medical Dosimetrists than the other clinical employment venues.

- Academic Efforts – In 2020, 24.0% of Medical Dosimetrist respondents participated in a training program for Medical Dosimetrists. In 2012, this number was 18.6%. Almost 30% of Medical Dosimetrists who participate in a training program hold some type of traditional academic appointments. Less than 2% of respondents hold a professorship. Many education and training sessions are now performed remotely, using online instruction platforms. Some planning instruction is now performed remotely.

- Income – The 2020 average reported salary of $123,343 may be compared to the 2012 average of $102,040. A 2020 starting salary of about $92,000 is a significant advantage over starting salaries for Radiation Therapists and others working in Radiology/Radiation Oncology professional positions. This has increased from $82,500 in 2012. In 2020, about 70% of Medical Dosimetrists are salaried employees. This number is higher than in 2012, when about 60% were salaried.

- Recruiting – Only about 40% of respondents are involved with the hiring of Medical Dosimetrists. In 2020, the Preferred qualifications for employment in order of importance were: 1) experience in Medical Dosimetry, 2) MDCB Certification, 3) graduate of JRCERT program, 4) Bachelor's degree, and 5)

Master's degree. This order listing is unchanged from 2012. In 2020, about 60% of open positions were filled within three months, but almost 30% stay open for six months or longer. In 2020, years of Medical Dosimetry experience seem to hold some advantage, but about 30% are hired without clinical experience outside of a training program. The average number of years of experience for the successful candidate was 5.3 years. In 2012, about 26% of successful candidates did not have any experience in Medical Dosimetry. The average years of experience for a successful candidate in 2012 was 1.9 years.

- Future Plans – In 2020, most Medical Dosimetrists expect to remain in their current position for the next year and have varying plans for the next five years. Results are similar to those measured in 2012. Approximately 88% of respondents would recommend Medical Dosimetry as a career with fewer than 4% saying they would not. The profession enjoys very strong support among its members.

- Attitudes and Opinions – Approximately 70% of respondents agree or strongly agree they are adequately compensated for their work and the responsibility they assume. There is general support (over 70% agree or strongly agree) for the diversity of education backgrounds within the Medical Dosimetry profession. This finding is similar in the 2012 survey. The 2020 Survey of Radiation Oncology Professionals also supports this diversity, but not quite as strongly. In the 2020 survey, there is strong but not universal consensus that remote planning is just as effective and beneficial to the patient as onsite planning. However, the 2020 Radiation Oncology Professionals survey does not support this consensus as these professionals are not yet convinced that remote planning is equivalent to on-site planning. In the 2020 survey, over 50% of respondents disagree or strongly disagree that Master's level Medical Physicists with American Board of Radiology (ABR) Certification are qualified to perform all of the work responsibilities of a certified Medical Dosimetrist. This is in contrast to the 2012 survey in which there was no consensus to this question. In the 2020 and the 2012 survey, there was no consensus among respondents as to whether Master's level Medical Physicists should be allowed to take the MDCB examination.

- Technology – About 60% of respondents report that their clinic uses some arrangement for remote planning. Deformable fusions have not yet entered all clinics that perform fusion, but this technology has achieved widespread adoption. 92% of respondents indicate that Medical Dosimetrists perform fusions in the clinic. Respondents report that Medical Dosimetrists (over 90%) and physicians (about 40%) are primarily responsible for contouring organs at risk. Automated contouring is still a future clinical technology according to almost 80% of respondents. Over 95% of respondents indicated the QA process did not change due to the COVID-19 pandemic. For those that did change, the free text responses suggest radiation therapists were more involved in the QA process. About 30% of respondents report that adaptive therapy is offered in their clinics.

Technical Report #3 – Staffing Model for Medical Dosimetry Practice
Background and Methods
In the past various references have been used to estimate Medical Dosimetrist staffing from clinical activity. Most recently, the American Society for Radiation Oncology (ASTRO) published an updated version of *Safety is No Accident* (SINA), which includes a staffing matrix for various Radiation Oncology role groups, including Medical Dosimetrist staffing. Also, the Time and Work Survey from the 2012 AAMD Workforce Study (Project #2) contains a robust method for determining Medical Dosimetry staffing. Both of these studies had their disadvantages. The SINA matrix was limited in execution to facilities employing 6 or fewer Medical Dosimetrists.

