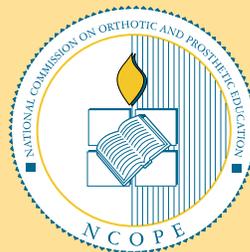


The Orthotic and Prosthetic Profession: 

A Workforce Demand Study

DECEMBER 2006

Demand Study Prepared for the
National Commission on
Orthotic and Prosthetic Education
and
American Orthotic and Prosthetic Association





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By: Corathers Health Consulting, LLC

Primary Contributors: Cathy Corathers, MA/Chief Officer of Corathers Health
Consulting, LLC and Mark Janczewski, MD, MPH, MA, ASc.



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A Demand Study Prepared for the National Commission on Orthotic and Prosthetic Education (NCOPE)

By: Corathers Health Consulting, LLC (Primary Contributors: Cathy Corathers, MA/Chief Officer of Corathers Health Consulting, LLC and Mark Janczewski, MD, MPH, MA, ASc.)

EXECUTIVE SUMMARY

Orthotics and prosthetics care plays an increasingly prominent role in healthcare delivery. For example, quality of life issues, such as the ability to engage in active sports and recreation are vitally important. The Seattle Foot, introduced in 1985, was the first step, in the development of a complete Seattle limb system. The pioneering design spurred further developments to aid amputees.¹ Likewise, orthotic devices such as leg braces, while often used for polio victims during the mid-20th Century, have also evolved to help a wide range of patients from those with congenital deformities to healthy athletes striving to protect a knee from injury while recovering from surgery. This industry continues to be marked with breakthroughs and improvements in adaptability and usefulness.

Along with these dynamic improvements in devices, the demographics of the United States continue to point to an older population that is significantly more active than its cohorts of previous generations. Coupled with an increase in certain disease processes this increased demand presents a challenge to the profession. While the technological advancements in orthotic and prosthetic design and function will continue to keep pace with the desires of its patients, the more important question is whether there will be a sufficient cadre of certified orthotists and prosthetists to provide the diagnostic design, fitting, and educational services to meet the growing needs of patients.

There is an expected shortage of 4.2 percent by 2030, based on population growth alone. The rate increases by 0.40 percent annually, so that by 2030 a 9.5 percent shortage may exist if no new schools were to be opened.

Key Highlights:

1. An assumption is made of adding two new schools. The result is significant, for it adds almost 10 percent to the annual supply of new orthotists and prosthetists.
2. While the population of the United States is on the rise, the aging in America is also significantly affecting both supply and demand for orthotic and prosthetic treatment.
3. Two of the most compelling areas that stress an increased demand for orthotic and prosthetic specialists now and in the future are obesity and diabetes.
4. In order to assure coverage into the future, new technologies must show improved quality of life and long term cost effectiveness. In order to develop a robust Business Case Analysis (BCA) in the short term the American Orthotic and Prosthetic Association (AOPA) or other stakeholder body would greatly benefit from evidence-based studies on efficacy of orthotic and prosthetic devices.
5. In the event that some particular reimbursements become limited to a certain caliber of device provided by practitioners, there may be an innovative breakthrough of certain products that are high quality, yet efficient from the standpoint of supply cost and related labor costs.

6. Coming advancements in technology will likely place an increased demand on orthotists and prosthetists. However, these technological advancements should improve practitioner efficiencies creating a certain amount of counter-balance surrounding the overall technology influence on supply and demand.
7. Orthotics and prosthetics encompasses not only direct-patient orthotic and prosthetic caregivers (i.e. certified practitioners and fitters), but also the technicians who fabricate the orthoses and prostheses.
8. Although CAD/CAM utilization appeared relatively flat from 2000 to 2006, CAD modeling was just starting to present in the primary schools curriculum. CAD is one of the content areas in the 2006 Core Curriculum Guide for CAAHEP accredited schools.² The assumption is that orthotic and prosthetic professionals will increase utilization of CAD/CAM. A conservative assumption, as we understand it, for the time saved by scanning versus casting is about 50 percent, with an average three-hour procedure reduced down to an hour-and-a-half.
9. Due to technological advancements a technician's role may see changes that would create an opportunity for them to transition to certified fitters once additional training has occurred. In turn, they could displace the practitioner in handling less sophisticated applications, decreasing the practitioner demand. This type of domino displacement plays out in healthcare, as the market is better able to fund lower-salaried workers.
10. Bionic technologies are among the drivers in technological innovations that are revolutionizing both prosthetic and orthotic care, particularly in prosthetics.
11. The revolutionizing prostheses of the future will create a paradigm shift because of the neuro-control strategy. This will change the way prosthetists work with patients. In addition, it will greatly expand the time, need and demand for the prosthetist to serve as patient educator and trainer.
12. Orthotic spinal braces and knee braces are definitive examples of the occurrence of off-the-shelf products being driven into the market at higher volumes due to technological advancements in materials.
13. The growth rates of pre-fabricated device procedures vastly exceed that of custom-made devices. This has implications for the practice of orthotists and prosthetists, for those procedures that could be performed by other individuals are rising much higher than orthotist/prosthetist-only procedures.
14. As with most healthcare delivery, there are certain rural areas that may have access issues that should be considered with respect to provider treatment.

The following study examines a multitude of factors that affect both the demand for and supply of certified orthotists and prosthetists. Projections for the next several years are provided, as well as recommendations for policymakers in the field.

INTRODUCTION

The orthotic and prosthetic profession continues to be an integral part of an ever-changing healthcare environment. As a result of this continuous change, the face of the orthotic and prosthetic profession is likely to appear different in the future. Although many factors are likely to affect the current landscape of the orthotic and prosthetic profession, there is evidence to suggest that certain factors will affect this landscape more dramatically than other areas. In particular, trends in technological advancement will change the scope of what and how prosthetic care is provided in the future. Additionally, obesity and related disease processes in the United States have grown to epidemic proportions and are likely to have a profound effect on the overall scope of orthotic care. These and other factors reveal an emerging demand that will ultimately affect the orthotic and prosthetic profession.

For example, the huge "baby boomer" generation, just now approaching retirement age, as its trend-setting, cause-oriented past suggests, is not likely to accept aging passively. To address the projected health issues related to

this group it will be necessary for the orthotic and prosthetic profession to be responsive to these needs as they relate to the profession.

Will the United States have enough healthcare professionals in the near future to meet this emerging demand? Based on our assessment, it is likely that a shortage of certified orthotists and prosthetists will emerge due to projected healthcare needs, population trends, the limited number of current certified orthotic and prosthetic professionals and the limited educational training programs available for new orthotists and prosthetists in the U.S. Preparing a sufficient number of orthotists and prosthetists to meet increasing demand is the challenge.

METHOD

This research project was designed to identify potential healthcare shortages in the professions of orthotics and prosthetics. The study used both quantitative and qualitative content analysis to determine its conclusion. Primary data, both governmental and private, examined include:

- Population of certified practitioners and fitters and the number of educational training programs;
- U.S. population growth and aging of America;
- Healthcare epidemics and other chief diseases/conditions that impact service demands;
- Volume of services provided for specific procedural codes;
- Healthcare reimbursement and payment issues;
- Healthcare advancements, technologies and delivery models of care.

The supply of professionals was explored by combining orthotics and prosthetics as one comprehensive service. For some study purposes, the different levels of patient care and service providers were examined. The definitions of those providers are as follows:

Orthotists/Prosthetists (certified orthotist, certified prosthetist, certified prosthetist-orthotist) - those trained and educated to manage comprehensive clinical orthotic and prosthetic care;

Pedorthists (certified pedorthist) - those trained and educated to design, manufacture, modification and/or fit of footwear, including shoes, orthoses and foot devices;

Fitters (orthotic fitters, mastectomy fitters, therapeutic shoe fitters) - those trained in fitting prefabricated and off-the-shelf orthoses, mastectomy products and non-custom diabetic shoes/inserts.

Key factors affecting the likely shortage are cited with respect to both supply and demand.

Primary factors influencing supply include:

1. Number of current certified orthotists/prosthetists, pedorthists and fitters;
2. Number of current and future accredited schools to train new orthotists/prosthetists, pedorthists and fitters;
3. Number of current and future students enrolled in such programs.

Contributing factors related to those above include:

1. Compensation for certified orthotists/prosthetists, pedorthists and fitters;
2. Insurance (government and private) reimbursement for services provided by certified orthotists/prosthetists, pedorthists and fitters;
3. State licensure laws and other regulatory mechanisms to control growth in the profession;

4. Extent of Continuing Education in the profession;
5. Need for additional education/training to keep up with technological advances;
6. General lifestyle enjoyed by practitioners and fitters;
7. Community standing.

Primary factors influencing demand include:

1. Overall populations growth in the U.S.;
2. Age-specific changes in population;
3. Changes in the prevalence of diseases and injuries that require a need for orthotic and prosthetic care (e.g. diabetes mellitus, peripheral vascular disease, accidents);
4. Reimbursement policies;
5. Advances in technology.

Because of the numerous complexities that impact on the demand for orthotic and prosthetic services, this study looked at those factors that have both the greatest impact and are easily quantifiable. For example, understanding the result of changes in reimbursement policies (which also can affect the future supply of orthotists and prosthetists) would require an extremely sophisticated and complex economic model that would need, for example, to weave in the number of cases for each condition requiring services and the change in the reimbursement rate for each. Further complicating this particular issue is the fact that forecasting what changes will be made in reimbursement rates would be an impossible task. This disclaimer notes that this study did not look at forecasting the number of users and the impact on orthotic and prosthetic services but only made the projections based upon population growth and graduation rates. This in turn reduces the accuracy of the estimate of the need.

This research study aims to establish that due to a projected upward spiral of demand, unless there is a significant increase in the number of accredited educational programs graduating more professionals, the service needs for quality, comprehensive orthotic and prosthetic care will not be met in the United States.

SUPPLY ISSUES

Certified Individuals

At present (2006) there are an estimated 7,177 certified orthotists and prosthetists and pedorthists in the U.S., and 4,494 certified fitters. The table below presents the breakdown of these professionals by certification organization. Because no data was available concerning professionals certified by both the BOC and BCP or by all three, an estimate was made, as noted in the footnote below the table. It is expected that this assumption will not be off more than ±1 percent.

Current (2006) Number of Certified Patient Care Providers

Program Name	Certification Organization							Total
	ABC	BOC	BCP	ABC & BOC	ABC & BCP	BOC & BCP *	All 3 **	
Certified orthotists and prosthetists	5,251	1,284	2,310	1,365	242	64	3	7,177
Certified Fitters	3,608	1,581		575	120		0	4,494

* - Estimated at 5% of the minimum of BOC and BCP (e.g. 0.05*1284)

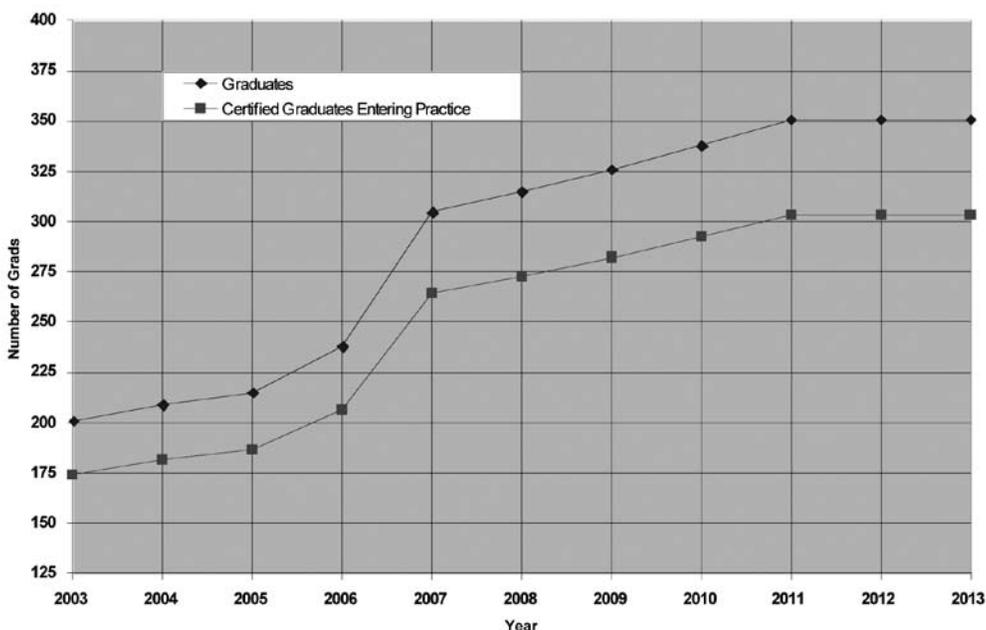
** - Estimated at 5% of (BOC+BCP) entry

While this provides a snapshot of today, what does the future hold? The projected supply of certified practitioners is largely based on the present population of certified orthotists and prosthetists plus the accredited practitioner training programs minus forecasts about those leaving the profession through retirement, death, etc. The following chart provides an indication of the number of graduates in orthotics and prosthetics for the historical years 2003-2006, and projections for 2007 to 2012. In these projections, it is assumed that two new schools will open in 2009 and 2010, respectively, with eventual enrollments leading to 15 graduates each per year. Additionally, it is estimated that approximately 91 percent of graduates will become certified, based on the data.

**Number of Graduates in Orthotics and Prosthetics
Historical (2003-2005) and Projected (2006-2010)**

Program Name	% of Grads. Who Become Certified	% of Cert. Grads. Who Enter Practice	Number of Graduates										
			Historical			Projected							
			2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
California State University	95.0%	95.0%	28	32	32	42	48	48	48	48	48	48	48
Century College	95.0%	95.0%	24	24	24	24	24	24	24	24	24	24	24
Eastern Michigan University	90.0%	95.0%	N/A	N/A	3	9	11	12	12	12	12	12	12
George Institute of Technology	90.0%	95.0%	5	8	9	10	10	10	16	16	16	16	16
Newington Certificate Program	90.0%	95.0%	26	37	34	32	48	52	52	52	52	52	52
Northwestern University	90.0%	95.0%	89	87	89	100	120	120	120	120	120	120	120
St. Petersburg College	92.2%	95.0%	N/A	N/A	N/A	N/A	21	24	24	24	24	24	24
University of Texas	90.0%	95.0%	14	12	12	11	13	13	13	13	13	13	13
University of Washington	90.5%	95.0%	15	9	12	10	10	12	12	12	12	12	12
New School #1 ³	90.0%	95.0%	N/A	N/A	N/A	N/A	N/A	N/A	5	10	15	15	15
New School #2	90.0%	95.0%	N/A	N/A	N/A	N/A	N/A	N/A	N/A	7	15	15	15
TOTALS:			201	209	215	238	305	315	326	338	351	351	351
TOTAL WHO BECOME CERTIFIED (1 Year Later)	91.2%		184	191	196	218	278	287	297	308	320	320	320
TOTAL CERTIFIED & ENTER PRACTICE (1 Year Later):		95.0%	174	181	187	207	264	273	282	292	304	304	304

