Projecting the Adequacy of Workforce Supply to Meet Patient Demand

Analysis of the Orthotics and Prosthetics (O&P) Profession

Dobson | DaVanzo

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Table of Contents

Executive Summary

Study Purpose and Background

The National Commission on Orthotic and Prosthetic Education (NCOPE) commissioned Dobson DaVanzo & Associates, LLC (Dobson | DaVanzo) to estimate and project the future demand for and supply of orthotic and prosthetic (O&P) professionals over the next ten years (2016-2025). Workforce projections allow professions to better align their workforce with the future demand for their services.

The O&P workforce consists of formally educated and trained individuals that provide custom and pre-fabricated external prostheses and orthoses to patients with limb loss and musculoskeletal conditions.[1] The seven professional types included in the O&P profession are: orthotists, prosthetists, dual certified prosthetists and orthotists ("prosthetist/orthotist"), pedorthists, assistants, technicians, and fitters (therapeutic shoe, mastectomy, and orthotic). Across the American Board for Certification in Orthotics, Prosthetics and Pedorthics (ABC) and Board of Certification Accreditation, International (BOC), O&P professionals can be certified in each of these provider types.

In recent years, policymakers, researchers, and industry stakeholders[2,3,4] have closely monitored the health care workforce as the U.S. population with health insurance coverage is expected to dramatically increase under landmark provisions in the Patient Protection and Affordable Care Act (ACA). Accordingly, the utilization of health care services is expected to increase rapidly, potentially resulting in a shortage of providers. Professionals in the allied health workforce (including those in the O&P profession) are

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[1] Bureau of Labor Statistics, U.S. Department of Labor. Occupational Outlook Handbook, 2014-15 Edition, Orthotists and Prosthetists. Available online at: http://www.bls.gov/ooh/healthcare/orthotists-and-prosthetists.htm.

[2] Steinwald AB. Primary care professionals: recent supply trends, projections, and valuation of services. Testimony before the Committee on Health Education, Labor, and Pensions, U.S. Senate. Washington, D.C.: Government Accountability Office February 12, 2008. Available online at: http://www.gao.gov/new.items/d08472t.pdf.

[3] U.S. Department of Health and Human Services, Health Resources and Services Administration, National Center for Health Workforce Analysis. Technical Documentation for HRSA's Health Workforce Simulation Model. Rockville, Maryland: U.S. Department of Health and Human Services, 2014.

[4] Grundy P, Hagan KR, Hansen JC, and Grumbach K. The multi-stakeholder movement for primary care renewal and reform. *Health Aff* 2010; 29(5):791-8.

increasingly viewed as a means of strengthening the larger health care provider network.[5, 6, 7]

Methodology in Brief

We used multiple sources of information to project the demand for and supply of O&P professionals, including: 1) Medicare claims data, 2) National Health Interview Survey (NHIS); 3) U.S. Census Bureau projections; (4) published and unpublished O&P profession estimates and literature, and 5) interviews with O&P profession stakeholders, representing: providers, education and accreditation organizations, trade organizations, manufacturers, and the Veteran's Affairs Administration. We also consulted a clinical advisory committee on an on-going basis to validate study assumptions and to help interpret the study findings.

Our analytic approach consisted of developing separate demand and supply models to assess whether the current and future O&P profession is at an equilibrium. In this project, we define equilibrium as the alignment between the number of practicing and credentialed (certified and/or licensed) O&P professionals and the number of professionals needed to treat the patients currently receiving O&P services. Our baseline model provides estimates for the supply and demand of O&P professionals in 2014. We then project demand for and supply of O&P professionals over a ten year period between 2016 and 2025 based on multiple factors that will affect the profession. This study only estimated the credentialed O&P professional workforce, although the impact of non-credentialed providers is considered in our projections.

Our demand model is divided into orthotic and prosthetic services, and estimates the need for professionals providing these services separately. This model converts the projected number of patient visits to an O&P professional into the number of unique professionals needed to deliver patient services. The demand model is developed for the over-65 population, and then extrapolated to represent the overall population demand for O&P services. Demand projections considered the impact of exogenous factors, such as expected changes in off-the-shelf (OTS) orthotic device utilization, advances in technology, changes in insurance coverage, patient age distribution, state licensure, and the needs of veterans, on the future demand for O&P services.

Our supply model for providers is based on the number of board certified O&P professionals, the estimated number of new entrants into the field, and the projected

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[5] Institute of Medicine. Allied health workforce and services: workshop summary. Washington, D.C.: National Academies Press, 2011.

[6] Association of American Medical Colleges. Physician workforce policy recommendations. Washington, D.C.: AAMC September 2012. Available online at: https://www.aamc.org/download/304026/data/2012aamcworkforcepolicyrecommendations.pdf.
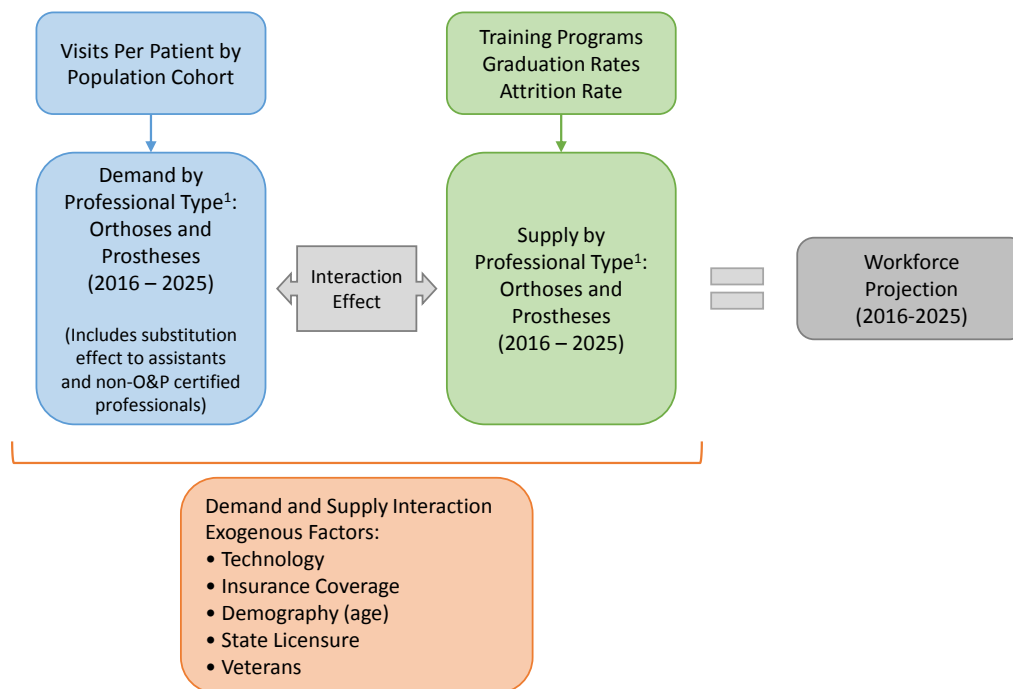
[7] Institute of Medicine. Retooling for an aging America: building the health care workforce. Washington, D.C.: National Academies Press, 2008.

attrition rate out of the field (due to retirement, career change, and death). As in our demand model, supply projections considered exogenous factors, such as advances in technology, changes in insurance coverage (both provider and patient), provider age distribution, and state licensure laws.

Exhibit ES-1 provides an overview of the O&P workforce model in which demand and supply interact subject to a set of exogenous factors.

Exhibit ES-1: Overview of O&P Workforce Model

[1] Model includes certified orthotists, prosthetists, prosthetists/orthotists, pedorthists, assistants, technicians, and fitters (therapeutic shoe, mastectomy, and orthotics).

In order to assess equilibrium, we calculated a demand-to-supply ratio for each professional type. If the ratio was close to 1.0, the market was considered to be in equilibrium for that particular professional type. We compared the demand-to-supply ratio at baseline (2014), and for each year of the projected study period (2016-2025).

Results in Brief

Baseline Workforce Model for O&P Profession

At baseline (2014), we estimate that there is a demand for 18,816 O&P providers and a supply of 14,905 credentialed providers. These projections yields a demand-to-supply ratio of 1.3. Among patient-facing professionals (certified orthotists, prosthetists,

prosthetists/orthotists, pedorthists, assistants, and fitters), we determined that demand and supply are effectively in equilibrium; that is, these professional levels have a demand-to-supply ratio of approximately 1.0.

According to our interview findings, a large (but unknown) proportion of O&P technicians are not currently certified. Since the supply model only captures credentialed (certified) providers but the demand model captures the need for all (certified and non-certified) providers, the demand for technicians exceeds the supply of certified technicians, with a demand-to-supply ratio of 8.7. In other words, the number of certified technicians would need to increase by a factor of 8.7 to meet current demand.[8] Since there are a limited number of non-certified professionals in the other O&P professional types (i.e., a small proportion of orthotists are not certified), the model shows a basic equilibrium between demand for O&P professionals and supply of certified professionals. Because there are no supply data for non-certified professionals, the model cannot account for them. Based on the findings of our interviews, it seems that non-certified technicians are helping to meet the demand for these O&P services.

