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Clinical Investigation

Supply and Demand for Radiation Oncology in the United States: Updated Projections for 2015 to 2025

Hubert Y. Pan, MD,* Bruce G. Haffty, MD,† Benjamin P. Falit, MD, JD,‡ Thomas A. Buchholz, MD,* Lynn D. Wilson, MD, MPH,§ Stephen M. Hahn, MD,* and Benjamin D. Smith, MD*

**Department of Radiation Oncology, The University of Texas MD Anderson Cancer Center, Houston, Texas; †Department of Radiation Oncology, Robert Wood Johnson Medical School — University of Medicine and Dentistry of New Jersey, New Brunswick, New Jersey; ‡Radiation Oncology Associates, Lowell, Massachusetts; and §Department of Therapeutic Radiology, Yale University School of Medicine, New Haven, Connecticut*

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Summary

Prior studies have forecasted the demand for radiation therapy to grow 10 times faster than the supply between 2010 and 2020. In this updated analysis for 2015 to 2025, the expected demand for radiation therapy was projected to grow by 19%, in comparison with an expected 27% increase in the supply of full-time equivalent practicing radiation oncologists.

Purpose: Prior studies have forecasted demand for radiation therapy to grow 10 times faster than the supply between 2010 and 2020. We updated these projections for 2015 to 2025 to determine whether this imbalance persists and to assess the accuracy of prior projections.

Methods and Materials: The demand for radiation therapy between 2015 and 2025 was estimated by combining current radiation utilization rates determined by the Surveillance, Epidemiology, and End Results data with population projections provided by the US Census Bureau. The supply of radiation oncologists was forecast by using workforce demographics and full-time equivalent (FTE) status provided by the American Society for Radiation Oncology (ASTRO), current resident class sizes, and expected survival per life tables from the US Centers for Disease Control.

Results: Between 2015 and 2025, the annual total number of patients receiving radiation therapy during their initial treatment course is expected to increase by 19%, from 490,000 to 580,000. Assuming a graduating resident class size of 200, the number of FTE physicians is expected to increase by 27%, from 3903 to 4965. In comparison with prior projections, the new projected demand for radiation therapy in 2020 dropped by 24,000 cases (a 4% relative decline). This decrease is attributable to an overall reduction in the use of radiation to treat cancer, from 28% of all newly diagnosed cancers in the prior projections down to 26% for the new projections. By contrast, the new projected supply of radiation oncologists in 2020 increased by

Reprint requests to: Benjamin D. Smith, MD, Department of Radiation Oncology, The University of Texas MD Anderson Cancer Center, Unit 1202, 1515 Holcombe Blvd, Houston, TX 77030. Tel: (713) 563-2380; E-mail: bsmith3@mdanderson.org

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275 FTEs in comparison with the prior projection for 2020 (a 7% relative increase), attributable to rising residency class sizes.

Conclusion: The supply of radiation oncologists is expected to grow more quickly than the demand for radiation therapy from 2015 to 2025. Further research is needed to determine whether this is an appropriate correction or will result in excess capacity.

Introduction

In the 2 decades after the conclusion of World War II, the United States experienced a temporary increase in birth rate, giving rise to the "baby boomer" generation (1). In anticipation of this generation's entry into older adulthood, prior studies projected a steep rise in the population burden of cancer beginning in approximately 2010 (2), with concomitant forecasts of physician shortages across oncologic disciplines, including radiation oncology (3, 4). In part to address this projected shortage, the number of radiation oncology residency positions rose by more than 50% in the past 10 years (5). Nevertheless, some have expressed concern that increasing the number of training positions could result in an oversupply of radiation oncologists (6), with a negative impact on the specialty and those who practice it.

Given the concerns regarding oversupply, there is a need to re-evaluate supply and demand projections in light of more current data. Therefore, we sought to update the projections regarding demand for radiation therapy and supply of radiation oncologists through 2025, to assess the accuracy of prior projections (3), and to investigate the reasons underlying differences in prior versus current projections. To accomplish this goal, we used population-based data to assess the current use of radiation therapy, US Census Bureau population projections to predict future demand for radiation therapy, and American Society for Radiation Oncology (ASTRO) workforce data to estimate the current and future supply of radiation oncologists. The goal of this work is to provide data that will inform policy decisions regarding training positions and the future of the field.

Methods and Materials

Demand for radiation therapy analysis

The US Census Bureau's most recent population projections for 2014 to 2060 were issued in March 2015. Based on the 2010 Census and official 2013 estimates of birth, death, and net international migration rates (7), these population forecasts are stratified by age (0-100 years), gender, race (white, black, Asian, Pacific Islander, American Indian/Alaska Native, and multiracial), and origin (Hispanic, non-Hispanic).

To estimate the current use of radiation therapy, the population-based Surveillance, Epidemiology, and End Results (SEER) 18 database was used. This data set represents 26% of the United States population based on 2010 census data and includes the following geographic areas: San Francisco/Oakland, Connecticut, Detroit, Hawaii, Iowa, New Mexico, Seattle, Utah, Atlanta, San Jose/Monterey, Los Angeles, Alaska Native Tumor Registry, rural Georgia, greater California, Kentucky, Louisiana, New Jersey, and greater Georgia. SEER reports the use of radiation therapy during the initial course of treatment administered for an incident malignancy, which includes all treatment before progression or recurrence. It does not report on radiation therapy that may be delivered after disease progression, as salvage therapy, or for benign conditions. The SEER data were used to estimate radiation therapy utilization rates over the period 2010 to 2012 for specific disease sites and stratified by age (<1 year, 1-4 years, and subsequent 5-year increments), sex, race (white, black, Asian/Pacific Islander, American Indian/Alaska Native), and origin (Hispanic, non-Hispanic). The primary SEER data set for this study modeled reporting delay (8) but was restricted to malignant-only histology (9). It was thus supplemented with a separate SEER data set to include breast ductal carcinoma in situ (10), with reporting delay adjustment assumed to be equivalent to that of invasive breast cancer. This process of calculating radiation therapy utilization rates was repeated for 2003 to 2005 because the previously published projections were based on data from this time period (3).

The projected demand for radiation therapy during the initial treatment course from 2015 to 2025 was determined by methods as previously described (3). The age-, sex-, race-, and origin-specific population projections for 2015 to 2025 from the US Census Bureau were multiplied by the delay-adjusted age-, sex-, race-, and origin-specific radiation therapy utilization rates for 2010 to 2012 from SEER to produce site-specific and total projected demands. Projections were modeled using JMP Pro version 11.2.0 (SAS Institute, Cary, NC).

The primary outcome of the demand analysis was the relative change in the number of patients receiving radiation therapy during the initial treatment course from 2015 to 2025. An assumption was made that this change in initial radiation therapy use would approximate the relative change in total radiation therapy use. Additionally, these