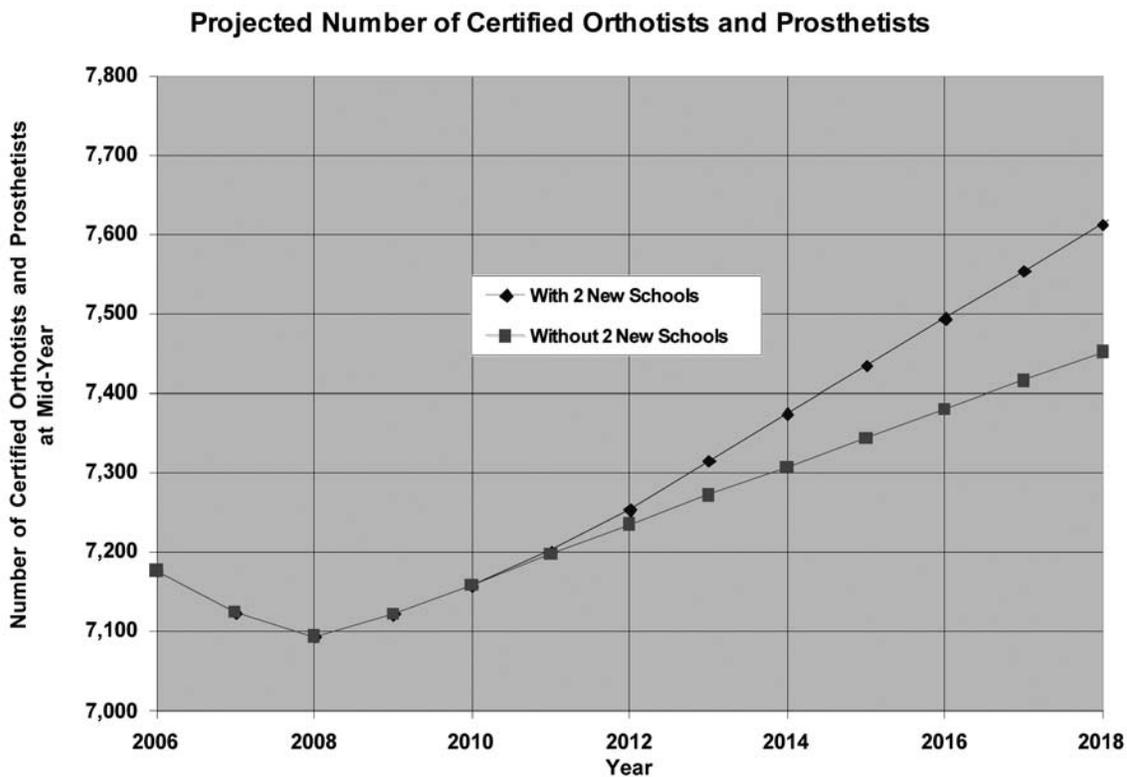
SUPPLY OF GRADUATES IN ORTHOTICS & PROSTHETICS



It should be noted that the graduation forecasts are based on the traditional “brick and mortar” approach of education, which possesses limitations imposed by physical plant (e.g. number and size of classrooms) and availability of professors and teachers. The Graduation “capacity” of current schools may well increase in the near future as new methods of instruction such as distance education and web-based learning become more widely adopted.

Additionally, forecasting the number of those who will leave the profession is less precise. For example, at present, 3.23 percent of all ABC certified professionals (orthotists, prosthetists and fitters) are known to be 65 or over, which represents the typical retirement age. Assuming an average career of 30 years in the profession gives a similar attrition rate of 3.33 percent.

Assembling these three factors (current population, expected graduates, expected attrition) allows us to roughly forecast the supply of certified professionals during the next few years. This is graphically depicted in the following chart.⁴



Assuming there are no significant changes for training new certified orthotists and prosthetists, there will be a slight decrease in practicing orthotists and prosthetists of approximately 1 percent during the next two years combined, followed by an annual growth of about 0.4 to 0.6 percent, then an upsurge of a higher growth rate of over 1.45 percent starting in 2011.

The assumption made of adding two new schools is significant, for it adds almost 10 percent to the annual supply of new orthotists and prosthetists. While the impact of adding these schools in 2007-2008 will not be evident until after the first class graduates, the effect of this can be seen in later years in the graph above, where, by the year 2018, the number of certified practicing orthotists and prosthetics will be about 180 more if two new

schools are opened now than if no new schools are opened. Another way of looking at this is the growth rates under the two alternatives during the years after 2010. In the first case, where the opening of two new schools is assumed, that growth rate is about 2.4 percent annually after 2013 and gradually decreases to about 2.2 percent. On the other hand, for the alternative of no new schools, the growth rate is only about 1.5 percent in 2012 and gradually decreases to 1.4 percent annually. By the year 2030, there would be approximately 469 more certified orthotists and prosthetists in practice under the first assumption than the second.

Certified Fitter

Certifying/accrediting agencies require applicants for the fitter credentials to have completed an approved educational course, experiential requirement and to pass the certification exam. Many of these people cross over from related occupations. Examples include, but are not limited to: physical therapy assistants, cast technicians, occupational therapy assistants, nurses' aides, billing clerks and manufacturer sales representatives.

These individuals are health care professionals with sufficient training in anatomy, biomechanics, patient etiologies and the fitting of specific pre-fabricated orthotic/prosthetic devices, along with the practical experience to meet the minimum requirements of the appropriate and deemed certifying agencies to be certified fitters. Having achieved this title they therefore have demonstrated the skills and capabilities to assist orthotists and prosthetists in the delivery of quality patient care.

Technicians

Furthermore, another very important professional component in orthotics and prosthetics is the technician level. Technicians fabricate, repair and provide maintenance for orthoses and prostheses. There are accredited programs for technicians that are producing graduates. In 2005, over 50 graduates entered the profession.

DEMAND ISSUES

The increasing demand for certified orthotic and prosthetic services is largely based on a few critical factors, including the United States population growth, aging of Americans, and epidemic proportions of conditions such as diabetes and obesity.

U.S. Population Trends

The population of the United States continues to grow.

Projected Population of the United States, by Age and Sex: 2000 to 2050

(In thousands except as indicated. As of July 1. Resident population.)

Population or percent, sex, and age	2000	2010	2020	2030	2040	2050
POPULATION						
TOTAL						
TOTAL	282,125	308,936	335,805	363,584	391,946	419,854
0-4	19,218	21,426	22,932	24,272	26,299	28,080
5-19	61,331	61,810	65,955	70,832	75,326	81,067
20-44	104,075	104,444	108,632	114,747	121,659	130,897
45-64	62,440	81,012	83,653	82,280	88,611	93,104
65-84	30,794	34,120	47,363	61,850	64,640	65,844
85+	4,267	6,123	7,269	9,603	15,409	20,861
MALE						
TOTAL	138,411	151,815	165,093	178,563	192,405	206,477
0-4	9,831	10,947	11,716	12,399	13,437	14,348
5-19	31,454	31,622	33,704	36,199	38,496	41,435
20-44	52,294	52,732	54,966	58,000	61,450	66,152
45-64	30,381	39,502	40,966	40,622	43,961	46,214
65-84	13,212	15,069	21,337	28,003	29,488	30,579
85+	1,240	1,942	2,403	3,340	5,573	7,749
FEMALE						
TOTAL	143,713	157,121	170,711	185,022	199,540	213,377
0-4	9,387	10,479	11,216	11,873	12,863	13,732
5-19	29,877	30,187	32,251	34,633	36,831	39,632
20-44	51,781	51,711	53,666	56,747	60,209	64,745
45-64	32,059	41,510	42,687	41,658	44,650	46,891
65-84	17,582	19,051	26,026	33,848	35,152	35,265
85+	3,028	4,182	4,866	6,263	9,836	13,112
PERCENT OF TOTAL						
TOTAL						
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0
0-4	6.8	6.9	6.8	6.7	6.7	6.7
5-19	21.7	20.0	19.6	19.5	19.2	19.3
20-44	36.9	33.8	32.3	31.6	31.0	31.2
45-64	22.1	26.2	24.9	22.6	22.6	22.2
65-84	10.9	11.0	14.1	17.0	16.5	15.7
85+	1.5	2.0	2.2	2.6	3.9	5.0
MALE						
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0
0-4	7.1	7.2	7.1	6.9	7.0	6.9
5-19	22.7	20.8	20.4	20.3	20.0	20.1
20-44	37.8	34.7	33.3	32.5	31.9	32.0
45-64	21.9	26.0	24.8	22.7	22.8	22.4
65-84	9.5	9.9	12.9	15.7	15.3	14.8
85+	0.9	1.3	1.5	1.9	2.9	3.8
FEMALE						
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0
0-4	6.5	6.7	6.6	6.4	6.4	6.4
5-19	20.8	19.2	18.9	18.7	18.5	18.6
20-44	36.0	32.9	31.4	30.7	30.2	30.3
45-64	22.3	26.4	25.0	22.5	22.4	22.0
65-84	12.2	12.1	15.2	18.3	17.6	16.5
85+	2.1	2.7	2.9	3.4	4.9	6.1

Source: U.S. Census Bureau, Population Division,
Population Projections Branch

Maintained By: Information & Research Services

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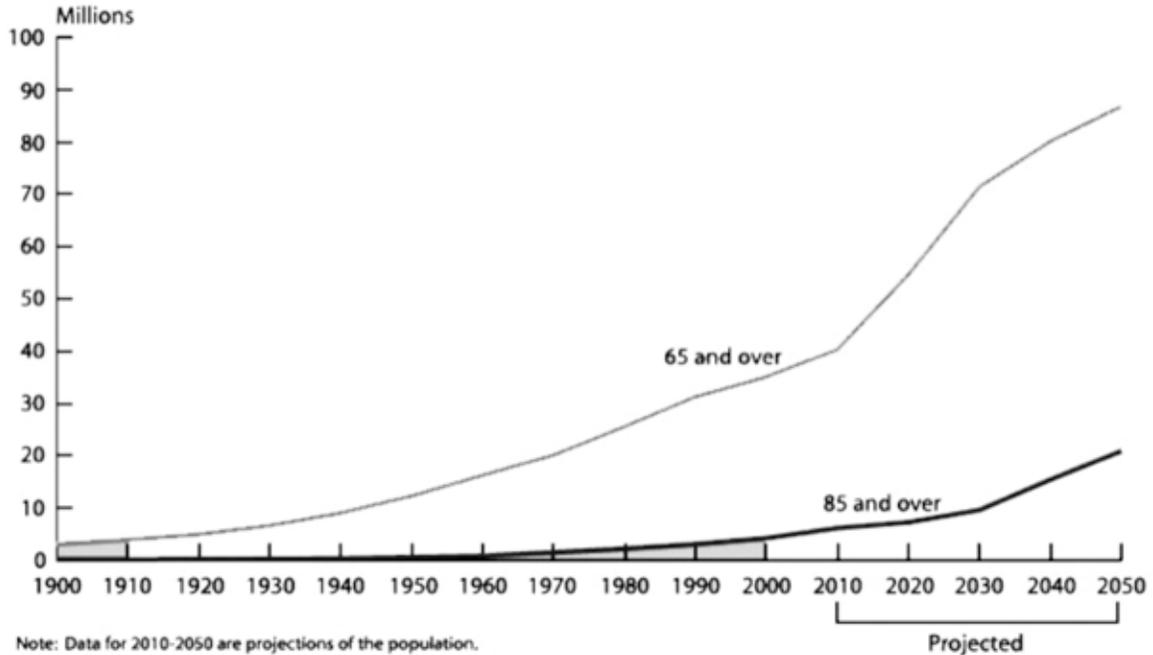
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Aging of America

While the population of the United States is on the rise, the aging in America is also significantly affecting supply and demand for orthotic and prosthetic treatment. Older Americans use more healthcare services than their younger counterparts and are more likely to have chronic diseases such as diabetes that require both orthotic and

prosthetic care. On the other hand orthotic demand will also be affected by the growth in the younger segments of the population as they remain more active. In this case advances in technology will enable the use of orthotic devices to become more widespread in younger people with congenital or accidental deformities and/or less serious conditions than today.

Number of people age 65 and over, by age group, selected years 1900-2000 and projected 2010-2050



Note: Data for 2010-2050 are projections of the population.
 Reference population: These data refer to the resident population.
 Source: U.S. Census Bureau, Decennial Census and Projections.

Source: *Federal Interagency Forum on Aging-Related Statistics*
 3311 Toledo Road, Room 6227
 Hyattsville, MD 20782
 AgingStats.Gov

According to the U.S. Census Bureau, by the year 2010, Florida, West Virginia, Maine, Pennsylvania and North Dakota will rank as the states with the highest percentages of populations age 65 and older. (For year 2000, Florida, Pennsylvania, West Virginia, Iowa and North Dakota were the oldest.).