Projected Workforce Model for O&P Profession Overall

Based on the inputs and assumptions in our model, we estimate a substantial change in both the demand for and supply of O&P services over the next ten years. Demand is largely affected by the change in the potential patient population (increasing demand), while supply is largely affected by the expected graduation rates (increasing supply) and the estimated attrition rates (decreasing supply) of certified providers. Overall, we estimate that the attrition rate will surpass the graduation rate, and, therefore, decrease the relative supply of credentialed O&P professionals over the study period.

In 2016, the demand-to-supply ratios across providers are expected to remain stable relative to baseline (2014), with an overall demand-to-supply ratio of 1.3 (see Exhibit ES-2). However, by 2025, we project demand to increase (to 20,504 O&P professionals) and supply to decrease (to 12,775 credentialed professionals), resulting in a demand-to-supply ratio of 1.6. This ratio indicates that the overall supply of credentialed O&P providers would need to increase by about 60 percent to meet the growing demand. We note that non-certified (and non-O&P) providers are likely providing care to meet the growing demand for services.

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[8] Our model estimates there are 579 certified technicians to meet the demand for 5,040 O&P technicians at baseline.

Exhibit ES-2: Comparison of Projected Demand for and Supply of O&P Professionals (2014; 2016-2025)

Category	Demand-to-Supply Ratio		
	2014 (Baseline)	2016 (Projected)	2025 (Projected)
1) Orthotists	1.2	1.3	1.9
2) Prosthetists	0.6	0.7	0.9
3) Prosthetists/Orthotists	0.9	0.9	1.2
Weighted Average	**1.0**	**1.0**	**1.4**
4) Pedorthists	0.9	0.9	1.1
5) Fitters	0.8	0.8	0.9
6) Assistants	2.2	2.4	2.9
Weighted Average	**1.0**	**1.0**	**1.3**
7) Technicians	8.7	8.1	6.6
Overall Weighted Average	**1.3**	**1.3**	**1.6**

Source: Dobson | DaVanzo workforce demand projections.

Conclusion, Limitations, and Discussions

As of 2014, our analysis suggests that the O&P market was at relative equilibrium. However, as demand continues to grow over time due to aging "baby boomers" and the extended life expectancy of the population in general, the demand for services will outpace the supply of certified providers. With relatively few O&P education programs currently available, the expected attrition rate will likely outpace the growth in the supply of certified O&P professionals.

The model estimates that by 2025, demand for O&P professionals will be about 60 percent higher than the available supply of certified providers. Non-certified professionals, not limited to but including technicians and assistants, are likely to continue to help meet demand. Furthermore, the composition of the workforce is likely to change markedly as the credentialed supply becomes unable to meet the demand and as OTS devices continue to be provided by physicians, occupational/physical therapists, and medical supply companies without certified O&P professionals.

There are several limitations to our analysis that affect the interpretation of these results. First, O&P practices vary markedly across the country, and while we attempted to represent the diverse perspectives of O&P profession stakeholders in our projection assumptions, our results may not be generalizable across the entire profession. Second, there is no uniform national database that maintains O&P professional statistics for credentialed and non-credentialed providers, such as regional licensure, demographics, and attrition rates. As a result, only information from professional organizations reporting on their affiliated professionals is available, which provides an incomplete picture of

actual provider supply. Therefore, this study supply estimates only include credentialed/certified providers and do not include those individuals in the field who are providing care without a certification or license.

Finally, in allied health professions, there are no benchmarks against which to measure a shortage or overproduction of personnel. A deficit or surplus of allied health professionals simply describes a misalignment between the projected supply of personnel and the demand assumptions (e.g., growth in the population demanding services), without acknowledging a profession's *need.* In this study, we have identified a demand-to-supply ratio of 1.3 as a relative equilibrium, in that there is no shortage (defined as a delay in obtaining care) of professionals to provide O&P services. However, to the extent that non-certified providers cannot treat complex patients needing specialized care, there could be a true shortage of O&P professionals within the next ten years.

Given these limitations, this study provides data and information previously unavailable for an allied health workforce study. Beyond the projected demand and supply trends for the O&P profession over the next ten years, a major contribution of this study is an identification of the challenges due to a lack of data that were encountered while undertaking this study. The triangulation of quantitative and qualitative information from multiple sources, including information from practitioners directly, allowed us to overcome these challenges.

Introduction

The National Commission on Orthotic and Prosthetic Education (NCOPE) commissioned Dobson DaVanzo & Associates, LLC (Dobson | DaVanzo) to estimate and project the demand for and supply of orthotic and prosthetic (O&P) professionals over the next ten years (from 2016 to 2025). Workforce projections are intended to support O&P practitioners and education administrators as they anticipate changes in the future demand for and supply of O&P services. The assumptions that underlie our projection estimates are also intended to inform stakeholders of which demand and supply factors are expected to have the greatest impact on O&P professionals in the coming years.

Our workforce model is designed to estimate demand for and supply of each of the seven certified O&P groups: orthotists, prosthetists, prosthetists/orthotists, pedorthists, assistants, technicians, and fitters (therapeutic shoe, mastectomy, and orthotic). In doing so, we give particular attention to: 1) the subgroup of orthotists, prosthetists, and prosthetists/orthotists; 2) other patient-facing providers (pedorthists, assistants, and fitters); and 3) the profession overall (including technicians who assist in the delivery of care). Only certified professionals are included in our supply analyses, as there are no consistent data or statistics on non-certified professionals.

Importance of Workforce Projections and the Impact on Allied Health Professions

Workforce projections allow professions to better align their workforce with the future demand for their services. How closely workforce projections track with actual behavior is unique to each profession. The initial size, staffing-levels, and demographic composition of a profession's workforce, as well as the profession's ability to grow or scale-down its workforce, are basic assumptions that workforce projection models attempt to quantify. For some professions, projection models also account for competition-related and/or regulatory factors that may modify the external market environment.

In recent years, policymakers,[9, 10, 11] researchers,[12, 13, 14, 15] and industry stakeholders[16, 17] have closely monitored the health care workforce as major health care provisions – most notably those included under the Patient Protection and Affordable Care Act (ACA) – were implemented to dramatically increase the proportion of the U.S. population with health insurance coverage. By increasing the rate of insurance, it is expected that the utilization of health care services will increase, possibly leading to provider workforce shortages. By 2024, the effects of the ACA are expected to reduce the total uninsured population in the U.S. from 57 to 31 million persons.[18] Also during this time period, Medicare enrollment and expenditures are expected to accelerate as the "baby boomer" generation, a population that typically utilizes a disproportionate share of health care services, become Medicare eligible.[19]

In contrast, growth in key areas of the health care workforce is expected to slow in the coming years. Of particular concern is the expected growth in the primary care physician workforce – clinicians traditionally regarded as patients' entry-point into the health care system. Growth in the primary care workforce is expected to increase by only eight percent between 2010 and 2020, while the demand for primary care services is expected to increase by 14 percent.[20] Researchers expect shortages in primary care physicians of between 46,000 and 90,000 providers by 2025 if fundamental changes are not made to

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9 Steinwald AB. Primary care professionals: recent supply trends, projections, and valuation of services. Testimony before the Committee on Health Education, Labor, and Pensions, U.S. Senate. Washington, D.C.: Government Accountability Office February 12, 2008. Available online at: http://www.gao.gov/new.items/d08472t.pdf.

10 Sen Daschle. Creating a workforce for the new health care world. *Health Aff* (Blog). March 7, 2013. Available online at: http://healthaffairs.org/blog/2013/03/07/creating-a-workforce-for-the-new-health-care-world/.

11 Patient Protection and Affordable Care Act 42 U.S.C. 18001 293k et. seq. SEC. 5508, 749A, 340H.

12 U.S. Department of Health and Human Services, Health Resources and Services Administration, National Center for Health Workforce Analysis. Technical Documentation for HRSA's Health Workforce Simulation Model. Rockville, Maryland: U.S. Department of Health and Human Services, 2014.

13 Bodenheimer T, Chen E, and Bennett HD. Confronting the growing burden of chronic disease: can the U.S. health care workforce do the job? *Health Aff* 2009; 28(1): 64-74.

14 Nicholson S. Will the United States have a shortage of physicians in 10 years? Robert Wood Johnson Foundation Changes in Health Care Financing and Organization. November 2009. Available online at: http://www.academyhealth.org/files/publications/HCFOReportDec09.pdf.

15 Petterson SM, Liaw WR, Phillips RL, et al. Projecting the US primary care physician workforce needs: 2010-2025. *Ann Fam Med*. 2010; 10:503-9.

16 Grundy P, Hagan KR, Hansen JC, and Grumbach K. The multi-stakeholder movement for primary care renewal and reform. *Health Aff* 2010; 29(5):791-8.

17 Association of American Medical Colleges. Physician workforce policy recommendations. Washington, D.C.: AAMC September 2012. Available online at: https://www.aamc.org/download/304026/data/2012aamcworkforcepolicyrecommendations.pdf.

