What to Expect from Cancer Treatment in 2022

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Despite the profound challenges of the COVID-19 pandemic, there's a lot to look forward to in terms of cancer treatment. According to the American Cancer Society, the cancer death rate fell 32 percent between the years of 1991 and 2019.[1] And while the COVID-19 pandemic caused disruptions in the diagnosis and treatment of cancer, including a 13 percent drop in new cancer diagnoses in 2020,[2] there's reason to believe that cancer will continue its downward trend thanks to recent advancements in technology.

The Food and Drug Administration approved more than a dozen new oncology drugs in 2021.[3] The continued development of artificial intelligence (AI) will enable professionals in radiation oncology to pass off traditionally arduous tasks to machines, thereby driving efficiencies in diagnosis and treatment. Recent conversations about equity have inspired a new push to provide cancer care to historically underserved populations, with the proliferation of mobile screening and other strategies.[4]

In short, researchers, health systems, and medical professionals are continuing their full-court press on cancer, still the second-leading cause of death in the United States.[5] Virtually every imaginable aspect of cancer treatment will receive more attention and development in 2022 and beyond, and each deserves its own white paper. Whatever comes down the pike, new opportunities will breed new challenges; fortunately, the opposite is also true. To help radiation oncology professionals prepare for what lies ahead, this white paper will explore some of the developments that dosimetrists, medical physicists, and radiologists can expect to see in regard to cancer treatment in 2022 and beyond.

CHANGES FOR PROFESSIONALS

Perhaps a useful way to begin a discussion of cancer treatment in 2022 and beyond is to examine what the professionals responsible for cancer diagnosis and treatment can expect. First, it's worthwhile to take a snapshot of radiation oncology today, including both the state of the field before the pandemic and the gaps that remain in the wake of the pandemic.

Shortages of Dosimetrists and Medical Physicists

There have been reported shortages of medical physicists and dosimetrists emerging from the COVID-19 pandemic. A report prepared for the American Association of Medical Dosimetrists suggests that the demand for dosimetrists may outstrip the number of graduates produced each year,[6] signaling a need for more formal education programs.

[1] "Risk of Dying from Cancer Continues to Drop at an Accelerated Pace," American Cancer Society, January 12, 2022, https://www.cancer.org/latest-news/facts-and-figures-2022.html.

[2] Brian R. Englum et al., "Impact of the COVID-19 Pandemic on Diagnosis of New Cancers: A National Multicenter Study of the Veterans Affairs Healthcare System," Cancer, (2022): 128(5), 1048–1056, https://doi.org/10.1002/cncr.34011.

[3] "Novel Drug Approvals for 2021," US Food and Drug Administration, accessed June 2, 2022, https://www.fda.gov/drugs/new-drugs-fda-cders-new-molecular-entities-and-new-therapeutic-biological-products/novel-drug-approvals-2021.

[4] Usha Trivedi et al., "Mobile Mammography Services and Underserved Women," Diagnostics (Basel, Switzerland) vol. 12,4 902, (2022): doi:10.3390/diagnostics12040902

[5] "Leading Causes of Death," Centers for Disease Control and Prevention, accessed June 2, 2022, https://www.cdc.gov/nchs/fastats/leading-causes-of-death.htm.

[5] Michael D. Mills, "Executive Summary—Medical Dosimetry Workforce Study Final Report," American Association of Medical Dosimetrists, June 1, 2022, https://pubs.medicaldosimetry.org/pub/6C754B84-E1AA-DDA9-1C85-2F6282AEA009.

It's a similar story with medical physicists. One report mentions that though the number of Commission on Accreditation of Medical Physics Education Programs (CAMPEP)–accredited imaging programs should be sufficient according to a 2009 projection, the profession itself has seen unanticipated growth in the years since that projection.[7] In other words, there still aren't enough imaging programs. Some also cite the changes in American Board of Radiology (ABR) certification rules and older medical physicists retiring as other reasons why there aren't enough medical physicists working.