**Interim Projections: Ranking of States by Projected Percent of Population
Age 65 and Older: 2000, 2010, and 2030**

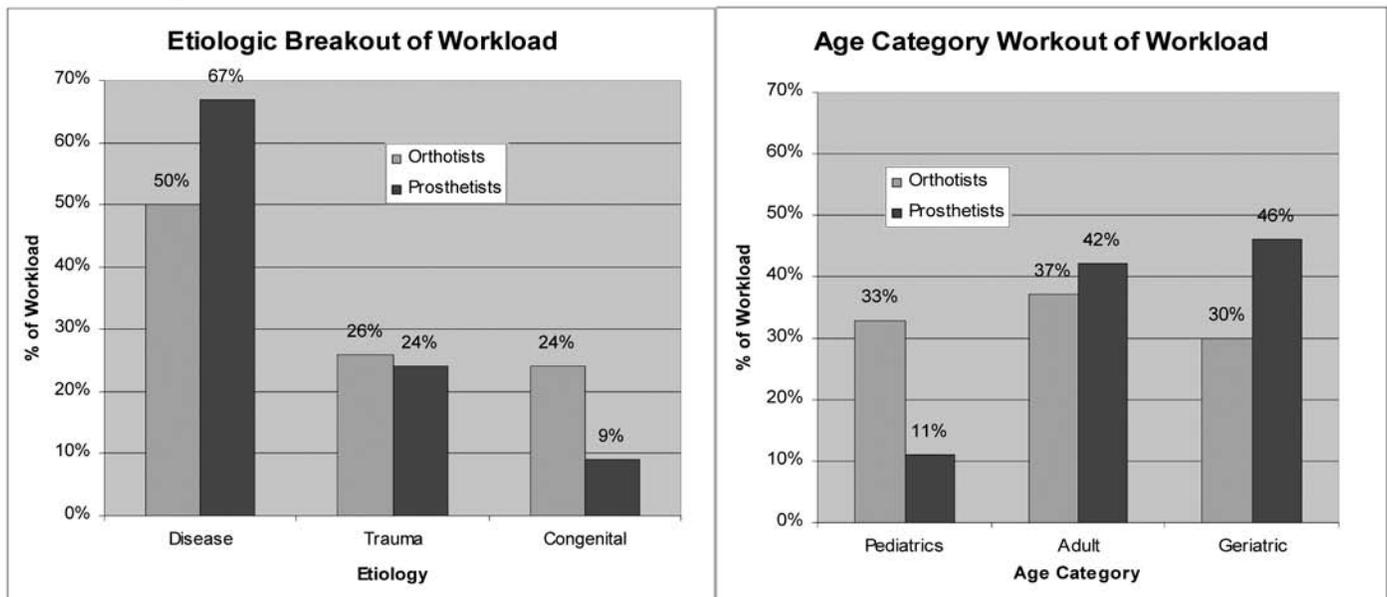
2000 State	2000 Percent	2000 Rank	2010 State	2010 Percent	2010 Rank	2030 State	2030 Percent	2030 Rank
United States	12.4	(x)	United States	13.0	(x)	United States	19.7	(x)
Florida	17.6	1	Florida	17.8	1	Florida	27.1	1
Pennsylvania	15.6	2	West Virginia	16.0	2	Maine	26.5	2
West Virginia	15.3	3	Maine	15.6	3	Wyoming	26.5	3
Iowa	14.9	4	Pennsylvania	15.5	4	New Mexico	26.4	4
North Dakota	14.7	5	North Dakota	15.3	5	Montana	25.8	5
Rhode Island	14.5	6	Montana	15.0	6	North Dakota	25.1	6
Maine	14.4	7	Iowa	14.9	7	West Virginia	24.8	7
South Dakota	14.3	8	South Dakota	14.6	8	Vermont	24.4	8
Arkansas	14.0	9	Connecticut	14.4	9	Delaware	23.5	9
Connecticut	13.8	10	Arkansas	14.3	10	South Dakota	23.1	10
Nebraska	13.6	11	Vermont	14.3	11	Pennsylvania	22.6	11
Massachusetts	13.5	12	Hawaii	14.3	12	Iowa	22.4	12
Missouri	13.5	13	Delaware	14.1	13	Hawaii	22.3	13
Montana	13.4	14	Alabama	14.1	14	Arizona	22.1	14
Ohio	13.3	15	Rhode Island	14.1	15	South Carolina	22.0	15
Hawaii	13.3	16	New Mexico	14.1	16	Connecticut	21.5	16
Kansas	13.3	17	Wyoming	14.0	17	New Hampshire	21.4	17
New Jersey	13.2	18	Arizona	13.9	18	Rhode Island	21.4	18
Oklahoma	13.2	19	Missouri	13.9	19	Wisconsin	21.3	19
Wisconsin	13.1	20	Oklahoma	13.8	20	Alabama	21.3	20
Alabama	13.0	21	Nebraska	13.8	21	Massachusetts	20.9	21
Arizona	13.0	22	Ohio	13.7	22	Nebraska	20.6	22
Delaware	13.0	23	Massachusetts	13.7	23	Mississippi	20.5	23
New York	12.9	24	New Jersey	13.7	24	Ohio	20.4	24
Oregon	12.8	25	New York	13.6	25	Arkansas	20.3	25
Vermont	12.7	26	South Carolina	13.6	26	Missouri	20.2	26
Kentucky	12.5	27	Wisconsin	13.5	27	Kansas	20.2	27
Indiana	12.4	28	Kansas	13.4	28	New York	20.1	28
Tennessee	12.4	29	Tennessee	13.3	29	New Jersey	20.0	29
Michigan	12.3	30	Kentucky	13.1	30	Kentucky	19.8	30
District of Columbia	12.2	31	Oregon	13.0	31	Louisiana	19.7	31
South Carolina	12.1	32	Michigan	12.8	32	Michigan	19.5	32
Minnesota	12.1	33	Mississippi	12.8	33	Oklahoma	19.4	33
Illinois	12.1	34	Indiana	12.7	34	Tennessee	19.2	34
Mississippi	12.1	35	Louisiana	12.6	35	Minnesota	18.9	35
North Carolina	12.0	36	New Hampshire	12.6	36	Virginia	18.8	36
New Hampshire	12.0	37	North Carolina	12.4	37	Nevada	18.6	37
Wyoming	11.7	38	Virginia	12.4	38	Idaho	18.3	38
New Mexico	11.7	39	Illinois	12.4	39	Oregon	18.2	39
Louisiana	11.6	40	Minnesota	12.4	40	Washington	18.1	40
Maryland	11.3	41	Nevada	12.3	41	Indiana	18.1	41
Idaho	11.3	42	Washington	12.2	42	Illinois	18.0	42
Washington	11.2	43	Maryland	12.2	43	California	17.8	43
Virginia	11.2	44	Idaho	12.0	44	North Carolina	17.8	44
Nevada	11.0	45	California	11.5	45	Maryland	17.6	45
California	10.6	46	District of Columbia	11.5	46	Colorado	16.5	46
Texas	9.9	47	Colorado	10.7	47	Georgia	15.9	47
Colorado	9.7	48	Texas	10.5	48	Texas	15.6	48
Georgia	9.6	49	Georgia	10.2	49	Alaska	14.7	49
Utah	8.5	50	Utah	9.0	50	District of Columbia	13.4	50
Alaska	5.7	51	Alaska	8.1	51	Utah	13.2	51

Source: *U.S. Census Bureau, Population Division*
 4700 Silver Hill Road
 Washington DC 20233-0001
 Interim State Population Projections, 2005
 Internet Release Date: April 21, 2005

Two Critical Health Epidemics Driving Demand for Orthotic and Prosthetic Services

Aging and population growth are not the only factors fostering demand for orthotic and prosthetic professionals. Orthotic and prosthetic care needs arise from a variety of backgrounds and etiological categories. A practice analysis study by Professional Examination Services for the American Board for Certification in Orthotics and Prosthetics reports that the percentage of patients per etiological category for orthotic practitioners is 50 percent disease, 26 percent trauma and 24 percent congenital. In addition, the age range breakout for patients is 33 percent pediatric, 37 percent adult and 30 percent geriatric.⁵

According to that same study, the etiological breakouts for prosthetic practitioners is 67 percent disease, 24 percent trauma and 9 percent congenital with age breakouts being 11 percent pediatrics, 42 percent adult and 46 percent geriatric.⁶ These data are graphically depicted below:



Two of the most compelling areas that stress an increased demand for orthotic and prosthetic specialists now and in the future are obesity and diabetes. Obesity primarily drives orthotic service needs while diabetes creates need for both orthoses and prostheses.

Obesity

Obesity is reaching epidemic proportions in America. The National Center for Health Statistics (NCHS), an arm of the Centers for Disease Control and Prevention (CDC), notes that the percent of noninstitutionalized adults age 20 years and over who are overweight or obese is an astounding 66.3 percent and those who are obese is 32 percent.⁷ (Overweight is defined as an excess of body weight compared to set standards. Obesity is defined as having an abnormally high proportion of body fat). These findings indicate that a significant number of people who, as they age, will require either surgical procedures (disk surgery, hip replacement, etc.) or orthotic management to allow them to maintain a better quality of life.

The U.S. Department of Health and Human Services Weight-control Information Network reports that this prevalence has steadily increased over the years among both genders, and all ages, racial/ethnic groups, educational and smoking levels.⁸ It is well-documented that individuals who are overweight are at increased risk for many diseases and health conditions, including some that relate directly to orthoses and prostheses.

As discussed in the article “Excess Body Weight and Orthotic Support,” lower extremity biomechanics are very different in patients that are overweight and have specific issues regarding foot orthoses.⁹

Furthermore, obese people are at increased risk for diabetes. The CDC reports that there is a strong and significant link between obesity and diabetes.¹⁰

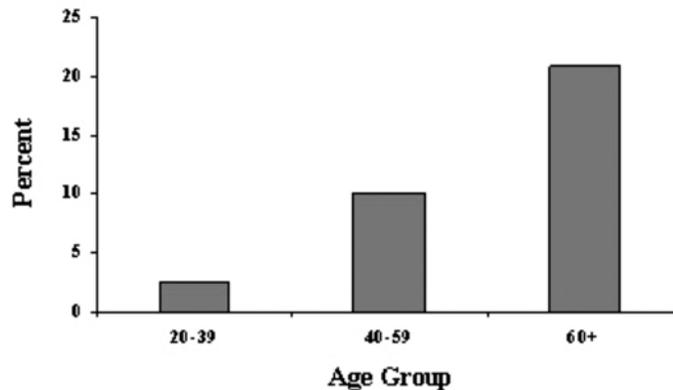
Diabetes

In conjunction with obesity, the rate of diabetes is escalating. Dr. Julie Gerberding, director for the CDC, suggests that one in three Americans born in 2000 will develop diabetes sometime during his/her lifetime.¹¹

The CDC estimates that in the U.S. today, 20.8 million people, or 7 percent of the population, have diabetes, and that 20.9 percent of all people age 60 years or older have the disease.¹²

According to the CDC in Atlanta, the number of Americans with diagnosed diabetes is projected to increase from 11 million in 2000 to 29 million in 2050.¹³

Estimated total prevalence of diabetes in people aged 20 years or older, by age group – United States, 2005

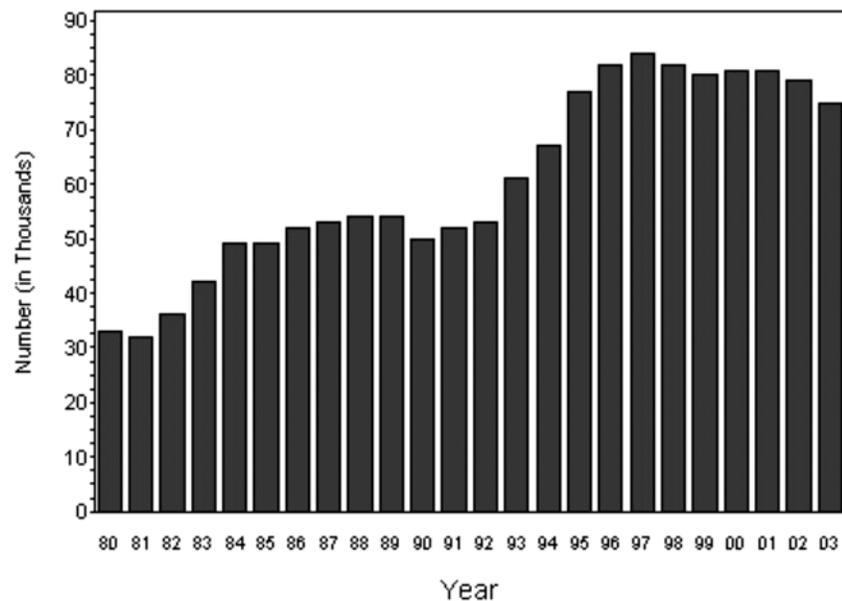


Source: *National Health and Nutrition Examination Survey – 1999-2002*
 CDC’s Diabetes Program – Publications & Products – *National Diabetes Fact Sheet 2005*
 Division of Diabetes Translation
 National Center for Chronic Disease Prevention and Health Promotion
 Centers for Disease Control and Prevention
 4770 Buford Highway NE, Mailstop K-10, Atlanta, GA 30341-3717
<http://www.cdc.gov/diabetes/pubs/estimates05.htm>

It is estimated that approximately 1.9 million people in the U.S. have had an amputation. Although a variety of disorders and conditions can lead to amputations, diabetes is the most common cause.

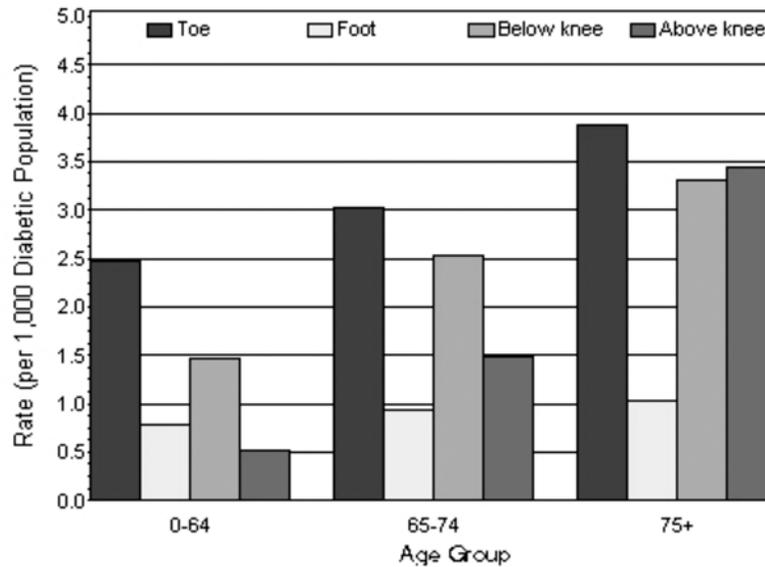
More than 60 percent of non-traumatic lower-limb amputations are a result of diabetes (in 2002, about 82,000 non-traumatic lower-limb amputations were performed on diabetic patients).¹⁴

Number (in Thousands) of Hospital Discharges for Nontraumatic Lower Extremity Amputation with Diabetes as a Listed Diagnosis, United States, 1980-2003



Source: *National Diabetes Surveillance System,*
National Center for Chronic Disease Prevention and Health Promotion (NCCDPHP)
4770 Buford Hwy, NE
MS K-40
Atlanta, GA 30341-3717
<http://www.cdc.gov/Diabetes/statistics/lea/fig1.htm>

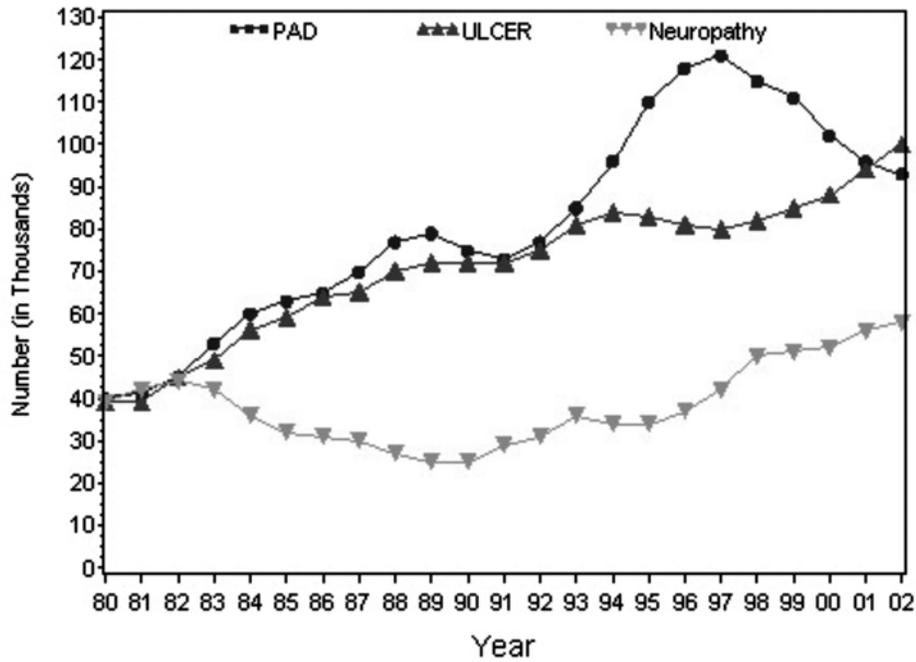
Hospital Discharge Rate for Nontraumatic Lower Extremity Amputation per 1,000 Diabetic Population, by Level of Amputation and Age, United States, 2002



Source: Centers for Disease Control and Prevention
 National Center for Chronic Disease Prevention and Health Promotion (NCCDPHP)
 4770 Buford Hwy, NE MS K-40
 Atlanta, GA 30341-3717
<http://www.cdc.gov/diabetes/Statistics/lealevel/fig9.htm>

According to the International Diabetes Federation 15 percent of people with diabetes will develop a foot ulcer during their lifetime. In the U.S. an estimated 2.4 million people are at risk for the same condition. In diabetics, a foot ulcer, if not properly treated, can lead to amputation.¹⁵

Number (in Thousands) of Hospital Discharges with Peripheral Arterial Disease (PAD), Ulcer/Inflammation/Infection (ULCER), or Neuropathy as First-Listed Diagnosis, United States, 1980-2002



Source: Centers for Disease Control and Prevention
 National Center for Chronic Disease Prevention and Health Promotion (NCCDPHP)
 4770 Buford Hwy, NE
 MS K-40
 Atlanta, GA 30341-3717
<http://www.cdc.gov/diabetes/Statistics/hosplea/fig1.htm>

Other Amputation Causes that Impact the Need for Prosthetics

Prosthetic care needs correlate to amputation trends in America. Amputations are mainly caused by disease, trauma and cancer. Congenital related incidences are another category yielding higher functional levels through related surgeries. Vascular disease and trauma rank as the number one and two causes of amputation, while cancer and congenital incidents rank more distantly. It is estimated that the two most common causes of lower extremity amputation are disease at roughly 70 percent and trauma at approximately 22 percent.¹⁶

Vascular Disease

The Amputee Coalition of America points to vascular disease as the primary cause of lower-limb amputation.¹⁷ These amputations fall under the category of dysvascular-related amputations. As stated previously, in 2002, more than 60 percent of non-traumatic lower-limb amputations occurred in people with diabetes.