18 Congressional Budget Office. Updated estimates of the effects of the insurance coverage provisions of the Affordable Care Act. Washington, D.C.: Congressional Budget Office, April 2014. Available online at: http://www.cbo.gov/sites/default/files/45231-ACA_Estimates.pdf.

19 Office of the Actuary. National Health Expenditure Projections 2013-2023. Forecast Summary. Baltimore, MD: Centers for Medicare and Medicaid Services, December 2014. Available online at: http://www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/NationalHealthExpendData/Downloads/Proj2013.pdf.

20 Department of Health and Human Services, Health Resources and Services Administration, National Center for Health Workforce Analysis. Projecting the supply and demand for primary care practitioners through 2020. Rockville, MD: Department of Health and Human Services, 2013. Available online at: http://bhpr.hrsa.gov/healthworkforce/supplydemand/usworkforce/primarycare/projectingprimarycare.pdf.

the way primary care is delivered.[21] The workforce outlook for geriatricians is bleaker. Approximately 81 percent of the projected 14 percent growth in demand for primary care services will be needed to serve the elderly population.[22] In order to match the rapid growth in demand for geriatric medicine and services, the supply of board certified geriatricians (approximately 6,986 in 2011),[23] would need to reach 30,000 providers by 2030.[24] Between 2000 and 2011, however, the number of geriatricians actually decreased by 10 percent.[25]

Given the above projections, professionals in the allied health workforce are increasingly looked to for strengthening the larger health care provider network,[26, 27, 28] particularly in rural areas of the country where provider shortages may become most prevalent.[29, 30] Allied health professions generally support the delivery of services that are distinct from the core duties of physicians, registered nurses and physician assistants, pharmacists, and mental health providers (including licensed social workers and psychologists).[31]

The role of allied health professions has grown markedly in last three decades as the delivery of patient care has become increasingly more sophisticated. Driven mostly by rapid advances in science and medicine, hospital systems grew more complex and health care professions diversified into numerous medical specialties and subspecialties.[32, 33]

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[21] IHS Inc., The complexities of physician supply and demand: projections from 2013 to 2025. Prepared for the Association of American Medical Colleges. Washington, D.C.: IHI Inc., 2015. Available online at: https://www.aamc.org/download/426242/data/ihsreportdownload.pdf?cm_mmc=AAMC-_-ScientificAffairs-_-PDF-_-ihsreport.

[22] Department of Health and Human Services, Health Resources and Services Administration, National Center for Health Workforce Analysis. Projecting the supply and demand for primary care practitioners through 2020. Rockville, MD: Department of Health and Human Services, 2013. Available online at: http://bhpr.hrsa.gov/healthworkforce/supplydemand/usworkforce/primarycare/projectingprimarycare.pdf.

[23] Bragg EL and Warshaw GA. Geriatric medicine in the United States 2012 Update. American Geriatrics Society and Geriatrics Workforce Policy Studies Center, April 2012. Available online at: http://www.americangeriatrics.org/files/documents/gwps/Geriatric.Medicine.in.the.US.Updated.2012.pps.

[24] American Geriatrics Society. The demand for geriatric care and the evident shortage of geriatric healthcare providers. New York, NY: American Geriatrics Society, March 2013. Available online at: http://www.americangeriatrics.org/files/documents/Adv_Resources/demand_for_geriatric_care.pdf.

[25] Bragg EL and Warshaw GA. Geriatric medicine in the United States 2012 Update. American Geriatrics Society and Geriatrics Workforce Policy Studies Center, April 2012. Available online at: http://www.americangeriatrics.org/files/documents/gwps/Geriatric.Medicine.in.the.US.Updated.2012.pps.

[26] Institute of Medicine. Allied health workforce and services: workshop summary. Washington, D.C.: National Academies Press, 2011.

[27] Association of American Medical Colleges. Physician workforce policy recommendations. Washington, D.C.: AAMC September 2012. Available online at: https://www.aamc.org/download/304026/data/2012aamcworkforcepolicyrecommendations.pdf.

[28] Institute of Medicine. Retooling for an aging America: building the health care workforce. Washington, D.C.: National Academies Press, 2008.

[29] Allen SM, Ballweg RA, Cosgrove EM, Engle KA, Robinson LR, Rosenblatt RA, Skillman SM, and Wenrich MD. Challenges and opportunities in building a sustainable rural primary care workforce in alignment with the Affordable Care Act: the WWAMI program as a case study. *Acad Med* 2013; 88(12):1862-9.

[30] Cunningham PJ. Beyond parity: primary care physicians' perspectives on access to mental health care. *Health Aff*. 2009; 28(3):w490-w501

[31] Institute of Medicine. Allied health workforce and services: workshop summary. Washington, D.C.: National Academies Press, 2011.

[32] Institute of Medicine. Crossing the Quality Chasm. Crossing the Quality Chasm in the 21st Century. Washington, D.C.: National Academies Press, 2001. Available online at: http://www.nap.edu/catalog/10027/crossing-the-quality-chasm-a-new-health-system-for-the.

[33] Institute of Medicine. 2000. To Err is Human: Building a Safer Health System. Kohn LT, Corrigan J M, and Donaldson MS, eds. Washington, D.C.: National Academy Press. Available online at: https://www.iom.edu/Reports/1999/To-Err-is-Human-Building-A-Safer-Health-System.aspx.

Although allied health professions pre-date this transformation,[34, 35] their alignment with the traditional health care system has emerged in areas to fill the need for comprehensive, integrated care management systems that leverage the skills and infrastructure of allied health providers beyond inpatient settings.[36, 37, 38]

About the O&P Profession

The O&P profession is an allied health occupation recognized since 1992 by the Commission on Accreditation of Allied Health Education Programs (CAAHEP), the national third-party accrediting body for allied health sciences education. Certified orthotists and prosthetists are formally educated and trained to provide custom and pre-fabricated external prostheses and orthoses to patients with limb loss and musculoskeletal conditions.[39] Reflected in these conditions are a number of etiological diagnoses (e.g., complex diabetes, congenital deformity, obesity, foot ulcers, cancer, rheumatoid arthritis, and etc.) that can span pediatric, adult, and elderly patient populations.

In 2014 the CAAHEP accredited 2,107 programs across 19 allied health professions. Twelve CAAHEP accredited programs were approved for orthotists and prosthetists.[40] Two accredited programs for technicians were also recently approved.[41] While O&P pedorthists, assistants, and fitters are considered skilled entities within the O&P profession, the accreditation for these professions resides with NCOPE and they are not part of the CAAHEP system.

NCOPE accredits six technician and two pedorthic level programs, and approves educational courses for orthotic, mastectomy, and therapeutic shoe devices. The American Board for Certification in Orthotics, Prosthetics and Pedorthics (ABC) and/or the Board of Certification Accreditation, International (BOC) credentials professionals if they pass competency assessment(s) and field training requirements. The minimum educational attainment level needed to obtain certification by ABC and/or BOC ranges

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[34] Institute of Medicine. Allied health workforce and services: workshop summary. Washington, D.C.: National Academies Press, 2011.

[35] Hovorka CF, Shurr DG, and Bozik DS. The concept of an entry-level interdisciplinary graduate degree preparing orthotists for the new millennium part 1: history of orthotic and prosthetic education. *J Prosthet Orthot* 2002; 14:51-8.

[36] Green LV, Savin S, and Lu Yina. Primary care physician shortages could be eliminated through use of teams, nonphysicians, and electronic communication. *Health Aff* 2013; 32(1):11-9.

[37] Bodenheimer T. Primary care – will it survive? *N Engl J Med* 2006; 355:861-4.

[38] Hovorka CF, Shurr DG, and Bozik DS. The concept of an entry-level interdisciplinary graduate degree preparing orthotists for the new millennium part 1: history of orthotic and prosthetic education. *J Prosthet Orthot* 2002; 14:51-8.

[39] Bureau of Labor Statistics, U.S. Department of Labor. Occupational Outlook Handbook, 2014-15 Edition, Orthotists and Prosthetists. Available online at: http://www.bls.gov/ooh/healthcare/orthotists-and-prosthetists.htm.

[40] 2014 CAAHEP Annual Report. Clearwater, FL: Commission on Accreditation of Allied Health Education Programs June 30, 2014. Available online at: http://www.caahep.org/documents/file/Publications-And-Governing-Documents/AnnualReport.pdf.

[41] News and Announcements. Commission on Accreditation of Allied Health Education Programs. Available online at: http://www.caahep.org/Content.aspx?ID=24

from high school diploma or equivalency for pedorthists, assistants, technicians and fitters to the Master's degree for orthotists and prosthetists.

Fifteen states grant licensure for orthotists and prosthetists, while two additional states have regulatory requirements that professionals be certified by either ABC or BOC. Several of these states also grant licensure for certain fitters, technicians, assistants and pedorthists. Although neither certification nor state licensure is required to render O&P services in the remaining 35 states and the District of Columbia, only custom-fabricated devices provided by state licensed orthotists and prosthetists, or ABC and/or BOC certified orthotists and prosthetists who practice in non-licensure states, are eligible for Medicare reimbursement.[42]

The Bureau of Labor Statistics' (BLS) most recent estimates suggest that orthotists and prosthetists held approximately 8,500 full-time jobs in 2012, and that by 2022 the job prospect for these providers is projected to increase to 11,500 or by 36 percent. While BLS does not monitor employment statistics for assistants, fitters, pedorthists, or technicians separately,[43] it is unclear whether these providers are included in the BLS estimates.