The 2012 Time and Work Survey staffing method is very complex, requiring the evaluation of a number of CPT codes to predict staffing. The method used in this 2020 model is very simple, requiring only two inputs.

The most consistent and valuable process was to use a simple metric common to the great majority of Medical Dosimetrists and their work. Medical Dosimetrists uniquely spend the vast majority of their time performing external beam treatment plans. The Staffing Matrix uses data from questions #74 and #75 from the 2020 AAMD Workforce Survey detailed in Technical Report #2. While the FTE Medical Dosimetrist effort among and between programs might vary substantially, the resulting fractional FTE planning efforts should be proportional to the total FTE effort of a Medical Dosimetrist, including clinical non-planning work and non-clinical work for the community overall. It is noteworthy that this method of predicting staffing appears to be valid even for larger facilities. A sample report form for Medical Dosimetrist Staffing as developed is included below.

Medical Dosimetrist Staffing Matrix				
Number of Patient Procedures	**Annual Plans**	**# of Plans**	**Relative FTE Factor**	**Required Total FTE**
	Standardized Plans*	1200	**0.0027**	3
	Advanced Plans**	1600	**0.0036**	6
Nonclinical Estimated Total FTE Effort	**Estimated Total FTE Effort**	**FTE Effort**		
	Education & Training (FTE)	0.1		0.1
	Report Generation (FTE)	0.1		0.1
	Meetings (FTE)	0.1		0.1
	Administration (FTE)	0.2		0.2
			Subtotal	0.5
			Total	9.5

* Standardized plans include 3D and complex plans
** Advanced plans include IMRT/VMAT, SRS, SBRT, adaptive and dose accumulation plans

This Staffing Matrix should be used with care and with the understanding it represents typical staffing for a clinic with a common patient mix, an average inventory of equipment, and a representative mix of routine and special procedures. The range of reported Medical Dosimetrist staffing indicate many facilities do not have typical practices and service procedure mixes. The data suggests that even large systems and institutions have significant variability in their clinical processes resulting in a need for greater or fewer Medical Dosimetrists.

Technical Report #4 – Future Trends in the Supply of and Demand for Medical Dosimetrists
Background and Methods

The goal of this project is to determine a reasonably accurate projection of workforce supply and demand. If too few training positions are available, the resulting undersupply could result in extended working hours and a lower quality of life. If too many Medical Dosimetrists are trained, the resulting oversupply could lead to unemployment and lower wages. As the profession looks forward, it is important to evaluate the number of training positions that will be required as the profession faces ever evolving challenges.

The major issues facing Medical Dosimetrists between 2020 and 2035 are:
- Cancer incidence is continuing to grow and is projected to continually increase approximately 2% annually, leading to an increase of approximately 30% by 2035.
- The 2017 requirement of completion of a JRCERT-accredited program for MDCB certification continues to be the driving factor controlling the supply of Medical Dosimetry professionals.
- The percent rate of retirement is continuing to rise and is anticipated to peak between 2025 and 2030 based on professional demographics.
- The growth and evolution of artificial intelligence integration into treatment planning continues to shape the work of the Medical Dosimetrist and will continue to evolve and impact demand of the workforce. Additionally, there is a shift to a more remote workforce in response to the COVID-19 pandemic.   This shift has imposed some limitations on clinical training sites.

An increasing incidence of cancer would increase demand for Medical Dosimetry services while greater efficiencies in treatment plan optimization might decrease demand. Having more or larger training programs would increase the supply of Medical Dosimetrists, while increasing retirement rates might decrease the supply. It is therefore important to identify and quantify as many factors as possible that influence both the demand and supply of Medical Dosimetrists.

Summary of Results:

The model was first run with no changes to the demand for Medical Dosimetry professionals using current trend data or the current enrollment in Medical Dosimetry formal educational programs which anticipates approximately 175 graduates annually.   The model demonstrates these graduating numbers of Medical Dosimetrists are currently at almost pure equilibrium with demand in 2020 but are beginning to create an undersupply.   Although in 2020 supply approximately equals demand, between 2021 and 2035, the undersupply will grow from 10 to nearly 50 Medical Dosimetrists less than the number of positions open per year. The model predicts the undersupply is expected to steadily increase with the continued increase in cancer incidence as well as the surge in retirement around 2028-2030 when all baby boomers will be over 65 leading to a possible surge in retirement rates.