Trauma

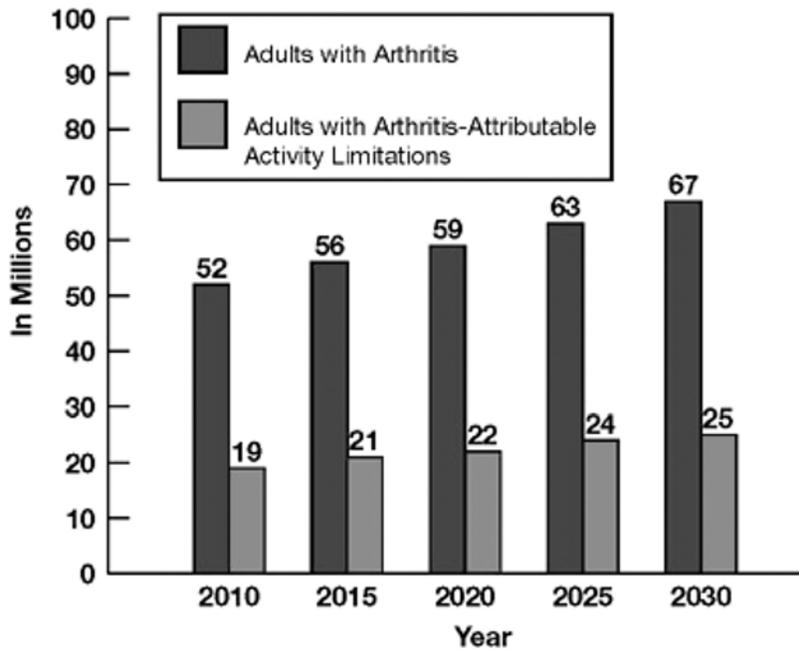
Trauma serves as the second leading cause of amputations in the U.S. Motor vehicle accidents, industrial and farming mishaps, and power tool accidents are common causes of traumatic amputations. Military veterans returning from combat duty such as in Iraq and Afghanistan have a much higher proportion of traumatic limb injuries than in previous conflicts owing to use of body armor that protects the chest and abdomen, thus reducing deaths due to wounds to those areas.

Other Health Issues that Impact the need for Orthotics:

Arthritis

The CDC notes that arthritis is on the rise in America with 43 million adults afflicted in 2002, and projected to increase to 67 million by 2030. Arthritis is the nation’s leading source of disability.¹⁸

Projected Number of Adults with Arthritis and Arthritis-Attributable Activity Limitations, 2005 – 2030



Source: Centers for Disease Control and Prevention
 National Center for Chronic Disease Prevention and Health Promotion (NCCDPHP)
 4770 Buford Hwy, NE
 MS K-40
 Atlanta, GA 30341-3717
<http://www.cdc.gov/diabetes/Statistics/hosplea/fig1.htm>

Orthoses are important for arthritis patients who can benefit from bracing to help delay/prevent surgery and are prescribed for patients for a number of reasons such as stabilizing joints, reducing pain and improving function.¹⁹

What's more, the Arthritis Foundation maintains that properly prescribed and fitted custom-made orthoses can help relieve pain and improve function in children suffering from arthritis.²⁰

Stroke

Stroke is a leading cause of serious long-term disability. Nearly 75 percent of strokes occur in people over the age of 65. More people are surviving strokes due to a variety of factors such as advancements in medicine and rapid treatment response, thus necessitating a greater need for orthotic management to improve function.²¹

Fractures

In some cases where casts are not appropriate for the treatment of fractures, orthoses are used. This can be seen in certain circumstances in the elderly population.

Spina Bifida

The National Institute of Neurological Disorders and Stroke of the National Institute of Health states that many individuals with spina bifida, a neural tube defect, need assistive devices such as braces, crutches or wheelchairs.²² Depending on the level of lesion the child may use no orthosis, an orthosis alone, or combination of orthosis and assistive device. Although spina bifida has declined in the U.S. due to better prenatal care with the use of folic acid, it is the second most common birth defect in the world, as noted by the Spina Bifida Association.²³

Scoliosis

The National Scoliosis Foundation confirms that scoliosis affects an estimated 6 million Americans and that about 30,000 are orthotically managed each year.²⁴

Cerebral Palsy

Cerebral Palsy Facts.com states that approximately a half million people in the U.S. have some degree of cerebral palsy and it is not known if cerebral palsy, as a collective category, is increasing, steady or declining.²⁵ However, some specific types of cerebral palsy such as athetoid cerebral palsy have been on a steady decline. Orthotic management is frequently used with this pediatric population to address spinal, upper, and lower limb deformity. As one example, children with cerebral palsy may exhibit an equines gait pattern during ambulation in which the child walks primarily on his toes with little to no heel contact. This is usually the result of patterned movements and limited range of motion that is often orthotically managed.

Plagiocephaly

Orthotists also work with infants with plagiocephaly through cranial remolding treatment for cranial asymmetry. Some theorize the increase of plagiocephaly in the U.S. is due to infants being put to sleep on their backs in an effort to avoid SIDS.

Sports and Wellness

In addition to orthotic management for individuals with disabilities, there appears to be a growing need for orthotic management specific to sports related injuries. For example, the number of women participating in NCAA-sanctioned intercollegiate sports grew from 29,977 in 1971-1972 to 128,209 in 1996-1997,²⁶ in large part as a result of Title IX. Given that girls and young women who play soccer suffer three times as many anterior cruciate ligament tears in their knees compared with their male counterparts, it's not surprising to find that the demand for orthotic management has increased. Further, athletic and prophylactic orthotic management is relevant to all age groups and will prove important to keep healthy adults active as they move into their senior years.

Surgery Projections that Impact the need for Mastectomy Fitters

Mastectomy

The demand for mastectomy fitter services is directly impacted by the number of breast cancer and mastectomy cases. An article in the *Annals of Surgical Oncology* on workload projections estimates that the number of mastectomy procedures will rise 36.8 percent through the years 2000 to 2020.²⁷

REIMBURSEMENT AND PAYMENT ISSUES

Healthcare coverage and reimbursement play a vital role in healthcare delivery. The mix of Medicare, Medicaid, private pay insurers and self pay are all important aspects to the future of orthotic and prosthetic services.

According to the 2004 AOPA Operating Performance and Compensation Report by Industry Insights, Inc., reporting on 2003 results, the percent of net sales by primary paying agents included Medicare at 33 percent, Medicaid at 11 percent (Medicare and Medicaid together equal 44 percent), contracted private insurance at 23 percent, non-contracted private insurance 11 percent (contracted and non-contracted private insurance together equal 34 percent), self pay at 4 percent and miscellaneous categories subtotaling approximately 18 percent (hospitals/nursing homes – 7 percent , Workers Compensation – 5 percent , Veterans Administration – 4 percent , vocational rehabilitation – 1 percent , other – 2 percent).²⁸

The Amputee Coalition (ACA), in a 2004 communication, reports that reimbursement funds are decreasing and that prostheses are no longer covered by some insurers or that coverage provides inadequate Durable Medical Equipment, Prosthetics, Orthotics and Supplies (DEMPOS) lifetime limits or caps on total payments leaving some individuals unable to afford prosthetic care that could make a major difference in their life.²⁹

A membership poll by the ACA of 468 respondents found 24 percent of members had experienced a reduction on coverage, while 4 percent had their coverage eliminated entirely.³⁰

Some states have passed legislation requiring insurance companies to cover prosthetic care, mirroring the federal Medicare laws as minimum standard.

In order to assure adequate reimbursement coverage into the future, new technologies must show improved quality of life and long term cost effectiveness. Due to the increased high-level functioning that new bionics will bring, it seems promising that quality of life will be greatly enhanced.

Such related documentation through outcomes and evidence-based studies needs to be pursued. This is obviously not a simple exercise. For example, the cost of a lower limb prosthesis depends on its complexity and the degree of technology used, and thus ranges from only a few thousand dollars to well over \$20,000. What advantage exists for an insurer to pay \$20,000 for a prosthesis instead of \$10,000? In many cases, the more expensive prosthesis will increase the mobility of a patient and in the process potentially help that patient maintain relative wellness for a longer period, thus decreasing insurance costs in the long run. Currently, however, there are no well documented clinical studies regarding high-tech costs and its effectiveness on quality of life. In order to develop a robust Business Case Analysis (BCA) in the short term the American Orthotic and Prosthetic Association (AOPA) or other stakeholder body would greatly benefit from evidence-based studies on efficacy of orthotic and prosthetic devices. In the longer term, as the health care industry moves toward adoption of electronic health records (EHRs) it will become increasingly possible to “mine” such data for outcome studies.

The California Health Benefits Review Program Analysis of Assembly Bill 2012,³¹ in referencing other state healthcare policies, cited that orthotic and prosthetic devices can help improve the physical and psychological functioning of persons with amputations, injuries, musculoskeletal disorders, and congenital physical disabilities by enabling them to exercise, work and perform other activities of daily life and thus, reduce their dependence on caretakers.

The ability to move, exercise and be active is important as sedentary lifestyles are associated with increased risk for disease, including cardiovascular disease.

Although initial cost for high-tech prostheses will be higher, long term cost effectiveness appears likely, especially for individuals who take self responsibility for positive behaviors such as exercise.³²

Without a continuous effort to highlight new technological advancement benefits and related reimbursement policy needs, individuals could go without life-enhancing and life-changing prosthetic products.

As demand has increased, the Veterans Administration is leading the way on increased funding allocations for orthotic and prosthetic services for its patients. The VA's budget for Prosthetics and Sensory Aids Services (PSAS) has increased from \$532 million in 2000 to \$947 million in 2005.³³

In addition, the millions of dollars in research through the United States Department of Defense (DARPA) to develop highly-advanced prostheses are projected to greatly impact the lives of amputees and the profession of orthotics and prosthetics.

It is important to consider the impact of medical innovations in total on cost, as orthotics and prosthetics do not stand alone. According to data released by the journal *Health Affairs*, many of the most promising medical innovations will result in better health and longer life, but they will increase, not decrease, Medicare spending. (Furthermore, researchers predict that curing any one particular disease won't save Medicare much money, with one important exception: eliminating obesity could potentially lower costs.)³⁴

Medicare policy dilemmas continue to be discussed. Evidence-based medicine continues to be pursued. In the event that some particular reimbursements become limited to a certain caliber of device fitted by practitioners, there may be an innovative breakthrough of certain products that are high quality, yet efficient from the standpoint of supply cost and related labor costs.

From 1984 through 2005, Medicare allowed a 29 percent increase in the fee schedule for orthotics and prosthetics (HCPCS L Codes) compared to an increase of 88 percent in the Consumer Price Index (CPI-U) during the same period.³⁵

Such reimbursement changes over time have led some manufacturers to consider the development of more standardized types of orthoses and prostheses that are user friendly and easy to install by a diversified number of healthcare professionals.

ADVANCEMENTS IN TECHNOLOGY

Coming advancements in technology will likely place an increased demand on orthotists and prosthetists. However, these technological advancements should improve practitioner efficiencies creating a certain amount of counter-balance surrounding the overall technology influence on supply and demand.

The advancements in orthoses and prostheses due to new technology alone are likely to galvanize the industry and create an additional demand from patients to meet their needs. As new prostheses are designed to mimic the human limb they will be much more functional. Thus, in addition to new amputees generating service needs, it appears that a significant percentage of long-standing patients who function with a prosthesis (including upper limb and lower limb prostheses) are likely to investigate and utilize new prosthetic technology, thus creating more demand. This is especially true of the upper limb prosthetic population. In this population many individuals will be less willing to continue with their current prosthetic management due to the limited functional gains. New prosthetic technology that has the capability of increasing function may have an effect on this current trend.

Advancements in Technology: Increasing Demand

Technological advancements will bring about an increase in demand for orthotic and prosthetic care. Such components as material and design breakthroughs, advancements contributing to longevity connected to the survival of healthcare emergencies, pharmaceutical advancements, new bionic technologies and advanced surgical techniques influence demand.

Materials and Design

New technologies will enhance orthotic and prosthetic products. This is important not only to the work of practitioners and fitters, but also for technicians as the materials used in orthotic and prosthetic products become more advanced.

Orthotics and prosthetics encompasses not only direct-patient orthotic and prosthetic caregivers (i.e. certified practitioners and fitters), but also the technicians who work to fabricate the orthoses and prostheses.

What's more, it is imperative that certified orthotic and prosthetic professionals work closely with engineers. In a featured column, "VA, DoD (Department of Defense) Working Closely on Prosthetics Research", Dr. Mindy Aisen reconfirms that the team approach in prosthetic care needs to include engineers working directly with clinicians to ensure that devices are designed to fit the needs of the patients.³⁶

Over the years materials and design work in orthotics and prosthetics has continued to progress. From traditional materials to aerospace-type materials to the promise of nanotechnology, custom fabricated prostheses and orthoses have gone high tech. For example, Computer-Aided Design and Manufacture (CAD/CAM) technology is a quick and cost effective way to design and fabricate models for socket production.³⁷

According to the 2000 ABC Practice Analysis Study the percentage of orthotic devices incorporating the use of computer-aided design and manufacturing (CAD/CAM) is about 14 and the percentage of prosthetic devices incorporating CAD/CAM is about 29.³⁸ In comparison, the 2006 study showed 16 percent of orthotic devices incorporate CAD/CAM and 24 percent of prosthetic devices incorporate the use of CAD/CAM.³⁹ Although CAD/CAM utilization appeared relatively flat for that six year period, CAD modeling was just starting to present in the primary schools curriculum. CAD is one of the content areas in the 2006 Core Curriculum Guide for CAAHEP

accredited schools.⁴⁰ The assumption is that orthotic and prosthetic professionals will increase utilization of CAD/CAM.

The orthotics and prosthetics profession is not unique, as automation will affect its work force as well. Given the assumption that to some degree a technician's work could become obsolete, technicians could transition with appropriate training/education into certified fitters. In turn, they could displace the practitioner in handling less sophisticated applications, decreasing the practitioner demand. This type of domino displacement plays out in healthcare, as the market is better able to fund lower-salaried workers.

Surviving Healthcare Emergencies

One source of increased patient longevity is steadily advancing technology. Progress in medical technologies will continue to lengthen lifespan and help patients survive disease processes and healthcare emergencies that in previous years may have caused them to die. This enhanced resilience impacts the workload for orthotists and prosthetists.

To better understand survival phenomena and their relationship to orthotics and prosthetics, two examples follow:

1. Strokes

With the increased survival rate secondary to stroke there is a greater need and reliance on the healthcare team. In particular, many survivors of stroke struggle to regain functional mobility and require a strong orthotic presence on the healthcare team in order to provide proper orthotic management and facilitate ambulatory function.

2. Septic Shock

Septic shock is a medical emergency that in some cases is treated with amputation, resulting in the need for more prosthetic services. Although septic shock has a high mortality rate, those surviving patients who require related amputations may increase the demand for prosthetic care.

Pharmaceutical Advancements

The development of new medications can help reduce mortality rates secondary to conditions such as stroke. In turn, saving lives contributes to people living longer, perhaps with chronic disease.

The hope is that further development of medications that deal with high profile epidemics such as diabetes will play a key role in the prevention of diabetic complications over time. Currently drug companies are investing substantial dollars in research and development to achieve such goals.

The results of pharmaceutical advances is that individuals living longer with existing conditions such as stroke and chronic diseases are likely to increase the need for orthotic and prosthetic care.