Report Outline

In this report, we outline the methodology and results of our workforce demand projections. In the methodology section, we present the overall analytic approach, followed by the data sources used and the details for developing the baseline and projection models for O&P professionals. In the results section, we present the overall workforce demand and supply in 2014 (at baseline) and for the ten-year study period of 2016 through 2025. We also present the demand for and supply of O&P professionals separately for orthoses and prostheses. Lastly, this report ends with conclusions and a discussion, including methodological limitations.

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[42] Office of Inspector General. CMS has not promulgated regulations to establish payment requirements for prosthetics and custom-fabricated orthotics (OEI-07-10-00410). Washington, D.C.: Department of Health and Human Services October 2012. Available online at: https://oig.hhs.gov/oei/reports/oei-07-10-00410.pdf.

[43] Bureau of Labor Statistics, U.S. Department of Labor. Occupational Outlook Handbook, 2014-15 Edition, Orthotists and Prosthetists. Available online at: http://www.bls.gov/ooh/healthcare/orthotists-and-prosthetists.htm.

Methodology

Overall Analytic Approach for Determining Demand and Supply

Our analytic approach consists of developing separate demand and supply models that are compared to assess whether the profession currently is, and will remain, in equilibrium. Equilibrium implies that there are enough credentialed (certified and/or licensed) O&P professionals to meet the demand for services across the U.S. Our approach uses a baseline model (2014) which is then projected over the next ten years (2016-2025).

The Demand Model

The demand model is divided into orthotic and prosthetic services and projects the need for professionals providing these services separately. For each type of service, we have considered the seven different certified provider groups who deliver these services.[44] At its core, the demand model converts the projected number of patient visits for O&P services to the number of professionals needed to provide those services. The demand model is first developed for the over-65 population, and then extrapolated to represent the overall population using O&P services.

Following the development of the baseline model, the projection models considered the impact of exogenous factors on the future demand for services by professional type. Specifically, we consider the projected trends in off-the-shelf (OTS) orthotic devices and the resulting potential substitution effects among professionals providing these services. For example, due to lower complexity of OTS services, patients in the future may receive these orthotic devices from assistants under the supervision of orthotists, or from physicians or other non-O&P providers instead of from certified orthotists directly. Additionally, our projection models explored the impact of other exogenous factors (advances in technology, changes in insurance coverage, patient age distribution, state

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[44] The seven professional types include orthotists, prosthetists, prosthetists/orthotists, pedorthists, technicians, assistants, and fitters (therapeutic shoe, mastectomy, and orthotic).
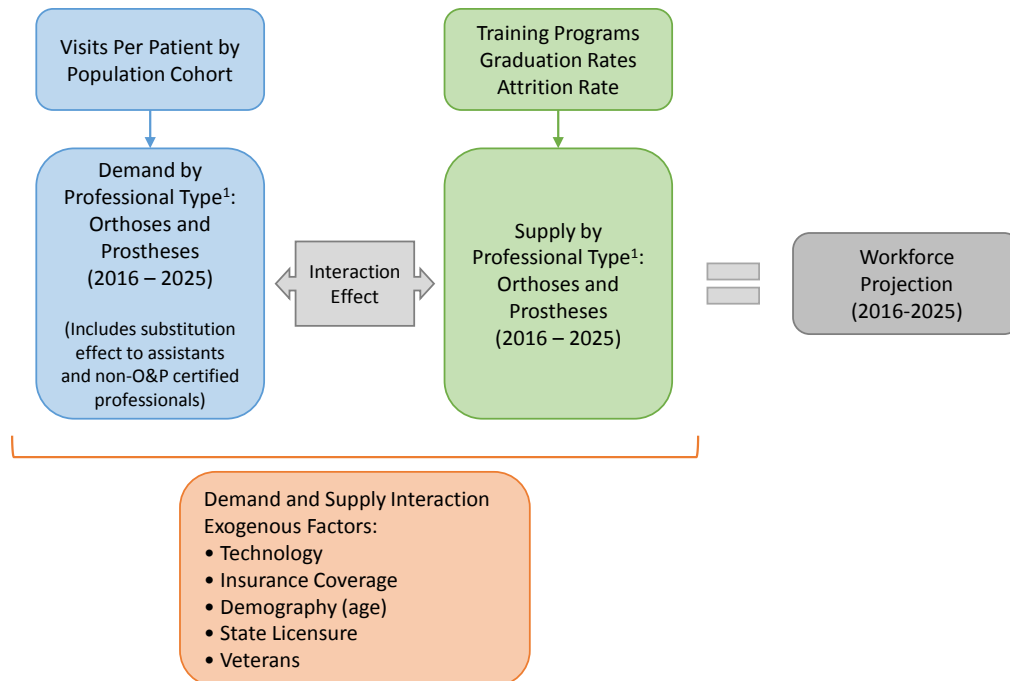
licensure laws, and demand from returning veterans) on O&P service demand. We relied on a series of interviews to inform our assumptions in these areas.

The Supply Model

The supply model for certified providers is based on: 1) the number of board certified O&P professionals; 2) the estimated number of new entrants (mainly graduation rates for orthotists, prosthetists, prosthetist/orthotists, and pedorthists) into the field; and 3) the projected attrition rate due to retirement, career change and death. Our projections have also considered a variety of exogenous factors such as advances in technology, changes in insurance coverage (both provider and patient), provider age distribution, and state licensure laws. Again, we relied on our interviews to identify those exogenous factors and to estimate their impact on the future supply of O&P professionals.

Exhibit 1 provides an overview of the O&P workforce model in which demand and supply interact subject to a set of exogenous factors.

Exhibit 1: Overview of Workforce Model

[1] Model includes certified orthotists, prosthetists, prosthetists/orthotists, pedorthists, assistants, technicians, and fitters (therapeutic shoe, mastectomy, and orthotics).

Data Sources Used

Because no single data source contains detailed information on the demand for or supply of O&P professionals, we made use of multiple sources to construct baseline demand and

supply estimates and projection assumptions. The analyses were primarily completed using: 1) Medicare claims data; 2) National Health Interview Survey (NHIS), (3) U.S. Census Bureau projections; 4) published and unpublished O&P profession estimates and literature; and 5) interviews with O&P profession stakeholders.

To determine the current demand for O&P professionals, we analyzed a five percent sample of Medicare Limited Data Set (LDS) claims file for durable medical equipment, prosthetics, orthotics, and supplies (DMEPOS) services provided in 2013.[45] This file was used to examine utilization, including services rendered and the provider specialty delivering those services, for Medicare beneficiaries aged 65 years and older (referred to as the over-65 population). We used statistics from the NHIS to determine users of orthoses and prostheses services for the over-65 and overall populations, and then used the Medicare analysis of the over-65 population to extrapolate to the overall population.

Whenever possible, we used available profession estimates and peer-reviewed literature to inform our modeling assumptions. Profession information, such as ABC and BOC certification data, O&P program enrollment and annual graduation statistics, and the overall demographic composition of certified O&P professionals were found in both published and unpublished sources. The peer-reviewed literature provided information on those factors that could impact future demand for O&P services, including: 1) epidemiologic changes in the patient population (e.g., projected change in diabetes-related amputations, overweight and obesity comorbidities in disabled populations, rates of degenerative skeletomuscular disorders and congenital deformities); 2) advances in O&P specific medical technology (i.e., more durable materials and three-dimensional printing); 3) health care policy and regulatory changes (e.g., site-neutral DME payments and competitive bidding); and 4) changes in the competitive landscape for O&P professional services (e.g., utilization of OTS devices, overall health of the economy, and insurance coverage, premiums, and deductibles).

The weighted impact of our projection assumptions was also informed by key informant interviews conducted with O&P profession experts, including practitioners representing each O&P profession, single and multi-facility O&P business owners, educators, trade organizations, Veteran's Affairs Administration representatives, and O&P device manufacturers. Through 22 interviews, our literature-based assumptions were either confirmed or modified to better reflect current conditions in the O&P profession. For instance, although we identified literature to suggest that the development of new technologies would improve the durability and comfort of certain types of prosthetic devices, interviewees indicated that payers and patients would not likely accept any

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[45] Medicare limited data set (LDS) claims data for 2013 – DME Line File

significant additional cost for such devices and, therefore, the assumed impact of technologies on the O&P profession was considered to be negligible.

Insights from interviewees also contributed to our understanding of competing demand factors within the O&P profession due to overlapping duties and responsibilities across certain profession-levels, as well as provider workload, patient visit estimates, and general patient referral pathways. Another key finding identified through interviews was the notable variation in the demand for and supply of O&P professionals and office staffing ratios based on interviewees' practice location. The geographic variation in how O&P services are provided appears to be significant.