The cumulative effect will be a potential shortage of over 400 Medical Dosimetrists by 2035 given no changes in workload per Medical Dosimetrist or change in cancer incidence.   The current job market bears out this current observation as some new Medical Dosimetry positions are finding it difficult to locate appropriate candidates with very little movement occurring in the job market. The figure below shows the results for the model in the current state of assumptions.

Current State of JRCERT Educational Programs

Cumulative Gap in FTE Medical Dosimetrist
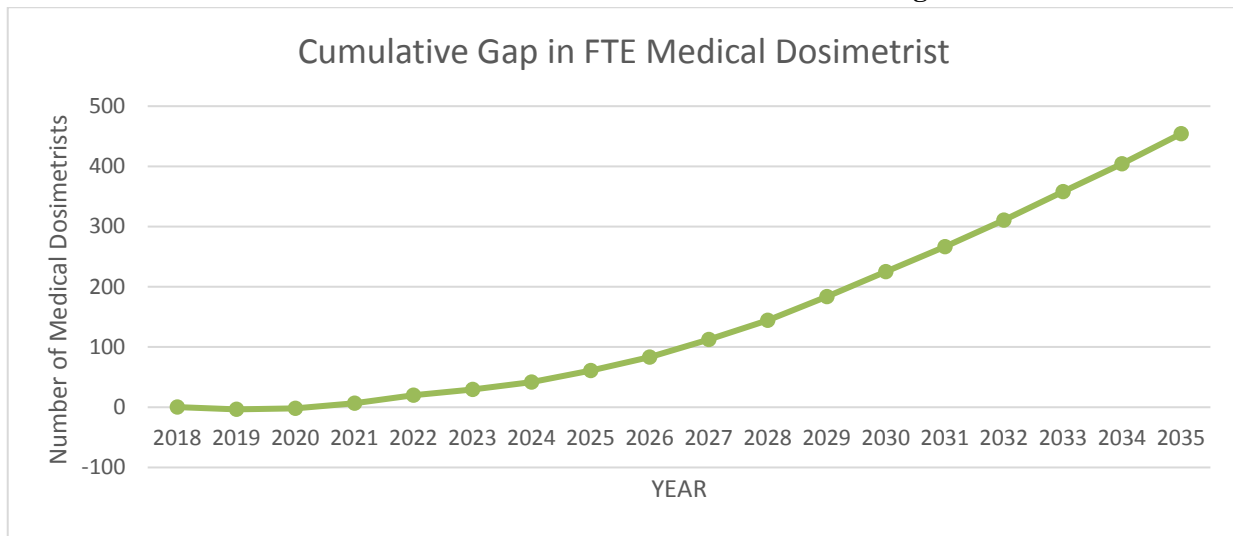
The Medical Dosimetry community exceeded the minimum 150 positions suggested in the 2012 Workforce Study to produce an adequate supply to keep pace with the demand through 2020.   The large pool of working Medical Dosimetrists combined with the elasticity of the workforce helps to buffer the immediate effects of a few years of shortage or surplus. Given the unprecedented circumstances of the COVID-19 pandemic, there may be additional struggles for programs to add training positions due to restrictions in many hospitals for support of clinical education.   The financial impact on hospitals from the pandemic may also reduce the ability to develop new Medical Dosimetry training programs. Conversely, the shift to remote work for practicing clinical Dosimetrists may increase some workload capacity in the current workforce.

The models suggest that the retiring wave of Medical Dosimetrists coupled with demographic population growth will expand the market for employment of Medical Dosimetrists between 2018 and 2035.   Given the current conditions it is predicted that an almost linear increase in JRCERT graduates from 170 in 2018 to 225 JRCERT graduates in 2035 will be needed to keep pace with the growing demand.

Technical Report # 5 – Survey of Radiation Oncology Professionals
Background and Methods
The AAMD Survey of Radiation Oncology Professionals was designed by the AAMD MedDos Infinity Task Group. Survey questions asked about demographic information, educational and career pathways to the profession, certification, current professional activity, and future of the profession. The survey also solicited opinions and attitudes of Medical Dosimetrists' professional colleagues on a number of subjects relevant to current professional issues.