Devices That Interface with Human Nervous System

Devices that interface with the human nervous system are among the drivers in technological innovations that are revolutionizing both prosthetic and orthotic care, particularly in prosthetics. In addition to corporate research and development both at home and abroad, academic centers and government entities are working to develop next generation devices in order to provide more natural and better functioning prostheses for those with amputations.

According to the United States Department of Veteran's Affairs Fact Sheet: "VA's Prosthetics and Sensory Aids,"

the trend in prostheses is to integrate body, mind and machine. The VA Medical Center and Brown University in Providence, R.I., are working to create artificial limbs that function at a very high level. The work involves a prosthesis with sensors that creates a kind of artificial muscle enabling amputees to walk greater distances. The sensors are microchips/bionic neurons to be injected into the residual leg or arm muscles that will tell the artificial limb what to do and receive feedback so the prosthesis can report to the brain what it accomplished.

The VA's role in taking prosthetic technology to the next level is part of their strategic goal to restore the capabilities of disabled veterans to the greatest extent possible. According to the United States Department of Veterans Affairs fact sheet, veterans seeking prosthetic services are on the rise. In 2005, 10,546 veterans received lower limb prosthesis and or components. In this same year 1,832 veterans received an upper limb prosthesis and or components. Also mentioned in the February 06 Fact Sheet: "VA's Prosthetics and Sensory Aids" is that in the future the VA expects to provide prosthetics to many veterans who have lost limbs in the Iraq and Afghanistan wars, whereas today's typical veteran is middle-aged and presents with an amputation secondary to vascular disease.⁴¹

Another technological improvement is a mechanical appendage developed to resemble and function just like a human arm, according to the American Forces Press Service. The Defense Advanced Research Projects Agency's (DARPA) Revolutionizing Prosthetics 2009 program wants to connect the limb directly into the nervous system so users can move it like a biological arm.⁴²

The prosthetist is the link between the device and the patient. The new bionic devices and surgical presentations will create a fairly steep learning curve making the educational standards and training programs for certified prosthetists even more critical.

The advances in the technological complexity of some of the prostheses of the future could cause a paradigm shift in the way patients are treated. This will be manifest in the time needed for the prosthetists to spend with the patients receiving such devices for education and training to enable the patients to best use the high tech devices. This may be true for the next versions of the electro-mechanical devices particularly those with neural automation and control. In this case the device will be actually activated and controlled with the body's own neuron-electrical stimuli.

Such technological advancements and expanded patient educational requirements should help to enhance and intensify the collaborative relations between certified prosthetists, the patient and occupational therapists and physical therapists increasing the significance of the prosthetist as an integral team member for care of amputees. The increased need for patient education will dramatically increase demand, most likely at the prosthetist level.

Advanced Surgical Techniques

New surgical techniques are also significant to the advancement of prosthetic care. The Department of Veteran's Affairs reports that the VA and Brown University are working on surgeries to lengthen the bone in the residual limb to make it easier to fit a prosthesis and allow for more mobility.

Osseointegration is an innovative technique in which prostheses are fixed to a special titanium bolt anchored directly into the bone of the residual limb. This principle has the potential to help eliminate socket complications for amputees.⁴³

As changing technology continues to impact orthotics and prostheses, quality educational programs are crucial to prepare professionals for orthotics and prosthetics services of the future.

Advancements in Technology: Improving Efficiencies

Technology will have an impact on improving efficiencies as well as increasing demand for the orthotics and prosthetics profession. For example, running parallel in the development of technology is the advancement of telehealth. Telehealth is remote care delivery by providers through the use of telecommunications technology to impart healthcare information, monitoring and/or services to patients. For example, group patient education classes can increase provider efficiencies.

Some technological advancements improve practitioner efficiencies in practice management. Efficiency improvement comes about through two separate phenomena. First, as a particular technology evolves through its life-cycle a simpler, less complex device can come into existence. It may enable certified fitters to perform part of the certified practitioner's current task regime. Second, other advanced technologies enable practitioners to conduct their tasks more efficiently. These advanced technologies can be divided into two streams: medical technologies and information technologies.

New scanning systems are an example of a medical technology that has enabled certified orthotists and prosthetists to save time over the traditional plaster casting approach. A conservative assumption, as we understand it, for the time saved by scanning versus casting is about 50 percent, with an average three -hour procedure reduced down to an hour-and-a-half.

Information technology will also improve practitioner efficiency by decreasing the time -consuming task of patient processing and paper work. The use of automation for intake, coding, documentation and billing will give practitioners more time for direct patient care. The rapid adoption of electronic health records (EHRs) will further improve clinical workflow efficiency and reduce the need for records personnel.

As a result, both the expansion of fitter duties and the adoption of time-saving technologies will help to increase the capacity for providers to see higher patient volumes and thereby augment throughput.

PROFESSIONAL DYNAMICS: ROLE AND DELIVERY OF SERVICE ISSUES

As with most healthcare professions, relationship dynamics with other healthcare professionals, along with roles and scope of duties, transition over time.

Collaborative Provider and Chronic Disease Management Team

Certified orthotic and prosthetic professionals are vital links to collaborative models of care in the delivery system. Teamwork has proven to be a significant component of successful chronic disease management such as diabetes. When providers work together in well-orchestrated collaborative models of care, the patient benefits. As the country moves further into evidence-based medicine, chronic disease management relies more heavily on the team approach that would include orthotists and prosthetists. This is important as care for millions of people with related diseases/conditions such as obesity and diabetes will rely upon the effectiveness of this team approach.

Inclusion of Other Professionals Providing Orthotic and Prosthetic Services

Driven by technology advancements in materials, many orthotic and prosthetic devices that were previously custom fabricated are now designed to permit a physician, physician's assistant or manufacturer's representative to fit

the device. As other professionals take on components of the practitioner's job, this will influence the demand for orthotist and prosthetist services, more so in orthotics than prosthetics.

Orthotic spinal braces and knee braces are definitive examples of the occurrence of off-the-shelf products being driven into the market at higher volumes due to technological advancements in materials. A cam-walker, a high top walking boot primarily used to maintain the foot and ankle at 90 degrees and prevent abnormal pressure on the foot and ankle, is another highly visible example of a product that was somewhat exclusive as a custom-fitted product, but now, because of advancements, can be emplaced by other healthcare professionals, such as a physician or cast technician.

Professional Role and Service Delivery Transition

Although some technologies will help to improve staffing efficiencies among orthotic and prosthetic professions, continuous evaluation of workflow and processes are needed in the profession.

As certain tasks of the orthotists and prosthetists can be performed by assistants, this transition in throughput can dramatically effect productivity and ultimately supply issues. For example, with a looming shortage of physicians in the United States, physician assistants provide an important staffing supplement that augments physician productivity. The article entitled "National Estimates of Physician Assistant Productivity"⁴⁴ in the Journal of Allied Health authored by Larson, Hart and Ballweg of the University of Washington, reports that physician assistants performed 61.4 outpatient visits per week compared with 74.2 visits performed by physicians, thus providing 82.7 percent of a physician full-time equivalent (FTE), with generalist physician assistants (PAs) and PAs in rural areas higher, specialist and urban PAs lower. Given that PA compensation is generally much less than this 83 percent, it is not surprising to see an increase in demand for their services.⁴⁵

Scope of Practice:

The American Board for Certification in Orthotics and Prosthetics, Inc. (ABC), presented the work of the "Scope of Practice Task Force (Orthotic and Prosthetic Scope of Practice)" in 2003.⁴⁶ This work outlines the following:

ABC Certified Orthotist and/or Prosthetist is an allied health professional who is specifically trained and educated to manage the provision of comprehensive orthotic and prosthetic care, based upon a clinical assessment and a physician's prescription, to restore physiological function and/or cosmesis.

The ABC certified practitioner independently provides or supervises the provision of comprehensive orthotic and prosthetic care. This includes patient assessment, formulation of a treatment plan, implementation of the treatment plan, follow-up and practice management.

ABC Registered Assistant is an individual trained and qualified to participate in the delivery of orthotic and prosthetic care while under the clinical supervision of an ABC certified practitioner.

The registered assistant supports the ABC certified practitioner by assisting in orthotic and prosthetic patient care. Under the guidance and supervision of the ABC certified practitioner, registered assistants may perform orthotic and prosthetic procedures and related tasks in the management of patients. The registered assistant also fabricates, repairs and maintains devices to provide maximum fit, function and cosmesis.

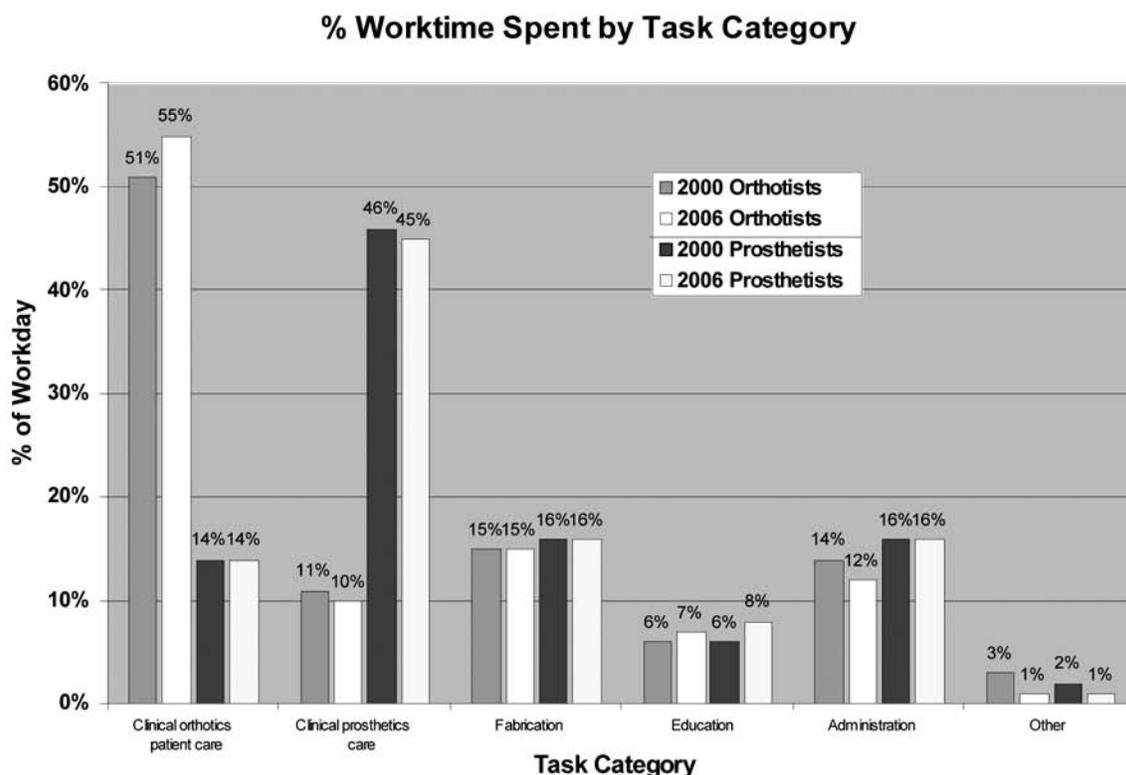
An ABC Registered Fitter-Orthotics is an individual trained and qualified to participate in the fitting and delivery of prefabricated orthotic devices and/or soft goods. An ABC registered fitter-orthotics is competent to practice orthotics within a scope of practice that is specific to fitting prefabricated and off-the-shelf orthoses as described below:

- Cervical orthoses not requiring more than minor modification;
- Pressure gradient hose;
- Trusses;
- Prefabricated spinal orthoses, except those used in the treatment of scoliosis, rigid body jackets made of thermoformable materials, and halo devices;
- Prefabricated orthoses of upper and lower extremities, except those used in the treatment of bone fractures.

ABC Registered Technician is an individual who supports the ABC certified practitioner by providing the technical implementation tasks and services associated with the support of patient care. Under the supervision of and in consultation with the practitioner, the registered technician fabricates, repairs and maintains devices to provide maximum fit, function and cosmesis. The registered technician is expected to keep abreast of all new fabricating techniques, must be familiar with the properties of pertinent materials and must be skilled in the use of appropriate equipment.⁴⁷

The Practice Analysis Studies for ABC in 2000 and 2006 by the Professional Examination Service provides insight into work time devoted to specific areas of practice and with regard to devices.

As reported by the 2000 and 2006 Practice Analysis Studies, the mean work time devoted by practitioners in practice was broken down as follows:

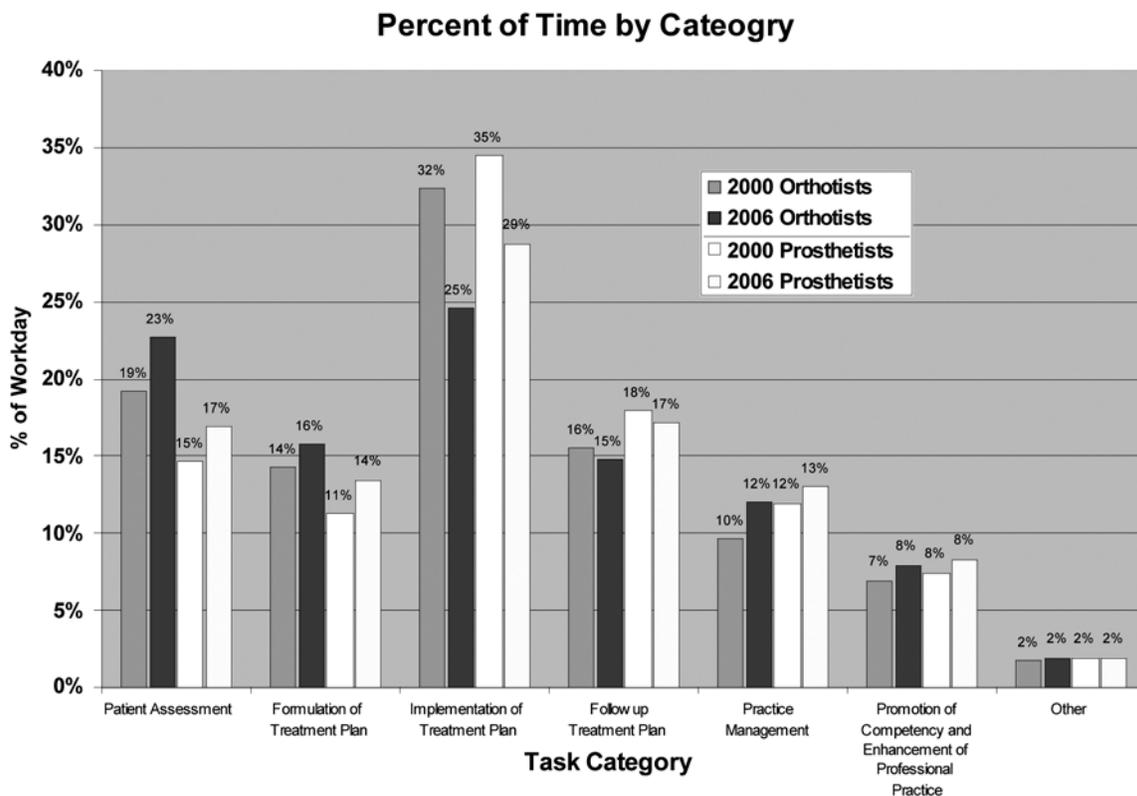


In the chart above, it is important to note the category of education for orthotists and prosthetists increased between 2000 and 2006. It is assumed that education is and will remain a critical category for attention for orthotists and prosthetists. A high level of education and continuing education differentiates orthotists and prosthetists from other professionals.

As noted in the comparisons, the percentage of time on patient care in orthotics has already started to rise. It is assumed that the time spent by practitioners on fabrication may likely decrease in the future.