In addition to the above mentioned data sources, the project was completed with the assistance of a technical advisory committee, which comprised certified providers and representatives of education and accreditation organizations. The purpose of this advisory committee was to validate our research assumptions and provide ongoing clinical input and interpretation of the data and literature.

In summary, we used the following sources to develop the assumptions that support our analyses:

Source (year)
Medicare Limited Data Set (LDS) Durable Medical Equipment (DME) file (2013)
American Board for Certification in Orthotics, Prosthetics, and Pedorthics Annual Reports (2012, 2013, and 2014)
Board of Certification/Accreditation reports (2013 and 2014)
National Commission on Orthotic and Prosthetic Education reports (2002 and 2006)
National Health Interview Survey (1996)
U.S. Census Bureau (projections from 2014 to 2025)
Interviews and profession sources (2015)
Guidance from technical advisory committee (2015)

Estimating the Demand for O&P Services: Baseline and Projection Model
In this section, we outline the methodology for developing our baseline and projection models for the demand for and supply of O&P professionals.

Demand Model Development
Exhibit 2 provides an overview of how we divided the overall O&P professional demand into orthotic (Model 1) and prosthetic (Model 2) services. In order to construct demand models for each of the seven different O&P professional types, we considered the services they provide for which they bill Medicare. Both the orthotic and prosthetic models include demand for all professional types, except for fitters. Therapeutic shoe and orthotics fitters are included in the orthotic model, while only mastectomy fitters are
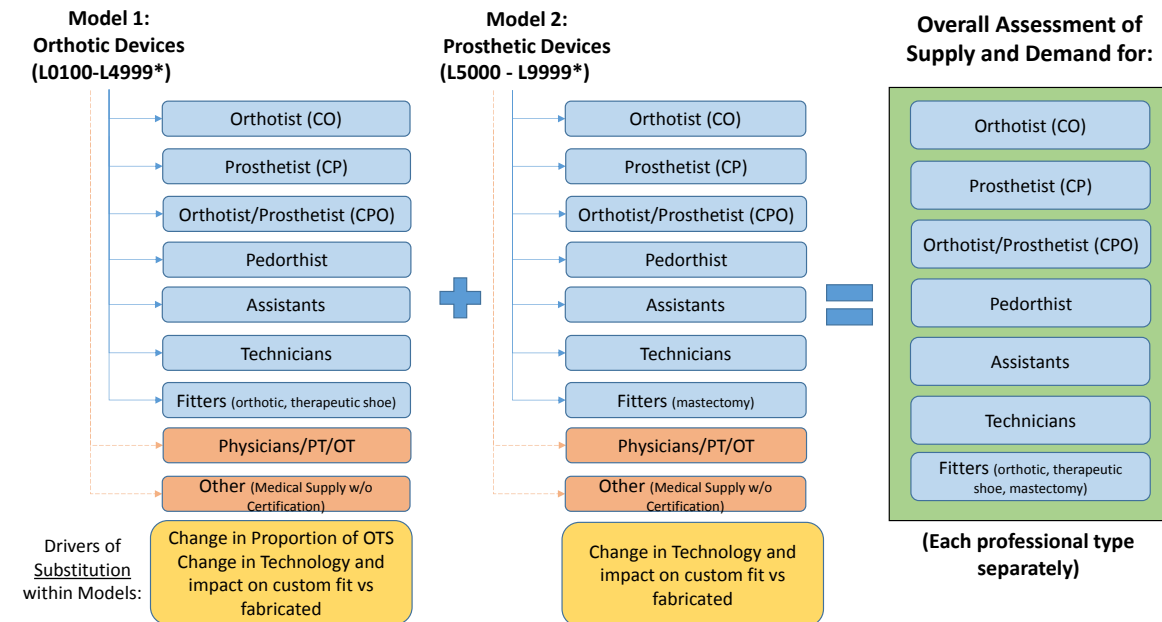
included in the prosthetic model. According to the Medicare claims analysis, each provider type can (and often does) provide both orthotic and prosthetic services.

Healthcare Common Procedure Coding System (HCPCS) codes were used to identify the number and type of orthoses and prostheses provided by each professional type. Primarily, orthoses were identified using HCPCS codes L0100 to L04999, while prostheses were identified using HCPCS codes L5000 to L9999. All orthotic and prosthetic services were allocated to the appropriate professional type based on the provider specialty code. Additionally, for each of the models, all HCPCS codes billed by certified orthotists, prosthetists, prosthetists/orthotists, and pedorthists that were outside the primary HCPCS codes of interest were included in the model to more accurately capture the full demand for their time.

Since physicians and occupational/physical therapists and other non-O&P providers (e.g., laboratories, medical supply companies, and pharmacies) can also provide relevant O&P services, these groups are also included in both demand models to aid in substitution modeling (i.e., the shifting of services away from certified O&P providers to physicians). However, the full demand and supply projections for non-O&P professionals are not included in the scope of this study.

Exhibit 2: Demand Model Structure

* E0100 to E0159 were also included and attributed as orthotic or prosthetic devices based on the provider specialty. A5500 to A5513 and E1800 to E1841 were also used to identify orthoses (matched to provider specialty). All other services billed by certified orthotists, prosthetists, prosthetists/orthotists, and pedorthists are also included.

Methodology

Calculating Baseline Demand

To estimate overall demand for O&P providers, we employed a two-step process, as no single data source provided the requisite input data to allow us to fully develop the model across all age categories. First, we estimated the demand for orthotic and prosthetic professionals for patients over 65 years old using Medicare claims. Second, we extrapolated the demand from the over-65 population to the entire population based on a ratio of O&P users. In this section, we highlight the key methodological steps for calculating the baseline demand model for both populations.

Estimating Baseline Demand for Population 65 Years and Over

A major driver of the demand models is the utilization rate (visits per patient and average number of annual visits) provided by a full-time equivalent (FTE) O&P professional. In order to determine the number of professionals needed to treat patients, we divided the number of patient visits to O&P professionals by the average number of annual (income generating and non-income generating) visits provided by each full-time O&P professional. The average number of annual visits provided by O&P was initially determined using the Medicare 2013 claims data, and augmented with profession estimates. Thus, in our baseline demand model, the number of patient visits is converted to the number of professionals needed to deliver the visits.

The concept of an "FTE" O&P provider is defined as the number of visits that can be provided by a typical O&P provider who is engaged in patient care (or for the case of technicians – time spent assisting in the delivery of care by building the device) on a full-time basis. We also use full-time O&P providers to represent supply, because the number of FTE O&P providers is a measure of the capacity of the workforce to deliver health care services. A common metric is necessary to compare demand and supply.

Baseline Estimation of Demand for All Age Groups:

In order to extrapolate the demand for professionals to treat the over-65 population to the overall population, we calculated a user ratio parameter separate for orthotic and prosthetic services. The user ratio was based on the proportion of patients over 65 years old with an incidence of particular diseases that rely heavily on O&P services compared to the overall population. The prevalence of the diseases of interest by age category was obtained from 1996 NHIS data, and literature estimates were used to determine what proportion of patients with a particular condition would require orthotic or prosthetic services.

For orthoses, the user ratio is based the incidence of patients with complete and partial paralysis of extremities and for deformity/orthopedic impairments for the over-65, and overall population. Furthermore, according to the literature, 20.3% of people with

complete and partial paralysis of extremities and 16.2% of people with deformity/orthopedic impairment use orthoses.[46] The orthotic use rates were applied to the NHIS disease incidence information by age to determine the number of patients seeking orthotic services for the over-65 and overall population.

For prostheses, a similar approach was applied to obtain the incidence rate of patients with absence of extremities (excludes tips of toes and fingers) for the over-65 and overall population. According to the literature, 75% of people with amputations use prostheses.[47] The prosthetic use rates were applied to the NHIS disease incidence information by age to determine the number of patients seeking prosthetic services for the over-65 and overall population.

The user ratio is then calculated (separately for orthoses and prostheses) by dividing the number of users of orthoses/prostheses for the over-65 population by the number of users of orthoses/prostheses for all ages. Once the user ratio is calculated, the following formula is used to calculate the demand for any certified provider type providing orthoses or prostheses services.

$$\text{Demand for orthoses/prostheses (by certified O\&P provider type) for all ages} = \frac{\text{Demand for certified provider (providing orthoses/prostheses) for over-65 population}}{\text{Ratio of users of orthoses/prostheses over-65 compared to all-ages category}}$$

Calculating Projected Demand

Using the baseline demand for orthoses and prostheses, the demand is projected to our study period (2016-2025). Similar to the baseline methodology, demand is projected separately for the over-65 population and the overall population.

Demand Projection for Population 65 Years and Over

We assume that the patient population in need of orthotic and prosthetic services grows at the same rate as the U.S. Census population. Our interviews indicated that this assumption is reasonable based on the anticipated impact of advances in technology, changes in insurance coverage, patient age distribution, state licensure, and needs of returning veterans on O&P demand.

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[46] Nielsen CC (2002). Issues affecting the future demand for orthotists and prosthetists: update 2002. National Commission on Orthotic and Prosthetic Education.

[47] Nielsen CC (2002). Issues affecting the future demand for orthotists and prosthetists: update 2002. National Commission on Orthotic and Prosthetic Education.