The AAMD developed a high-quality master list of professional colleagues of Medical Dosimetrists that contained email contact information for all targeted professionals. Professions targeted were radiation oncologists, medical physicists, radiation therapists, and radiation oncology administrators. The request for survey participation was sent to 131 colleagues of Medical Dosimetrists. At least 20 professionals in each of the above were sent the invitation to take the survey. Each colleague was provided with an individualized link to the survey

instrument to prevent duplication of responses. The survey was closed on November 20, 2020, with 33 responses, for a response rate of 25.2%.

Summary of Results:
- There is overwhelming consensus that Medical Dosimetrists are recognized as an essential member of the Radiation Oncology team and that Certified Medical Dosimetrists improve the quality of care and safety in the workplace.
- Certification by the Medical Dosimetrist Certification Board has very strong support among professionals that work in Radiation Oncology, with two-thirds of respondents strongly agreeing that such certification should be a requirement to practice Medical Dosimetry.
- The consensus of both the 2012 and 2020 surveys was that the supply of Medical Dosimetrists is sufficient to meet demand for their services.
- The majority of respondents agree that the diverse backgrounds of Medical Dosimetrists (RTT, non-RTT, Associate, Bachelor's, and Master's degree) strengthen the profession.
- In 2012, there was not a strong consensus that a Master's degree in Medical Dosimetry would be beneficial; in 2020, there is no consensus that Medical Dosimetrists should be trained at the Master's level.
- There is a slight consensus that Master's level ABR-certified Medical Physicists are not qualified to perform all of the work responsibilities of Certified Medical Dosimetrists. There is a strong consensus that Master's level Medical Physicists without ABR certification are not qualified to perform the work responsibilities of Certified Medical Dosimetrists.
- On the question of whether Master's level Medical Physicists should be allowed to take the Medical Dosimetrist Certification Board exam, in 2020, the consensus has changed to being slightly in favor of allowing such individuals to take the examination. In 2012, the consensus was neutral. It is noted that approximately 50% of 2020 survey respondents were Medical Physicists.
- There is a community consensus that Medical Dosimetry positions are not being eliminated in favor of other Radiation Oncology positions. In particular, there is a consensus that Master's level Medical Physicists are not competing for Medical Dosimetry positions.
- The consensus among Radiation Oncology professionals in 2012 and 2020 is that remote planning is not as effective and beneficial to the patient as onsite planning.
- The community of professionals is undecided about the increased need for Medical Dosimetry positions due to the increase in artificial intelligence.
- Radiation Oncology professionals do not consider automated efforts in contouring or planning to be as accurate and precise as manual efforts. Neither automated contouring nor planning are seen to increase the need for Medical Dosimetry positions.

Technical Report #6 – Interviews with Selected Medical Dosimetrists
Background and Methods
The survey of Medical Dosimetrists' professional colleagues was designed by the AAMD MedDos Infinity Task Group. The content of the questionnaire was determined after completion of a comprehensive literature review and after examining historical data on the Medical Dosimetry profession. In addition, interviews with practicing Medical Dosimetrists, directors of Medical Dosimetry education and training programs, industry representatives working with Medical Dosimetrists, government regulators, the professional association, the certification board, and with other stakeholders with an interest in Medical Dosimetry.

Twenty individuals were identified to take part in these interviews. Some of the selected individuals volunteered when completing the Membership Workforce Survey of Currently Active Medical Dosimetrists in 2020 (see Technical Report #2).   The interviews began November 1, 2020 and the effort was closed on January 18, 2021.