Another comparison of the 2000 and 2006 Practice Analysis for practitioners shows an increase in the mean for percentage of time spent under the domain of patient assessment, formulation of treatment plan, practice management, promotion of competency and a decrease in time spent on implementation of treatment plan and follow-up treatment plan, as shown in the figure below.

This shift emphasizes the evolving role and scope of practice terminology for the ABC Certified Orthotist and/or Prosthetist as a professional who is specifically trained and educated to provide or supervise the provision of comprehensive orthotic and prosthetic care including patient assessment, formulation of a treatment plan, implementation of the treatment plan, follow-up and practice management.



A further detailed breakdown from data from the 2000 Practice Analysis Study shows that in orthotics, practitioners spend 60 percent of their time in the practice area of the lower extremity, while only 9 percent of their time with the upper extremity, spinal 21 percent, and scoliosis 10 percent. Furthermore, the breakout with regard to devices under the lower extremity practice area was reported as custom shoes 4 percent, foot orthoses (FO) 9 percent, ankle-foot orthoses (AFO) 28 percent, knee orthoses (KO) 6 percent, knee-ankle-foot orthoses (KAFO) 7 percent, hip orthoses (HO) 3 percent and hip-knee-angle-foot orthoses (HKAF0) 3 percent.

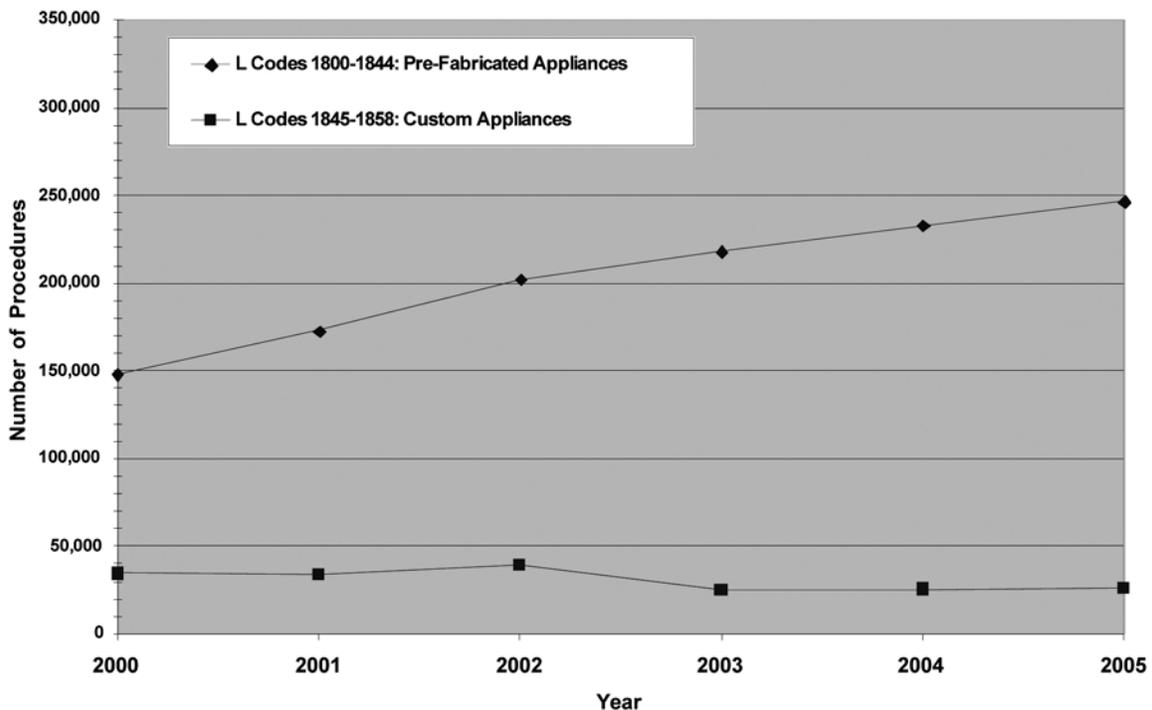
The 2006 Practice Analysis Study shows that orthotics practitioners spend 55 percent of their time in the practice area of the lower extremity, while only 8 percent of their time with the upper extremity, with no change in the previously reported 2000 study of spinal 21 percent, scoliosis 10 percent and other 6 percent. Furthermore, the breakout with regard to devices under the lower extremity practice area was reported as custom shoes 3 percent, FO 11 percent, AFO 26 percent, KO 6 percent, KAFO 6 percent, HO 2 percent and HKAFO 1 percent.

In an ABC conducted study of fitters in 2004 and 2005, the percentage of time spent in areas of orthotic practice for fitters reported 37.1 percent for lower extremity, representing: 16 percent orthopedic and/or diabetic shoes, 5 percent FO, 4 percent AFO pre-fabricated, 3 percent AFO custom, 4 percent KO soft, 2 percent KO rigid, 2 percent KO post-op and 1 percent HO.⁴⁸ The AFO percentage (2.6 percent total in 2004/5) for fitters is strikingly lower than the AFO percentage (14.3 percent in 2006) for practitioners. Thus, certified practitioners are devoting over five (5) times as much time on AFOs as fitters. The assumption is that certified fitters may begin to handle more work related to AFOs.

Key Areas of Projected Growth

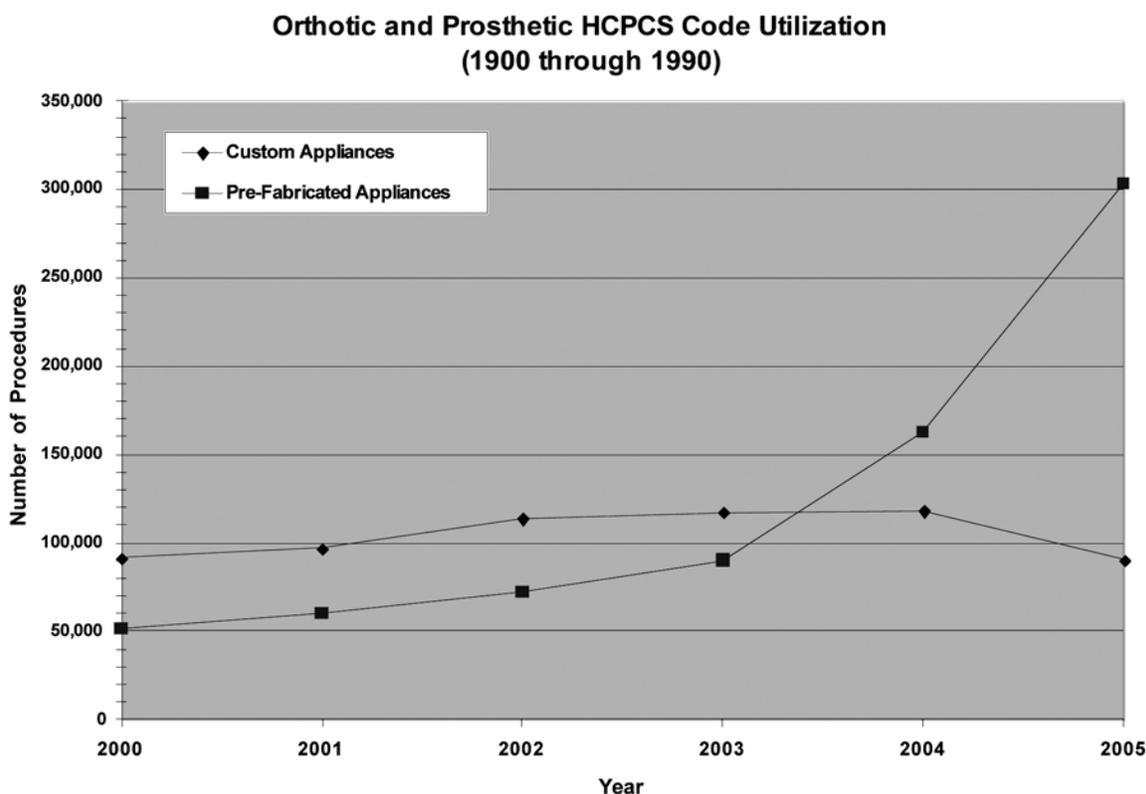
Orthotic Management in Sports: In addition, it is important to review key areas projected for growth in relationship to practice management, especially in the area of orthotic services. For example, for orthotic management in sports, the demand for orthotic management specific to sports for aging baby boomers will continue to increase in the future, as can be extrapolated from L-Codes 1800 to 1858⁴⁹. The increase in L-Codes 1800 to 1844 are important to the delivery of service as based on scope of practice because these services may be accomplished by a fitter. (The series that relates to sports as handled by the certified orthotist relates to L1845 to L1858.) Using a forecasting projection technique (i.e. least-squares exponential fit) on these data, the extrapolated growth rate for pre-fabricated appliances (L 1800 to 1844) is 10.6 percent, while that growth rate for custom appliance (L 1845 to 1858) is -7.2 percent, thus an actual decrease.

**Orthotic and Prosthetic HCPCS Code Utilization
(1800 through 1858)**



Furthermore, there is another group of codes that relates to sports that is performed by the fitter, L4350 to L4390, occurring largely from sports injuries and stress fractures.

Orthotic Management in Diabetes: The diabetic epidemic also brings an increase in orthotic services. “L” Codes for therapeutic shoes as provided by pedorthists and lower limb orthotics, L 1900 to 1990⁵⁰, as performed by certified orthotists show the following trend: By and large, these new “L” codes (formerly “A” codes) can be performed by either certified orthotists or pedorthists. For the pedorthist these are the most frequently utilized codes, while other codes are beyond their scope of practice (note: L codes 3000-3300 can also be performed by pedorthists but cannot be reimbursed by Medicare/Medicaid). As in the analysis for L Codes 1800 to 1858 above, the average annual growth rate for pre-fabricated devices in the L 1900 to 1990 series is 1.6 percent.



To summarize, in both sets of codes, the growth rates of pre-fabricated appliance procedures vastly exceed that of custom-made appliances. This has implications for the practice of orthotists and prosthetists, for those procedures that could be performed by other individuals are rising much higher than orthotist/prosthetist-only procedures.

Pre-Fabricated Spinal System: An example of an orthotic device that has transitioned to a more standardized “off the shelf” product is a pre-fabricated spinal system. This system, the traditional thermoplastic hard shell body jacket, has been improved due to enhanced materials/design and better information on sizing to a softer, modular pre-fabricated product.

Two examples of the pre-fabricated spinal systems are Lumbosacral Orthosis (LSO) - L0631 (was K0640) and Thoracolumbosacral Orthosis (TLSO) - L0458.⁵¹ While the L0458 procedures for (TLSO) dropped about 23 percent annually during the two year period 2003 to 2005, the T Bar Thoracic Extender (L0631) is being used more, and in fact, utilization of this procedure code increased over 105 percent from when it was first introduced in 2004, to 2005.

PATIENT VISIT EQUIVALENT FACTOR

Practice efficiencies look to increase the number of patient visits per day. In one industry estimate, it is projected that by 2012 there will be efficiency changes arising from the following:

- Decrease in percent of work time devoted to fabrications by practitioners (from 15 percent to 9 percent for orthotists, 16 percent to 10 percent for prosthetists);
- Reduction in percent time devoted to patient care due to digital scanning process by 20 percent;
- Reduction in percent time devoted to patient care due to new technology of 7 to 8 percent.

This would result in an overall increase in efficiency for orthotists of 23.9 percent and prosthetists of 22.2 percent. Given the assumption that prosthetists currently see 3.42 patient visit equivalents per day and orthotists care for 5.12 patient visit equivalents per day under a traditional framework, these performance improvements through higher technology utilization and decreased fabrication time could drive prosthetists to 4.24 patient visit equivalents per day and orthotists to 6.26 visit equivalents a day.

However, two caveats should be kept in mind. First, these efficiencies may not be representative of all practices (e.g. independently-owned solo or small practices of less than five practitioners, which represent 18.4 percent of all practices⁵²). Second, this projection is for six years from now and further increases in efficiency are less predictable and may also become relatively less important than other factors such as reimbursement issues.

REGIONAL DIFFERENCES

As with most health care delivery, there are certain rural areas that may have access issues that should be considered with respect to provider treatment.

To ensure supply for future demand, it is important to identify states with the highest percentages of elderly populations (page 13), obesity levels, diabetic and disability rates.

According to a report from the Trust for America's Health, the American obesity epidemic is escalating, with Mississippi, the heaviest state, having an adult obesity rate of 29.5 percent. Regionally, the South fields nine of the 10 states with the highest obesity rates. The top seven leading states are Mississippi, Alabama, West Virginia, Louisiana, Kentucky, Tennessee and Arkansas.⁵³

With respect to diabetes, Alabama, Mississippi, Florida, South Carolina and West Virginia lead the way in prevalence with Alabama at 10.5 percent, according to the CDC's "2001 Obesity and Diabetes Prevalence Among U.S. Adults by State."⁵⁴ The American Association of Clinical Endocrinologists concluded that Mississippi had the highest percentage of diabetics who were not in control of their blood sugar levels as deemed through A1C levels.⁵⁵

In a review of obesity and diabetes combined, the Kaiser State Health Facts found that the states with the highest percentages of adults asserting a disability are West Virginia (27.4 percent), Kentucky (22.6), Alabama (22.4), Oregon (22.4), Oklahoma (22.4), Mississippi (22.1), Washington (21.8) and Arkansas (21.0).⁵⁶

However, it is important to note the statistics of the Preliminary Report prepared for the American Academy of Orthotists and Prosthetists entitled "Geographic Distribution of Qualified Practitioners Compared to Eligible Medicare Beneficiaries Having Diagnoses Commonly Managed with Custom-made Orthosis and Prostheses." This

study revealed that West Virginia, Mississippi, Arkansas, Kentucky and Alabama had the lowest number of ABC certified practitioners per potential patient in 2001.⁵⁷

These same states (West Virginia, Mississippi, Arkansas, Kentucky and Alabama) that were reported as having the lowest number of ABC certified practitioners per potential patient rank high in obesity, diabetes and disability. All five of these states rank high in both obesity and disability profiles. West Virginia, Mississippi and Alabama are also leading diabetic states.

Note that both the Geographic Distribution of Qualified Practitioners paper and the obesity rankings point to a cluster of Southern states. The Geographic Practitioners study found that a lower ratio of qualified orthotics and prosthetics providers to potential patients in the South coincided with high rates of obesity there as well.

With respect to supply, the CAAHEP (Commission on Accreditation of Allied Health Education Programs) schools are located in California, Minnesota, Georgia, Connecticut, Illinois, Texas and Washington. Not surprisingly, the Geographic Distribution of Qualified Practitioners study concluded that there appears to be a more favorable ratio of qualified prosthetic and orthotic practitioners to potential patients in the states where these practitioner training programs are located.⁵⁸

OVERALL PROJECTIONS

The net growth in certified orthotists and prosthetists is expected to be about 0.5 percent annually, based on projected number of graduates from the nine professional schools during the next four years, taking into account the current number of professionals and an “attrition rate” of 3.33 percent annually. After that, the growth rate will be about 1.45 percent annually, or, with the addition of two new schools, it will increase to 2.4 percent annually between 2005 and 2030.

Correspondingly, the U.S. population as a whole will increase around 0.7 percent annually during the next few decades if current trends continue.