Methodology

The demand for O&P professionals by provider type is projected by multiplying the population projections by provider-type specific utilization rates. The formula to calculate projected demand for services (number of visits) provided by a professional type is given below.

$$
\begin{array}{c}
\text{Projected demand for} \\
\text{orthoses/prostheses by certified} \\
\text{O\&P provider type}
\end{array}
=
\begin{array}{c}
\text{Patient population} \\
\text{projections}
\end{array}
\times
\begin{array}{c}
\text{Utilization rate or visit} \\
\text{per patient}
\end{array}
$$

The number of O&P providers (by professional type) needed to meet the demand is calculated by dividing the projected demand for services provided by a specific O&P provider (e.g., certified orthotist) with the average annual visits provided by a full-time O&P provider, as shown in the formula below.

$$
\begin{array}{c}
\text{Demand for certified O\&P} \\
\text{provider}
\end{array}
=
\frac{
\begin{array}{c}
\text{Projected demand for services provided by certified} \\
\text{provider measured in visits}
\end{array}
}{
\begin{array}{c}
\text{Average number of annual visits provided by FTE} \\
\text{certified provider}
\end{array}
}
$$

Demand Projections for all aged groups:

We have assumed the relative proportion of medical conditions of interest that will lead to demand for orthoses and prostheses will remain unchanged throughout the study period. That is, the rates of paralysis, deformity, orthopedic impairment, or amputation by age group will remain relatively constant from 1996 over the projection period through 2025, and the number of patients using orthoses or prostheses (by age group) will grow at the same rate as the population growth obtained from U.S. Census data. Based on these assumptions, we projected the user ratio parameter for orthoses and prostheses.

Using the following formula we estimated the projected demand for certified providers providing orthoses and prostheses. The same formula is applied to all certified provider groups individually.

$$
\begin{array}{c}
\text{Projected demand for} \\
\text{orthoses/prostheses by} \\
\text{certified O\&P provider} \\
\text{for all ages (2016-2025)}
\end{array}
=
\frac{
\begin{array}{c}
\text{Projected demand for certified provider for over-65} \\
\text{population}
\end{array}
}{
\begin{array}{c}
\text{Projected ratio of users of orthoses/prostheses over-65} \\
\text{compared to all-ages category}
\end{array}
}
$$

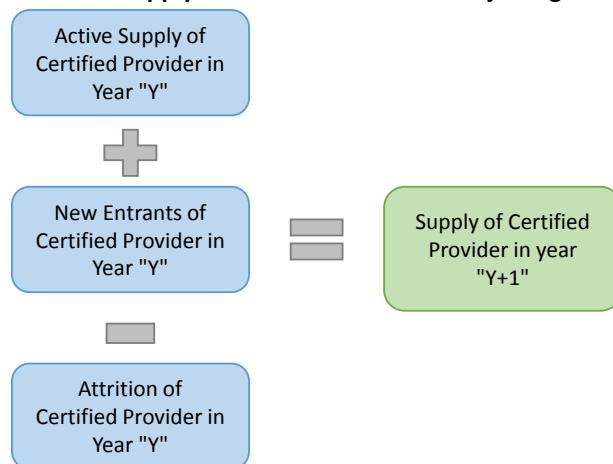**Estimating the Supply for O&P Services: Baseline and Projection Model**

Supply Model Development

As with the demand model, the supply model is divided into orthotic and prosthetic services. We recognize that a single professional may provide services under both models. The major drivers of O&P supply are: 1) number of clinically-active board certified O&P professionals; 2) the number of graduates across all programs; 3) the number of graduates receiving board certification and entering practice; and 4) the attrition rate for each of the provider types.

To construct the baseline supply models for the different certified O&P professionals, we first calculated the total supply of each provider in 2014 based on information collected from ABC, BOC, and other profession-related data. Adjustments were made to account for providers that are certified by both ABC and BOC and for those professionals who are not providing or assisting in the delivery of patient care (e.g., in academia). In this model, we assume that the number of new entrants to the O&P workforce remains consistent over time.

We then project the active supply (often referred to as "stock") of O&P professionals from 2015 to 2025 using the framework presented in Exhibit 3. The framework is applied to each professional group separately.

Exhibit 3: Supply Model Framework for Projecting Certified O&P Professionals

The projection starts with the number of board certified O&P professionals at baseline (2014), and adds new entrants into the model each year. Only new entrants that are providing patient care (or assisting in the delivery of care) are included in the model (i.e., excludes certified providers who are employed in retail or academic environments). The attrition aspect of the model (reducing supply) consists of O&P providers who leave the

workforce for reasons of a change in professional activity, retirement, or death. The new entrant and attrition rates are often referred to as the "flow" of the supply over time.

Attrition appears to be one of the largest drivers of the supply projections. Based on the literature, we assumed that 85 percent of O&P professionals over 55 years old would retire over the next 10 years, while 14.3 percent of professionals under age 50 would retire over the same period. Using the age distribution of certified providers given by ABC and BOC, we first determined the number of certified providers who are over and under 55 years old. We then applied the above assumption on attrition rates for these age groups to calculate the weighted average growth rate of attrition for both age groups over the ten year period. The compound annual growth rate for attrition was calculated and applied to the estimated stock of providers by type to calculate how many O&P providers would remain each year.

The annual attrition rate applied to each professional type is presented below in Exhibit 4.

Exhibit 4: Annual Attrition Rate by Provider Type

Professional Type	Annual Attrition Rate
Orthotists	5.0%
Prosthetists	4.5%
Prosthetist/Orthotists	4.5%
Pedorthists	4.7%
Orthotic Fitters	4.8%
Mastectomy Fitters	4.8%
Therapeutic Shoe Fitters	4.8%
Assistants	2.9%
Technicians	2.9%

Comparing Demand and Supply Models

The construction of our models allows demand and supply to be calculated by O&P professional type across orthoses, prostheses, and orthoses and prostheses combined. The supply of providers cannot be added across orthotic and prosthetic models due to the lack of mutual exclusivity (i.e., one professional may provide orthotic and prosthetic services and be counted in both models). However, the total supply model (without the division of orthoses and prostheses) can be compared to the total demand model.

In order to assess equilibrium, we calculated the demand-to-supply ratio for each professional type. If the ratio is close to 1.0, the market is considered to be in equilibrium for that particular professional type. We have calculated the demand-to-supply ratio for the baseline, and each year of the projected study period.

Results

In this section, we present the results of our analysis. First, we present the demand for and supply of O&P services by provider type at baseline (2014). We then show the projected workforce demand for the overall O&P profession from 2016 through 2025. As the projections differ for orthoses and prostheses, we also present the estimates for each service type separately. We note that the supply of each O&P professional type is not mutually exclusive across the orthoses and prostheses models, and therefore, these models are not additive to produce the overall profession estimates.

Baseline Results

Based on the information gathered through all of the available data sources, profession data, and literature, we estimate that in 2014 there is a need for 18,816 O&P providers (Exhibit 5). Of this total, almost one-third (6,369) need to be orthotists, prosthetists, and prosthetists/orthotists. For patient-facing activities (patient visits and consultations), there is a demand for 13,776 providers, including orthotists, prosthetist, and prosthetist/orthotists, pedorthists, assistants, and fitters (therapeutic shoe, mastectomy, and orthotics). The demand for technician services is estimated to require 5,040 professionals, as technicians often assist in the delivery of each and every custom fit and fabricated device, as well as the development of OTS devices.

For 2014, we estimate that there are 14,905 credentialed (licensed/certified) professionals currently involved in delivering (or assisting in the delivery of) patient care to help meet the demand. Among the certified orthotists, prosthetists, and prosthetists/orthotists, the supply of 6,675 providers almost perfectly matches the need – with a demand-to-supply ratio of 1.0. Furthermore, the overall supply of credentialed patient-facing providers (14,326 – including pedorthists, fitters, and assistants) results in an equilibrium of the profession (demand-to-supply ratio of 1.0).

The role of technicians is very complicated in this model. Based on the results of our interviews, we understand that a large (but unknown) proportion of technicians do not

become certified. That is, they enter the field in an entry-level position, and through tenure and experience, become technicians. There does not currently appear to be an incentive for the majority of technicians to be certified. As a result, our model is only able to track certified technicians and cannot quantify the non-certified workforce that is helping to meet the demand for O&P services. While this caveat affects all provider types in some way, the largest impact is evident among technicians and assistants. With our estimated credentialed supply of technicians (579), we estimate a demand-to-supply ratio of 8.7.

Across all provider types, we estimate that the O&P profession has a demand for 18,816 providers, and a current credentialed supply of 14,905 providers – or a demand-to-supply ratio of 1.3. As non-certified providers are likely treating the remaining patients seeking O&P care, the profession appears to be in relative equilibrium.