Summary of Results:
- A majority of respondents stated the Lead Medical Physicist has administrative oversight for Medical Dosimetrists for aspects such as recruitment, retention, annual evaluations, and salary concerns. A non-clinical administrator has some administrative oversight as well. There is some presence of a Lead Medical Dosimetrist, though primarily in larger institutions.
- There is a strong preference for reporting to medical physics, especially for clinical concerns. A few respondents preferred an administrator for non-clinical oversight.
- The majority of respondents felt most closely aligned with Medical Physicists with some mentions of Physicians and Radiation Therapists as well.
- A Bachelor's degree for the minimum requirement for entry into the Medical Dosimetry profession was the clear majority choice, with some preferring a Master's degree and a couple of outliers preferring Associate degree or none at all.
- 80% of respondents prefer a hybrid approach for a formal education model, with the other 20% wanting an emphasis on in-person training.
- Respondents seemed to value both the formal education process as well as on-the-job experience, with a slight preference toward those trained under a formal education process.
- Concerning the question of Commission on Accreditation of Medical Physics Education Programs (CAMPEP) trained Medical Physicists having a pathway to take the MDCB Board examination, there is no clear consensus.
- Respecting the question of sub-specialties for Medical Dosimetrists, the responses were split almost evenly between no, yes but only as an option not required, and yes.
- New technology was integrated in the majority of departments, with the primary technology adoption of auto-contouring, scripting, and adaptive planning. True AI had only been minimally implemented.
- The overall perception was that new technology adoption had not had a large impact on work.   Those who had a more robust implementation said the work had not decreased but shifted to more review of the AI and collaboration with the Physician on how to adapt, modify or optimize the outcome.
- The biggest impact reported from COVID-19 was a major shift to a more remote workforce.
- Medical Dosimetrists are primarily completing work within their Scope of Practice.
- 100% of respondents felt that compensation for Medical Dosimetry work will remain high.
- The respondents thought good job security for Medical Dosimetry would remain with some caveats.
- Medical Dosimetrists agree the work environment quality will remain high.
- Respecting service improvement: collaboration, involvement/visibility in the clinic, continuing education to stay current and protecting the work done by Medical Dosimetrists were the major themes.
- Additional thoughts include overall themes of evolving to stay current and keeping up with changes. In addition, there were some supply and demand concerns.

The uncertainty of health care financing in the United States coupled with external pressures on Medical Dosimetry positions are likely to make the next few years challenging and complex for AAMD leadership. Likely sources of pressures are the potential undersupply of JRCERT-accredited program graduates. Medical

Dosimetrists must take steps to promote the value of their profession and to create an adequate supply of superbly trained individuals to create the future market for their services.

Conclusion – Overall Summary of the AAMD Workforce Study

The overall future of Medical Dosimetry remains bright. It is likely that the education level of Medical Dosimetrists will continue to increase, the work experience will be high quality and the salaries will reflect fair compensation. Formal education programs likely will struggle with providing the number of trained professionals to meet the demand without further intervention. It remains doubtful that new AI technologies will immediately lead to greater efficiency of Medical Dosimetry practice, as increased integration has required more time spent in review and optimization of contours and plans. The following bulleted list focuses on the major findings and most important considerations for AAMD leadership over the next five or more years. The list is in no specific order.

- Medical Dosimetrists are changing the demographic makeup of the profession. Most have CMD certificates awarded after the year 2000, most have Bachelor's degrees or higher, and in a very few years, the majority will have had their clinical training from a JRCERT-accredited educational program rather than having been trained on-the-job.
- A starting salary of $92,000 represents a significant advantage over other Bachelor's-level professionals in Radiation Oncology and Radiology.
- The Staffing Matrix developed in Technical Report #3 provides a process to predict Medical Dosimetrist staffing for a center of any size that delivers a typical array of Radiation Oncology services. However, given the wide range of service mixes in the industry, the Staffing Matrix may underestimate or overestimate the staffing for any given clinic.
- Although in 2020 Medical Dosimetrist supply approximately equals demand, between 2021 and 2035, the undersupply will grow from 10 to nearly 50 Medical Dosimetrists per year.
- The consensus among Radiation Oncology professionals in 2020 is that remote planning is not as effective and beneficial to the patient as onsite planning.
- The community of professionals is undecided about the increased need for Medical Dosimetry positions due to the increase in artificial intelligence.
- Radiation Oncology professionals do not consider automated contouring or planning to be as accurate and precise as manual contouring, though introduction of these technologies is not seen to increase the need for Medical Dosimetry positions.
- A clear majority of Medical Dosimetry professionals indicate a preference for a Bachelor's degree for the minimum requirement for entry into the profession.
- 80% of professionals prefer a hybrid approach for formal education in Medical Dosimetry, with the other 20% wanting an emphasis on in-person training.
- New technology was integrated in the majority of departments, with adoption of auto-contouring, scripting, and adaptive planning. True AI had only been minimally implemented.
- The overall perception was that new technology adoption had not had a large impact on work.   Those who had a more robust implementation said the work had not decreased but shifted to more review of the AI and collaboration with the Physician on how to adapt, modify or optimize the outcome.