Based purely on U.S. population growth versus projected number of certified practitioners, the following table can be constructed:

US Population vs. # of Practitioners

	2005	2010	2015	2020	2025	2030
US Population (in millions)	296.2	308.2	320.7	333.7	347.2	361.3
With Two New Schools						
# of Practitioners:	7,177	7,201	7,494	7,792	8,090	8,388
# of People in US (in thousands)/Practitioner	41.3	42.8	42.8	42.8	42.9	43.1
Without Two New Schools						
# of Practitioners:	7,177	7,197	7,380	7,560	7,739	7,919
# of People in US (n thousands)/Practitioner	41.3	42.8	43.5	44.1	44.9	45.6

As can be seen in the table above, the number of people in the U.S. per practitioner rises only very slowly between 2005 and 2030. There is a 0.17 percent annual increase under the assumption of two new schools being opened during the next couple years. This equates to a “shortage” of 366 practitioners (about 4.2 percent) by 2030, based on population growth alone. Without the “new schools” assumption, the “shortage” rate increases by 0.40

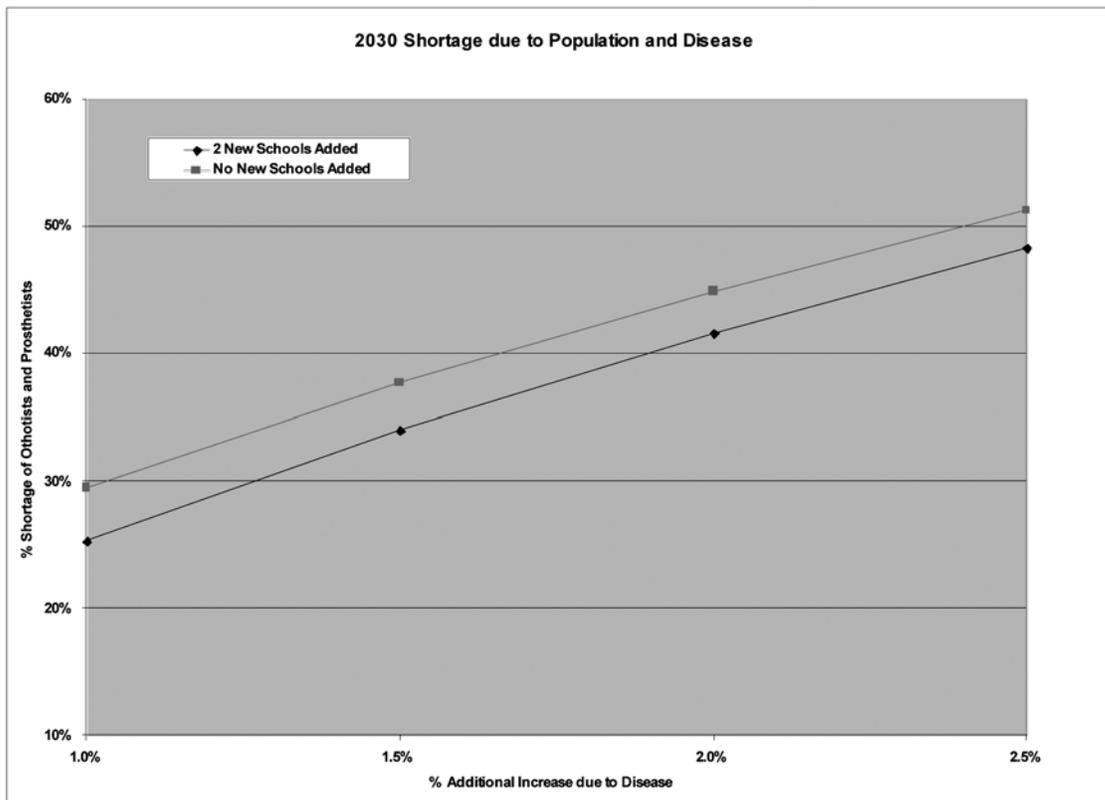
percent annually, so that by 2030 the profession would be 835 (9.5 percent) “short” of practitioners. This reinforces the significant effect of opening two new schools that was mentioned near the end of the Supply Issues section.

From the above calculations alone, it would appear that the projected number of practicing orthotists and prosthetists will almost keep up with that of the growing population. However, several of the factors mentioned throughout this study impact on this basic analysis, some pointing to a more severe impending shortage of professionals in the profession, others reducing that shortage.

Leaving for the moment the increase in patient efficiencies discussed earlier (and thus assuming that the average number of patient visits per professional stays the same), some of the factors that are driving demand higher can, to some extent, be qualitatively estimated. These are:

1. The aging population increases demand for prostheses. It is estimated that between 2000 and 2020 the population of 65-84 year olds will increase over 50 percent and those 85 and over by 70 percent. Put another way, while the U.S. population increases by 0.7 percent annually, the 65-84 year-old cohort increases 2.0 percent annually and the 85 and older group by 2.8 percent annually. This dramatically impacts the need for certified professionals, in particular prosthetists.
2. The increase in prevalence of both obesity and diabetes is far out of proportion to the overall growth in population resulting in the dramatic increase in need for orthotists and prosthetists. The growth in diabetes prevalence alone is approximately 2 percent annually. Obesity, with current trends, looks to grow similarly. As 50 percent of orthotists’ practices derive from disease-based patients and likewise 67 percent for prosthetists’ practice, an estimated extrapolation of at least an additional 2 percent growth (as many diabetics arise from the obese population) in demand for services due to diabetes and obesity could be posited.

By combining the rapid increase in the aging population and similar increases in obesity and diabetes one can expect an increased demand for orthotic and prosthetic care in the range of 3 percent or more annually due to these major factors alone. Other disease-based causes for demand may have additional impact, such as strokes and arthritis, but are not considered nearly as significant. Given that disease makes up 50 percent of visit etiologies for orthotists and 67 percent for prosthetists, as noted in the figure on page 14, an estimate of an annual increase of 1.5 percent in patients who are aged and/or have diabetes, obesity, peripheral vascular disease and other disease categories needing professional orthotic or prosthetic care, over and above the population increase, would seem conservative. Given that by the year 2030, there will be an increase in patient demand of 45 percent based on population growth, population aging and disease, the resulting shortage of practitioners would be 4,314 (25.2 percent) if two new schools are added shortly, and 4,783 (37.7 percent) if not. This is a fairly sensitive statistic. For example, given the stated conditions of population growth, the following shortage could be expected by 2030 given different assumptions (i.e. 1.0 percent, 1.5 percent, 2.0 percent and 2.5 percent) for the additional demand of population aging and increased disease:



Thus, population aging and increases in diseases such as diabetes and obesity above population growth can have a profound effect on the future balance between supply of practitioners and demand for services.

There are several additional factors previously noted that will either increase demand for or adversely affect the supply of certified orthotists and prosthetists. These are much more difficult, if not impossible, to quantify, and include:

1. Technology improvements increasing demand for prostheses in younger population;
2. Technology improvements requiring more education/training time per prosthetic device;
3. Private insurance rates decreasing, resulting in less reimbursement to the professional ultimately decreasing desire of individuals to enter the profession.

Earlier it was noted in the section Patient Visit Equivalent Factor that there may be significant improvements in practice efficiencies. By the year 2012, based upon discussion with an industry participant, there could be 20% savings in work time for Orthotists and equivalent for Prosthetists. This would more than eliminate potential shortages should such a trend occur. However, the authors believe that this data is representative of only a portion of the wide universe of different practice types and size, and that such efficiencies that effectively reduce time spent on fabrication or with patients, due to better techniques, digital scanning and new technologies, will not continue to occur at such a robust pace.

SUMMATION

If all things remained the same, growth in the number of certified professionals appears to almost match population growth in the US. However, some factors point to a shortage. Some are significant and quantifiable, such as the impact of certain diseases and the aging of the U.S. population. The effect of some other factors, such as reduced reimbursement rates or the need for increased professional/patient training and education on higher technology prostheses are extremely difficult to quantify. Additionally, the extent to which professionals such as certified fitters increase their provision of services that have heretofore been the domain of the certified orthotists and prosthetists presents the possibility of a decrease in demand for those services by certified orthotists or prosthetists. Finally, practitioner efficiencies could also tip the balance onto the side of a surplus of orthotists and prosthetists; however, it is felt that such efficiencies cannot continue to improve practice at such a rate indefinitely. In the short run (next 5-6 years) and assuming two new schools are opened shortly, we expect the current balance between supply and demand to continue. Beyond that, it is likely that there will be a gradually increasing shortage of orthotists and prosthetists.

GLOSSARY OF ORTHOTIC AND PROSTHETIC ORGANIZATIONS

American Academy of Orthotists and Prosthetists (AAOP) – is a membership organization that is dedicated to promoting professionalism and advancing the standards of patient care through education, literature, research, advocacy and collaboration. www.oandp.org

American Board for Certification in Orthotics and Prosthetics (ABC) – is the national certifying and accrediting body for the orthotic and prosthetic professions. The public requires and deserves assurance that the persons providing orthotic and prosthetic services and care are qualified to provide the appropriate services, and it was on this basis that the ABC was established as a credentialing organization. www.abcop.org

American Orthotic and Prosthetic Association (AOPA) – is a national trade association committed to providing high quality, unprecedented business services and products to O&P professionals. www.aopanet.org

Board for Orthotists/Prosthetist Certification (BOC) – is an independent, not-for-profit agency that certifies orthotists, prosthetists, orthotic and mastectomy fitters and accredits their facilities. www.bocusa.org

Board for Certification in Pedorthics (BCP)* – is an independent certification body that sets pedorthic standards and is itself recognized by the National Commission for Certifying Agencies.

National Association for the Advancement of Orthotics & Prosthetics (NAAOP) – is a non-profit trade association dedicated to educating the public and promoting public policy that is in the interest of the O&P patient. www.naaop.org

National Commission on Orthotic and Prosthetic Education (NCOPE) – is a 501(c)(3) non-profit organization and is the accreditation body for the orthotics and prosthetics (O&P) profession. As such, its primary mission and obligation is to ensure educational and residency programs meet the minimum standards of quality to prepare individuals to enter the O&P profession. www.ncope.org

** Effective January 1, 2007, BCP is no longer certifying CPeds, ABC acquired them and will now be certifying pedorthists.*

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Endnotes

- ¹ <http://www.washington.edu/research/pathbreakers/1985.html>>.
- ² National Commission on Orthotic and Prosthetic Education's "Core Curriculum for Orthotist and Prosthetist", October 18, 2006.
- ³ Forecasts for the two new schools were estimated based on the assumption that at least for the first several years, enrollment, and graduation rates, would be commensurate with other smaller schools such as E. Michigan, Georgia Tech, U. Texas, and U. Washington. It was also assumed that a two- or three-year "ramp up" period would apply in the years immediately after these schools opened.
- ⁴ It is assumed that those graduates who become certified obtain their certification one year after graduation.
- ⁵ American Board for Certification in Orthotics and Prosthetics (ABC). "Practice Analysis of the Disciplines of Orthotics and Prosthetics." Prepared for ABC by Professional Examination Services, Alexandria, Virginia, July 2006.
- ⁶ Ibid.
- ⁷ NHANES data on the Prevalence of Overweight and Obesity Among Adults-United States, 2003-2004. <http://www.cdc.gov/nchs/fastats/overwt.htm> >. Accessed 3 October 2006.
- ⁸ U.S. Department of Health and Human Services. Weight-control Information Network. "Statistics Related to Overweight and Obesity." <http://win.niddk.nih.gov/statistics/index.htm> >. Accessed 9 September 2006.
- ⁹ LookSmart, FIND ARTICLES. "Excess Body Weight and Orthotic Support." http://www.findarticles.com/p/articles/mi_qa3987/is_200402/ai_n9385662. Accessed 9 September 2006.
- ¹⁰ U.S. Centers for Disease Control and Prevention. "Obesity, Diabetes on the Increase in US." <http://usgovinfo.about.com/library/weekly/aa010803a.htm>. Accessed 7 September 2006.
- ¹¹ U.S. Centers for Disease Control and Prevention. "Diabetes: Disabling, Deadly, and on the Rise." <http://www.cdc.gov/nccdphp/publications/aag/ddt.htm>. Accessed 12 September 2006.
- ¹² U.S. Centers for Disease Control and Prevention. "National Diabetes Fact Sheet." <http://www.cdc.gov/diabetes/pubs/estimates05.htm>. Accessed 13 September 2006.
- ¹³ U.S. Centers for Disease Control and Prevention. "Projection of diabetes burden through 2050: impact of changing demography and disease prevalence in the U.S." *Diabetes Care*, November 2001; 24(11):1936-40. <http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstr...> . Accessed 13 October 2006.
- ¹⁴ U.S. Centers for Disease Control and Prevention. "National Diabetes Fact Sheet." <http://www.cdc.gov/diabetes/pubs/estimates05.htm>. Accessed 13 September 2006.
- ¹⁵ International Diabetes Federation. "Diabetes in North America: millions of feet at risk of amputations." June 2005. <http://www.idf.org/home/index.cfm?node=1426>. Accessed 13 September 2006.
- ¹⁶ MossRehab ResourceNet. "Amputation Fact Sheet." Albert Einstein Healthcare Network, Philadelphia, PA, 2006. <http://www.mossresourcenet.org/amputa.htm> . Accessed 9 September 2006.

- ¹⁷ National Limb Loss Information Center Fact Sheet. "Amputation Statistics by Cause. Limb Loss in the United States." Amputee Coalition of America, Knoxville, TN. 2006.
- ¹⁸ U.S. Centers for Disease Control and Prevention. "Targeting Arthritis: Reducing Disability for 16 Million Americans." <http://www.cdc.gov/nccdphp/publications/aag/arthritis.htm>. Accessed 15 September 2006.
- ¹⁹ Department of Physical Medicine and Rehabilitation, Mayo Medical School, Rochester, MN. Abstract: "Advances in orthotics for the patient with rheumatoid arthritis." August 1987. http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=330. Accessed 9 September 2006.
- ²⁰ Arthritis Foundation. Research Update, May/June 2005. "Using Orthotics to Improve Pain and Function in Children with Arthritis." http://www.arthritis.org/research/ResearchUpdate/05May_June/orthotics.asp. Accessed 9 September 2006.
- ²¹ U.S. Centers for Disease Control and Prevention. "Stroke Facts and Statistics." http://www.cdc.gov/Stroke/stroke_facts.htm. Accessed 15 September 2006.
- ²² National Institute of Health. National Institute of Neurological Disorders and Stroke. "Spina Bifida Fact Sheet." < http://www.ninds.nih.gov/disorders/spina_bifida/spina_bifida.htm >. Accessed 18 September 2006.
- ²³ Spina Bifida Association. Research Articles, July 2005 – September 2005. http://www.sbaa.org/site/c.gpILKXOEJqG/b.2021473/k.4ACC/July_2005_September_20. Accessed 18 September 2006.
- ²⁴ National Scoliosis Foundation. < <http://www.scoliosis.org/info.php> >. Accessed 9 September 2006.
- ²⁵ Cerebral Palsy Facts.com. < <http://www.cerebralpalsyfacts.com/stats.htm> >. Accessed 9 September 2006.
- ²⁶ Longman, Jere. "The Girls of Summer (The U.S. Women's Soccer Team and How it Changed the World)," HarperCollins, New York, 2000, page 112.
- ²⁷ Etzioni, MD, David, et al. "Workload Projection for Surgical Oncology: Will We Need More Surgeons?" *Annals of Surgical Oncology*. 2003;10(9):1112-1117.
- ²⁸ 2004 AOPA Operating Performance & Compensation Report (by Industry Insights, Inc). American Orthotic & Prosthetic Association, Alexandria, VA. 2004.
- ²⁹ Rossbach, Patty. "Taking the Lead in Campaign for Change." *inMotion* 14(2), March/April 2004. http://www.amputee-coalition.org/inmotion/mar_apr_04/change.html. Accessed 3 October 2006.
- ³⁰ Membership Poll. Amputee Coalition of America. Washington, D.C. January, 2006.
- ³¹ California Health Benefits Review Program Analysis of Assembly Bill 2012 references the Division of HealthCare Finance and Policy, Commonwealth of Massachusetts, 2005, p. 2 and Maine Bureau of Insurance, 2003, p. 31.
- ³² "Analysis of Assembly Bill 2012: Orthotic and Prosthetic Devices." California Health Benefits Review Program. Report presented to: California State Legislature, April 2006, 7. http://www.chbrp.org/documents/ab_2012final.pdf. Accessed 4 October 2006.
- ³³ United States Department of Veterans Affairs. "Fact Sheet: VA's Prosthetics and Sensory Aids." <http://www1.va.gov/opa/fact/pros-sensory.asp> >. Accessed 24 September 2006.