Exhibit 5: Comparison of Demand for and Supply of O&P Professionals at Baseline (2014)

Category	Baseline (2014)		
	Demand for Providers	**Supply of Credentialed Providers**	**Demand-to-Supply Ratio**
1) Orthotists	3,671	3,036	1.2
2) Prosthetists	1,198	1,880	0.6
3) Prosthetists/Orthotists	1,501	1,759	0.9
Sub-total (#1 through #3)	**6,369**	**6,675**	**1.0**
4) Pedorthists	1,072	1,240	0.9
5) Fitters	4,316	5,513	0.8
6) Assistants	2,019	898	2.2
Sub-total (#1 through #6)	**13,776**	**14,326**	**1.0**
7) Technicians	5,040	579	8.7
Overall Total (#1 through #7)	**18,816**	**14,905**	**1.3**

Source: Dobson | DaVanzo workforce demand projections.

Projected Workforce Model for O&P Profession Overall

Based on the inputs and assumptions to our model, we estimate a substantial change in both the demand for and supply of O&P services over the next ten years. We assume the demand for O&P services remains a constant proportion of the overall population after considering the change in the population due to the aging of the baby boomers and extended life expectancy. One factor within the O&P profession that we expect to change in the future is the role of OTS devices among orthoses. Previous research conducted by Dobson | DaVanzo indicated that about one-third of OTS orthotic devices are provided by

certified O&P professionals, while another one-third are provided by medical supply companies without certified professionals, and the last one-third are provided by physicians and occupational/physical therapists.[48] As OTS devices continue to increase as a proportion of all orthotic devices, we estimate that less-experienced O&P professionals (such as assistants) and non-O&P professionals will be providing these services instead of the certified orthotists who perform them today. While this does not increase the overall demand for O&P services, it does change the distribution of who provides that care (and the subsequent demand for those positions).

The largest drivers of the change in supply are the expected graduation rates of certified providers (increasing supply) and the estimated attrition rates of certified providers out of the profession (decreasing supply). This attrition rate includes retirement and all other changes away from patient care, including moving into management positions, retail environments, and academia. Overall, we estimate that the attrition rate will surpass the graduation rates and result in a declining supply of certified providers in the O&P profession overall across the study period.

Exhibit 6 presents the demand for and supply of O&P professionals for 2016 and 2025. The 2016 estimates remain relatively consistent with the baseline estimates, with an overall demand-to-supply ratio of 1.3. However, the demand for O&P professionals has increased by 310 professionals, and the supply of certified professionals has decreased by 479 professionals since 2014. By the end of the ten-year study period (2025), we estimate the demand will continue to increase to 20,504 O&P professionals and the supply will continue to decrease to 12,775 certified professionals. This will result in a demand-to-supply ratio of 1.6 – indicating that the credentialed supply would need to increase by about 60 percent to meet the growing demand. Again, we note that non-certified (and non-O&P) providers are likely providing care to meet the growing demand for services. For example, physicians and medical supply companies without certified personnel are increasing their share of O&P services billed to Medicare (and likely other payers) largely due to the increased trend in the use of OTS devices.

Among the certified orthotists, prosthetists, and prosthetist/orthotists, the demand-to-supply ratio increased from 1.0 in 2016 to 1.4 in 2025. As the age distribution for this sub-group of providers is generally older than that of assistants and fitters, these certified clinicians are disproportionately impacted by attrition. Certified orthotists are the largest driver of the change in the ratio, as they serve about 57 percent of the total demand, and comprise about 43 percent of the total supply.

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[48] Dobson | DaVanzo. (2013). Medicare Payments for O&P Services by Provider Type. Prepared for the American Orthotic and Prosthetic Association (AOPA)

Technicians are the only professional type that increase both in demand and supply between 2016 and 2025. This is because their estimated graduation rate is exceeding their attrition rate, based on the known age distribution of certified technicians.
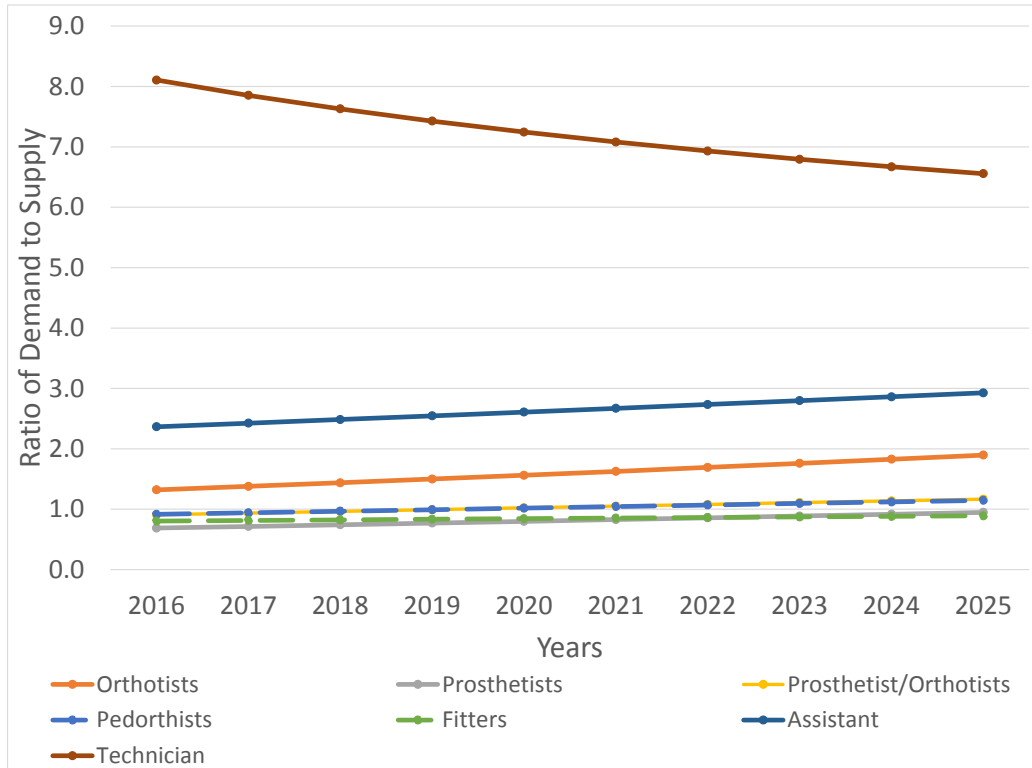
Exhibit 6: Comparison of Projected Demand for and Supply of O&P Professionals (2016-2025)

	2016			2025		
Category	**Demand for Providers**	**Supply of Credentialed Providers**	**Demand-to-Supply Ratio**	**Demand for Providers**	**Supply of Credentialed Providers**	**Demand-to-Supply Ratio**
1) Orthotists	3,731	2,826	1.3	4,000	2,109	1.9
2) Prosthetists	1,217	1,768	0.7	1,305	1,376	0.9
3) Prosthetists/Orthotists	1,525	1,680	0.9	1,635	1,401	1.2
Sub-total (#1 through #3)	**6,474**	**6,274**	**1.0**	**6,940**	**4,887**	**1.4**
4) Pedorthists	1,090	1,191	0.9	1,168	1,019	1.1
5) Fitters	4,387	5,461	0.8	4,703	5,279	0.9
6) Assistants	2,052	868	2.4	2,200	752	2.9
Sub-total (#1 through #6)	**14,003**	**13,794**	**1.0**	**15,012**	**11,938**	**1.3**
7) Technicians	5,123	632	8.1	5,492	838	6.6
Overall Total (#1 through #7)	**19,126**	**14,426**	**1.3**	**20,504**	**12,775**	**1.6**

Source: Dobson | DaVanzo workforce demand projections.

Exhibit 7 shows ratio of demand-to-supply for each year in our study period. As technicians are increasing supply faster than demand, the ratio is decreasing over time. For all other professional types, the ratio is slightly increasing each year of the study period.

Exhibit 7: Ratio of Demand-to-Supply by Professional Type by Year (2016-2025)

Source: Dobson | DaVanzo workforce demand projections.

For illustrative purposes, we next present the projected workforce for orthoses and prostheses separately.

Projected Workforce Model for Orthoses

Exhibit 8 presents the projected demand for and supply of O&P professionals providing orthoses (a subset of services presented in Exhibit 6, above). The provision of orthoses appears to be the primary driver of our overall demand and supply projections for the O&P profession. Of the total demand for O&P services of 19,126 providers (Exhibit 6), orthoses services account for almost 92 percent of all demand (17,574 providers). Furthermore, we estimate that there are 10,964 providers delivering orthoses services in 2016.

Among certified orthotists, prosthetists, and prosthetists/orthotists, the demand-to-supply ratio of 1.0 in 2016 and 1.3 in 2025 is relatively consistent with the overall O&P profession. Once pedorthists, fitters, and assistants are included, the demand-to-supply ratio for orthoses is higher than the overall profession, with an estimated ratio of 1.2 for 2016 and 1.5 for 2025 (compared to 1.0 in 2016 and 1.3 in 2025 for the overall

profession). Across all professionals (categories #1 through #7), the demand-to-supply ratio for orthoses services is higher than the overall O&P profession average projected in Exhibit 6. In 2016, there is an estimated demand-to-supply ratio of 1.6 for orthoses, which increases to 2.0 in 2025 (compared to 1.3 and 1.6 for the overall O&P profession in 2016 and 2025, respectively).