The bottom line is that health systems in need of dosimetrists and medical physicists may see certain challenges as a result of these shortages. For radiation oncology professionals themselves, this may result in longer hours or more responsibilities but also higher salaries as positions become more competitive.

Remote Work

One of the most discussed impacts of COVID-19 has been its impact on office work. This has extended to those working in radiation oncology—particularly dosimetrists. A survey of dosimetrists found that 40 percent of respondents moved to 100 percent remote work at some point in the first six months of the pandemic.[8] In that same survey, respondents expressed an overwhelming preference for remote work and agreed with the statement that they were more productive working remotely.[9]

[7] David W. Jordan et al., "Current State of the Imaging Physics Workforce and Financial Model," Journal of Applied Clinical Medical Physics vol. 22,12 (2021): 4–6, doi:10.1002/acm2.13489.

[8] Christine Chung, "The Impact of the COVID-19 Pandemic on the Field of Medical Dosimetry," presented at AAMD Virtual 46th Annual Meeting, accessed June 2, 2022, https://pubs.medicaldosimetry.org/pub/0D73B777-FCC8-7C8B-7DAA-45EFA45DBDDC.

[9] Chung, "Impact."

Given this data, it stands to reason that dosimetry, like other jobs historically conducted in an office or clinic, will see a permanent shift toward remote work, whether that means dosimetrists working 100 percent remotely or in a hybrid remote/in-clinic work scenario, which appears to be more common.

Changes in Treatment

We've discussed some of the changes and trends in radiation oncology professions; now it's time to discuss some of the changes to issues more closely related to cancer treatment itself. One of the most exciting and fascinating developments in cancer treatment will involve the increasing role of automation driven by AI.

Equipment Maintenance

Well-maintained equipment is essential for accurate cancer diagnoses and for ensuring the precise administration of radiation therapy. So it makes sense that equipment maintenance would be a time-consuming aspect of a medical physicist's job. Sophisticated new linear accelerators, for example, in addition to being more accurate, are more demanding in terms of quality assurance. In some instances, modern linear accelerators require more than double the quality assurance time compared to equipment ten years old or older.

One experiment with automating linear accelerator quality assurance concluded that "automation is a viable, accurate, and efficient option for monthly and annual QA."[10] In 2022 or the years

[10] Keith Pearman et al., "Automated Linac QA Using Scripting and Varian Developer Mode," International Journal of Medical Physics, Clinical Engineering and Radiation Oncology, 10, (2021): 149–168, (2021): doi.org/10.4236/ijmpcero.2021.104013.

to come, such automation will likely become necessary to keep up with sophisticated quality assurance needs without drawing medical physicists' time away from other important duties.

Identifying Tumors

Anyone paying attention to trends and developments in cancer treatment will be familiar with the use of AI to help identify cancer. For those who don't know, AI refers to the use of computer algorithms to solve problems in a manner that mimics human intelligence. One of the most exciting aspects of AI is its capacity to go beyond what humans can perceive. Scientists have already developed AI tools to aid cancer screening, using deep learning (a subset of AI) algorithms to spot malignant tumors that might go unnoticed even by the best-trained radiologists.[11]

For example, a study published in 2019 found that a deep learning algorithm designed to identify cervical precancers outperformed human doctors using the visual inspection method.[12] Another study showed promise in contouring tumor volumes, a necessary step in determining the scope of a given cancer.[13] There's much more research to be done, but continued research in artificial intelligence is promising, with more breakthroughs bound to come in 2022 and beyond. Medical physicists and radiologists would do well to learn about these tools, as they may become fixtures in cancer clinics sooner than we might think.

[11] NCI Staff, "Can Artificial Intelligence Help See Cancer in New Ways?," National Cancer Institute, March 22, 2022, https://www.cancer.gov/news-events/cancer-currents-blog/2022/artificial-intelligence-cancer-imaging.