- ³⁴ Health Affairs. "Medical Innovations Will Result in Better Health and Longer Life, But Will Increase, Not Decrease, Elderly Spending". Published by Project Hope, funded in part by the National Institute on Aging, and the John A. Hartford Foundation. September 2005. www.healthaffairs.org/press/septoct0502.htm. Accessed 13 November 2006.
- ³⁵ AOPA Internal Document. H:\aopa\Government Affairs\GOVREL\2004\Medicare O&P Fee Update data (2005).doc (CPI-U calculated using Bureau of Labor Statistics from June to June of the previous year.).
- ³⁶ Aisen, Dr.Mindy. "VA, DoD Working Closely On Prosthetics Research." U.S. Medicine. February 2004. www.usmedicine.com/column.cfm?columnID=169&issueID=59. Accessed 25 September 2006.
- ³⁷ Ibid.
- ³⁸ American Board for Certification in Orthotics and Prosthetics (ABC). "Practice Analysis of the Disciplines of Orthotics and Prosthetics." Prepared for ABC by Professional Examination Services, Alexandria, Virginia, July 2000.
- ³⁹ American Board for Certification in Orthotics and Prosthetics (ABC). "Practice Analysis of the Disciplines of Orthotics and Prosthetics." Prepared for ABC by Professional Examination Services,, Alexandria, Virginia, July 2006.
- ⁴⁰ National Commission on Orthotic and Prosthetic Education's "Core Curriculum for Orthotist and Prosthetist", October 18, 2006.
- ⁴¹ United States Department of Veterans Affairs. "Fact Sheet: VA's Prosthetics and Sensory Aids," February 2006. <http://www1.va.gov/opa/fact/pros-sensory.asp>. Accessed 25 September 2006.
- ⁴² Miles, Donna. "DARPA's Cutting-Edge Programs Revolutionize Prosthetics." American Forces Press Service, February 8, 2006. United States Department of Defense. http://www.defenselink.mil/news/Feb2006/20060208_4146.html. Accessed 24 September 2006.
- ⁴³ Aisen, www.usmedicine.com/column.cfm?columnID=169&issueID=59 . Accessed 25 September 2006.
- ⁴⁴ Larson EG, Hart LG and Ballweg R., WWAMI Center for Health Workforce Studies, Department of Family Medicine, Box 354696, University of Washington, Seattle, WA 98195, USA. ("National Estimates of Physician Assistant Productivity", *Journal Allied Health*,2001 Fall; 30(3):146-52.)
- ⁴⁵ Currently under Federal Health Personnel Shortage Area designation regulations, a PA is considered a 0.5 FTE equivalent of a physician; the authors in the U. of Washington report suggest that 0.75 FTE would be a more accurate figure to use.
- ⁴⁶ American Board for Certification in Orthotics and Prosthetics, Inc. (ABC), "Orthotic and Prosthetic Scope of Practice." Prepared for ABC, Alexandria ,VA, by Scope of Practice Task Force. 2003.
- ⁴⁷ Ibid.
- ⁴⁸ American Board for Certification in Orthotics and Prosthetics Practice Analysis Survey of the Practice of Orthotic Fitting. 2004/2005.
- ⁴⁹ Orthotic and Prosthetic HCPCS Codes Usage Data, ©2006 American Orthotic & Prosthetic Association (AOPA).
- ⁵⁰ Ibid.
- ⁵¹ Ibid.
- ⁵² AOPA Operating Performance and Compensation Report 2004 (Reporting on 2003 Results).

- ⁵³ “America’s Obesity Epidemic Getting Worse; New Report Finds Adult Obesity Rates Up In 31 States; The South Is The ‘Biggest Belt.’” Trust for America’s Health. (F as in Fat: How Obesity Policies are Failing America). 2006. <http://www.rwjf.org/newsroom/newsreleasesdetail.jsp?id=10428> >. Accessed 13 September 2006.
- ⁵⁴ U.S. Centers for Disease Control and Prevention. “Overweight and Obesity: Obesity Trends: 2001 Obesity and Diabetes Prevalence Among U.S. Adults by State.” http://www.cdc.gov/nccdphp/dnpa/obesity/trend/obesity_diabetes_states.htm . Accessed 12 September 2006.
- ⁵⁵ American Association of Clinical Endocrinologists. “State of Diabetes in America: A New Report Reveals America’s Diabetes Health is in Jeopardy.” May 2005. http://www.aace.com/newsroom/press/2005/index.php?r=20050518_2 . Accessed 12 September 2006.
- ⁵⁶ Kaiser State Health Facts. “Percent of Adults with a Disability, 2005.” <http://www.statehealthfacts.org/cgi-bin/healthfacts.cgi?action=compare&category=Health...> >. Accessed 12 September 2006.
- ⁵⁷ American Academy of Orthotists and Prosthetists (AAOP). “Geographic Distribution of Qualified Practitioners Compared to Eligible Medicare Beneficiaries Having Diagnoses Commonly Managed with Custom-made Orthoses and Protheses (Preliminary Report)”. Prepared for AAOP (through a grant from the U.S. Department of Education – H235R040001) by John W. Michael MED, CPO/L, Douglas G. Smith, MD and Sharon Hubbard, MS, July 2005, <http://www.oandp.org/grants/GeoMay/GeoDistro.pdf> >. Accessed September 6, 2006.
- ⁵⁸ Ibid.

BIBLIOGRAPHY

- Aisen, Dr. Mindy. "VA, DoD Working Closely On Prosthetics Research." U.S. Medicine. February 2004. www.usmedicine.com/column.cfm?columnID=169&issueID=59. Accessed 25 September 2006.
- American Academy of Orthotists and Prosthetists (AAOP). "Geographic Distribution of qualified Practitioners Compared to Eligible Medicare Beneficiaries Having Diagnoses Commonly Managed with Custom-made Orthoses and Prostheses (Preliminary Report)". Prepared for AAOP (through a grant from the U.S. Department of Education – H235R040001) by John W. Michael MEd, CPO/L, Douglas G. Smith, MD and Sharon Hubbard, MS, July 2005, <http://www.oandp.org/grants/GeoMay/GeoDistro.pdf>. Accessed 6 September 2006.
- American Association of Clinical Endocrinologists. "State of Diabetes in America: A New Report Reveals America's Diabetes Health is in Jeopardy." May 2005. http://www.aace.com/newsroom/press/2005/index.php?r=20050518_2. Accessed 12 September 2006.
- American Board for Certification in Orthotics and Prosthetics (ABC). "Practice Analysis of the Disciplines of Orthotics and Prosthetics." Prepared for ABC by Professional Examination Services, Alexandria, Virginia, July 2000.
- American Board for Certification in Orthotics and Prosthetics (ABC). "Practice Analysis of the Disciplines of Orthotics and Prosthetics." Prepared for ABC by Professional Examination Services,, Alexandria, Virginia, July 2006.
- American Board for Certification in Orthotics and Prosthetics, Inc. (ABC). "Orthotic and Prosthetic Scope of Practice." Prepared for ABC, Alexandria ,VA, by Scope of Practice Task Force. 2003.
- American Board for Certification in Orthotics and Prosthetics Practice Analysis Survey of the Practice of Orthotic Fitting. 2004/2005.
- "America's Obesity Epidemic Getting Worse; New Report Finds Adult Obesity Rates Up In 31 States; The South Is The 'Biggest Belt.'" Trust for America's Health. (F as in Fat: How Obesity Policies are Failing America). 2006. <http://www.rwjf.org/newsroom/newsreleasesdetail.jsp?id=10428>. Accessed 13 September 2006.
- "Analysis of Assembly Bill 2012: Orthotic and Prosthetic Devices." California Health Benefits Review Program. Report presented to: California State Legislature, April 2006, 7. http://www.chbrp.org/documents/ab_2012final.pdf. Accessed 4 October 2006.
- AOPA Internal Document. H:\aopa\Government Affairs\GOVREL\2004\Medicare O&P Fee Update data (2005).doc (CPI-U calculated using Bureau of Labor Statistics from June to June of the previous year).
- 2004 AOPA Operating Performance & Compensation Report (by Industry Insights, Inc). American Orthotic & Prosthetic Association, Alexandria, VA. 2004.
- Arthritis Foundation. Research Update, May/June 2005. "Using Orthotics to Improve Pain and Function in Children with Arthritis." http://www.arthritis.org/research/ResearchUpdate/05May_June/orthotics.asp. Accessed 9 September 2006.
- California Health Benefits Review Program Analysis of Assembly Bill 2012 references the Division of HealthCare Finance and Policy, Commonwealth of Massachusetts, 2005, p. 2 and Maine Bureau of Insurance, 2003, p. 31.
- Cerebral Palsy Facts.com. <http://www.cerebralpalsyfacts.com/stats.htm>. Accessed 9 September 2006.
- Department of Physical Medicine and Rehabilitation, Mayo Medical School, Rochester, MN. Abstract: "Advances in orthotics for the patient with rheumatoid arthritis." August 1987. http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=330.. Accessed 9 September 2006.

- Etzioni, MD, David, et al. "Workload Projection for Surgical Oncology: Will We Need More Surgeons?" *Annals of Surgical Oncology*. 2003;10(9):1112-1117. <http://www.washington.edu/research/pathbreakers/1985.html>
- Health Affairs. "Medical Innovations Will Result in Better Health and Longer Life, But Will Increase, Not Decrease, Elderly Spending". Published by Project Hope, funded in part by the National Institute on Aging, and the John A. Hartford Foundation. September 2005. www.healthaffairs.org/press/septoct0502.htm . Accessed 13 November 2006.
- International Diabetes Federation. "Diabetes in North America: millions of feet at risk of amputations." June 2005. <http://www.idf.org/home/index.cfm?node=1426> . Accessed 13 September 2006.
- Kaiser State Health Facts. "Percent of Adults with a Disability, 2005." <http://www.statehealthfacts.org/cgi-bin/healthfacts.cgi?action=compare&category=Health> . Accessed 12 September 2006.
- Larson EG, Hart LG and Ballweg R. WWAMI Center for Health Workforce Studies, Department of Family Medicine, Box 354696, University of Washington, Seattle, WA 98195, USA. ("National Estimates of Physician Assistant Productivity", *Journal Allied Health*, 2001 Fall; 30(3):146-52.)
- Longman, Jere. "The Girls of Summer (The U.S. Women's Soccer Team and How it Changed the World)," HarperCollins, New York, 2000, page 112.
- LookSmart, FIND ARTICLES. "Excess Body Weight and Orthotic Support." http://www.findarticles.com/p/articles/mi_qa3987/is_200402/ai_n9385662 . Accessed 9 September 2006.
- Membership Poll. Amputee Coalition of America. Washington, D.C. January, 2006.
- Miles, Donna. "DARPA's Cutting-Edge Programs Revolutionize Prosthetics." American Forces Press Service, February 8, 2006. United States Department of Defense. http://www.defenselink.mil/news/Feb2006/20060208_4146.html >. Accessed 24 September 2006.
- MossRehab ResourceNet. "Amputation Fact Sheet." Albert Einstein Healthcare Network, Philadelphia, PA, 2006. <http://www.mossresourcenet.org/amputa.htm>. Accessed 9 September 2006.
- National Commission on Orthotic and Prosthetic Education's "Core Curriculum for Orthotist and Prosthetist." October 18, 2006.
- National Institute of Health. National Institute of Neurological Disorders and Stroke. "Spina Bifida Fact Sheet." http://www.ninds.nih.gov/disorders/spina_bifida/spina_bifida.htm . Accessed 18 September 2006.
- National Limb Loss Information Center Fact Sheet. "Amputation Statistics by Cause. Limb Loss in the United States." Amputee Coalition of America, Knoxville, TN. 2006.
- National Scoliosis Foundation. <http://www.scoliosis.org/info.php> . Accessed 9 September 2006.
- Neilsen, Ph.D., Caroline. "Issues Affecting the Future Demand for Orthotists and Prosthetists: Update 2002." A study updated for the National Commission on Orthotic and Prosthetic Education (NCOPE), May 2002, by Caroline C. Nielsen, Ph.D., Consultant.
- NHANES data on the Prevalence of Overweight and Obesity Among Adults-United States, 2003-2004. <http://www.cdc.gov/nchs/fastats/overwt.htm> . Accessed 3 October 2006.

Orthotic and Prosthetic HCPCS Codes Usage Data. ©2006 American Orthotic & Prosthetic Association (AOPA).

Rossbach, Patty. "Taking the Lead in Campaign for Change." inMotion 14(2), March/April 2004.

http://www.amputee-coalition.org/inmotion/mar_apr_04/change.html . Accessed 3 October 2006.

Spina Bifida Association. Research Articles, July 2005 – September 2005.

http://www.sbaa.org/site/c.gpILKXOEJqG/b.2021473/k.4ACC/July_2005_September_20..

Accessed 18 September 2006.

U.S. Centers for Disease Control and Prevention. "Diabetes: Disabling, Deadly, and on the Rise."

<http://www.cdc.gov/nccdphp/publications/aag/ddt.htm> . Accessed 12 September 2006.

U.S. Centers for Disease Control and Prevention. "National Diabetes Fact Sheet."

<http://www.cdc.gov/diabetes/pubs/estimates05.htm>. Accessed 13 September 2006.

U.S. Centers for Disease Control and Prevention. "Obesity, Diabetes on the Increase in US."

<http://usgovinfo.about.com/library/weekly/aa010803a.htm>. Accessed 7 September 2006.

U.S. Centers for Disease Control and Prevention. "Overweight and Obesity: Obesity Trends: 2001 Obesity and Diabetes Prevalence Among U.S. Adults by State."

http://www.cdc.gov/nccdphp/dnpa/obesity/trend/obesity_diabetes_states.htm . Accessed 12 September 2006.

U.S. Centers for Disease Control and Prevention. "Projection of diabetes burden through 2050: impact of changing demography and disease prevalence in the U.S." Diabetes Care, November 2001; 24(11):1936-40. <http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Abstr..> Accessed 13 October 2006.

U.S. Centers for Disease Control and Prevention. "Stroke Facts and Statistics."

http://www.cdc.gov/Stroke/stroke_facts.htm. Accessed 15 September 2006.

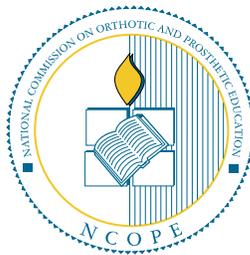
U.S. Centers for Disease Control and Prevention. "Targeting Arthritis: Reducing Disability for 16 Million Americans."

<http://www.cdc.gov/nccdphp/publications/aag/arthritis.htm>. Accessed 15 September 2006.

U.S. Department of Health and Human Services. Weight-control Information Network. "Statistics Related to Overweight and Obesity." <http://win.niddk.nih.gov/statistics/index.htm>. Accessed 9 September 2006.

United States Department of Veterans Affairs. "Fact Sheet: VA's Prosthetics and Sensory Aids."

<http://www1.va.gov/opa/fact/pros-sensory.asp> . Accessed 24 September 2006.



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