Again, technicians remain an anomaly in the analysis due to the large number of uncertified technicians assisting in the delivery of care (through the development of the devices in an on- or off-site facility. The demand-to-supply ratio of certified technicians for orthotics (13.1 in 2016 and 10.6 in 2025), increases the overall ratio.

Exhibit 8: Comparison of Projected Demand for and Supply of O&P Professionals for Orthoses (2016-2025)

Category	2016			2025		
	Demand for Providers	Supply of Credentialed Providers	Demand-to-Supply Ratio	Demand for Providers	Supply of Credentialed Providers	Demand-to-Supply Ratio
1) Orthotists	3,526	2,733	1.3	3,780	2,039	1.9
2) Prosthetists	674	1,437	0.5	723	1,118	0.6
3) Prosthetists/Orthotists	1,312	1,608	0.8	1,407	1,342	1.0
Sub-total (#1 through #3)	**5,513**	**5,778**	**1.0**	**5,910**	**4,499**	**1.3**
4) Pedorthists	1,031	1,177	0.9	1,106	1,007	1.1
5) Fitters	4,272	3,132	1.4	4,579	3,153	1.5
6) Assistants	1,898	508	3.7	2,035	440	4.6
Sub-total (#1 through #6)	**12,714**	**10,594**	**1.2**	**13,630**	**9,100**	**1.5**
7) Technicians	4,860	370	13.1	5,210	491	10.6
Overall Total (#1 through #7)	**17,574**	**10,964**	**1.6**	**18,840**	**9,591**	**2.0**

Source: Dobson | DaVanzo workforce demand projections.

Projected Workforce Model for Prostheses

Exhibit 9 presents the projected demand for and supply of O&P professionals providing prostheses (a subset of services presented in Exhibit 6, above). The projected demand for and supply of prostheses differed greatly from those for orthoses. Based on the Medicare claims data, most certified O&P providers delivered both orthotic and prosthetic devices in 2013. However, the demand for prostheses is significantly lower than the demand for orthoses. As a result, the projected demand-to-supply ratio for prostheses suggests that there is an oversupply of providers delivering prosthetic services. Note, however, that O&P providers are rarely exclusive to providing just orthotic or prosthetic services.

Across all O&P professionals (categories #1 through #7), the model projects a demand-to-supply ratio of 0.2 for 2016 and 0.3 for 2025. It is interesting to note, however, that the

demand-to-supply ratio for technicians is 1.0 in 2016 and 0.8 in 2025. One possible contributor to this finding could be that certified technicians are assisting in the delivery of all prosthetic devices, while orthotic devices are fabricated by non-certified professionals.

Exhibit 9: Comparison of Projected Demand for and Supply of O&P Professionals for Prostheses (2016-2025)

Category	2016			2025		
	Demand for Providers	Supply of Credentialed Providers	Demand Ratio: Demand-to-Supply	Demand for Providers	Supply of Credentialed Providers	Demand Ratio: Demand-to-Supply
1) Orthotists	205	1,806	0.1	220	1,348	0.2
2) Prosthetists	543	1,441	0.4	582	1,121	0.5
3) Prosthetists/Orthotists	213	1,147	0.2	229	957	0.2
Sub-total (#1 through #3)	**961**	**4,394**	**0.2**	**1,031**	**3,426**	**0.3**
4) Pedorthists	58	513	0.1	63	439	0.1
5) Fitters	115	2,329	0.0	124	2,126	0.1
6) Assistants	154	359	0.4	165	312	0.5
Sub-total (#1 through #6)	**1,289**	**7,595**	**0.2**	**1,382**	**6,302**	**0.2**
7) Technicians	263	262	1.0	282	347	0.8
Overall Total (#1 through #7)	**1,552**	**7,857**	**0.2**	**1,664**	**6,649**	**0.3**

Source: Dobson | DaVanzo workforce demand projections.

Conclusion, Limitations, and Discussion

The purpose of the NCOPE workforce study is to better understand the factors affecting the demand for O&P professionals and the supply of certified providers. We have tried to quantify the factors where possible and have projected the demand and supply models forward to 2025. Our study also includes qualitative analyses based on the study interviews. The interview results indicate that there are exogenous factors like technologic innovations, changes in insurance coverage, patient age distribution, state licensure, and returning veterans that can affect the demand for and supply of O&P providers. However, our interviewees indicated that our assumption of demand (based on population projection) is reasonable based on the fact that the exogenous variables intervene in the marketplace, such that the net effect of all variables taken together appears to be negligible.

As of 2014, our analysis suggests that the O&P market is at relative equilibrium, in that the demand for providers is mostly met by the available supply of credentialed providers. However, as the demand continues to grow over time due to aging of baby boomers and the extended life expectancy of the population, the demand for services will outpace the supply of credentialed providers. With relatively few O&P educational programs currently available, the expected attrition rate will outpace the growth in credentialed supply (based on graduation rates and the proportion of professionals entering the patient-facing aspects of O&P care).

The model estimates that by 2025, the demand for professionals will be about 60 percent higher than the available credentialed supply. Non-certified professionals, not limited to, but certainly including technicians and assistants, are likely to continue to help meet the demand. Furthermore, the composition of the workforce is likely to change markedly as the credentialed supply becomes unable to meet the demand and as OTS devices continue to be provided by physicians, occupational/physical therapists, and medical supply companies without certified O&P professionals.

Conclusion and Discussion

Limitations

Workforce projection models must overcome a number of challenges if their estimates are to provide meaningful guidance to profession stakeholders and students evaluating prospective career options.

First, O&P practices vary markedly across the country, and while we attempted to represent the diverse perspectives of O&P profession stakeholders in our projection assumptions, our results may not be completely generalizable across the entire profession. Thus, certain assumptions in our model may bias larger O&P practices or practices in certain areas of the country.

Second, the data used to estimate multiple model inputs are based on voluntarily submitted surveys collected by professional organizations. Specifically, provider attrition rate, which drives our projected supply of professionals, is based on the current age distribution that comprises each professional level, which was provided for ABC/BOC certifiees for select professional types, extrapolated to the remaining provider groups. To the extent that ABC/BOC's information is not generalizable to the universe of certified O&P providers across professional types, the supply estimates might be different.

Third, there were no uniform datasets that captured basic O&P professional statistics for credentialed and non-credentialed providers, such as regional licensure, demographics, and attrition rates. While our assumptions utilized the highest quality data available, we were unable to apply a consistent methodology (with the same data sources) to construct our projection model across professional types and unable to include both certified and non-certified personnel. The lack of published, shared data forced us to develop unique methodologic approaches for each professional level estimate and to only include credentialed personnel. Although our approach was necessary given the O&P profession's limited collection and sharing of data, estimates that relied heavily on assumptions developed through qualitative interviews likely bias the perspectives of the certified O&P profession in our projection model.

Finally, an important limitation inherent in our workforce estimates is how to interpret the projected shortages in O&P professions. The current and projected shortages in the primary care workforce describe the relative impact of provider supply and demand in terms of patients' inability to obtain care and/or providers' unwillingness to accept new patients. These benchmarks, while intermittently refined and updated, have allowed researchers to quantify the size of the primary care workforce relative to the profession's production of personnel.

Conclusion and Discussion

In allied health professions there are no benchmarks against which to measure a shortage or overproduction of personnel. A deficit or surplus of allied health professionals simply describes a misalignment between the current and projected supply of personnel augmented with basic demand-side assumptions (e.g., growth in the population demanding services), without acknowledging a profession's *need* which requires developing measurements of demand that are external to supply. In this study, we have identified a demand-to-supply ratio of 1.3 as relative equilibrium, in that given the numbers of certified professionals providing care, there is no shortage (defined as delay in care) of professionals to provide O&P services. However, to the extent that non-certified providers cannot treat complex patients needing specialized care, there could be a true shortage of O&P professionals within the next 10 years.

Discussion

Results from this study, as well as the assumptions that underlie them, are intended inform profession stakeholders of which demand and supply factors are expected to have the greatest impact on O&P professionals in the coming years. Unlike the Bureau of Labor Statistics' (BLS) estimates that only capture full-time employment statistics for orthotists and prosthetists, this study also calculated projection estimates for prosthetist/orthotists, pedorthists, assistants, technicians, and fitters. Stratifying demand and supply factors at each professional level and accounting for the responsibilities and services that are shared across multiple professions provides a more comprehensive picture of the O&P workforce that has not previously been available. Furthermore, this level of detail will support more targeted educational and training program development based on the projected shortage areas.

Beyond providing the future supply of certified O&P professionals, credentialing and educational programs are essential to the long-term health of the O&P profession. In the current regulatory environment – that is, in which the cost and quality of health care services are increasingly governed by practice standards informed by clinical evidence and patient outcomes – the demand for credentialed providers will in part be contingent upon whether the O&P profession, and importantly its educational institutions, embrace the development of practice standards that are guided by measurable patient health outcomes. Through rigorous training and educational programs, certified O&P professionals are posed to lead efforts towards more evidence-based practices that increasingly direct policymakers' and payers' reimbursement decisions.