[12] Liming Hu et al., "An Observational Study of Deep Learning and Automated Evaluation of Cervical Images for Cancer Screening," JNCI: Journal of the National Cancer Institute, vol. 111,9 (2019): 923–932, https://doi.org/10.1093/jnci/djy225.

[13] Li Lin et al., "Deep Learning for Automated Contouring of Primary Tumor Volumes by MRI for Nasopharyngeal Carcinoma," Radiology vol. 291,3 (2019): 677–686, doi:10.1148/radiol.2019182012.

Treatment Planning

Automation has already made its way into the dosimetrist's office (or home office) as well, with deep learning technology playing an ever-increasing role in treatment planning. A study from 2021 estimates that "approximately 20 percent of clinical practices may be using DL-based tools clinically within the next few years."[14] That same study also brings up a number of fascinating implications and challenges that are bound to accompany the widespread use of AI, including an overreliance on it, which could be detrimental if the technology malfunctions or fails.

Faster, More Adaptive Treatment

Automation driven by artificial intelligence is poised to increase not only accuracy in cancer diagnosis but speed as well. The faster a tumor is identified, and the faster a radiologist and dosimetrist devise a treatment plan, the faster a patient can begin treatment. Time saved at any point in this process can increase a cancer patient's chance of survival. The year 2022 and beyond will see many more iterations of existing tools, making them ever more efficient and accurate.

Diagnosis and treatment aren't just getting faster and more accurate but also more dynamic and adaptive. These adaptive therapies can enable radiation oncology personnel to adapt to changes quickly with the aid of automation tools. If a target moves because of too much bowel fill, for example, or if the target tumor is in a different position, the dosimetrist can leverage automation tools to pivot within minutes, whereas traditionally such a process might take hours.

[14] T. J. Netherton et al., "The Emergence of Artificial Intelligence within Radiation Oncology Treatment Planning," Oncology 99 (2021): 124–134, https://doi.org/10.1159/000512172.

Always Working toward Better Cancer Treatment

With technology driving efficiencies and higher accuracy in nearly every aspect of cancer treatment, it's reasonable to expect that cancers in 2022 and beyond will be identified sooner via modern imaging technology and protocols, involve more-quickly devised treatment plans, and be treated more dynamically than ever before. Still, there are many factors that will continue to complicate advancements in cancer treatment.

There's always a chasm between technological developments and their viability for widespread adoption. For example, the implementation of lifesaving technologies will depend on the financial reality of health systems and whether they can afford the latest equipment, software, and expertise. The ongoing consolidation of health systems across the United States could further disrupt the practice of medical physics and radiation oncology, and not always for the better.

There's also the matter of automation's impact on professions involved with radiation oncology. There's some indication that medical physicists aren't too concerned about being replaced by artificial intelligence, with most viewing it as a useful tool.[15] Still, the impact of technology on our livelihoods is always worth examining.

Again, opportunities breed challenges, but challenges breed opportunities: the bottom line is that the brilliant researchers, physicians, and medical physicists responsible for cancer research, diagnosis, and treatment have brought us a long way in the past few decades—and they're not stopping now.

Anyone interested in following the latest developments in cancer treatment from a radiation oncology standpoint would do well to follow the news coming out of the American Association of Physicists in Medicine (AAPM) and the American Society for Radiation Oncology (ASTRO) as well as conferences and talks hosted by these organizations.

Apex Physics Partners is a committed partner to anyone looking to drive lifesaving advancements in radiation oncology. Whether you're interested in a career in medical physics or you run a medical facility and are looking to better prepare for the future of cancer treatments, please get in touch with our team.

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15 Jonas Andersson et al., "Artificial Intelligence and the Medical Physics Profession—a Swedish perspective," Physica Medica 88 (2021): 218–225, https://doi.org/10.1016/j.ejmp.2021.07.009.