Because of the way health services are delivered in the United States, no accurate figures are available concerning the orthopaedic patient population, treatment methods, and other information that would be useful to administrators, clinicians, and research groups.

In July 1969 the Committee on Prosthetics Research and Development (CPRD) collected information that permitted certain estimates concerning amputees and orthotic patients in the U.S.A. (1). This article, compiled in May 1973, updates the 1969 effort. Further searching for more accurate information has emphasized that only rough estimates can be made, especially in orthotics.

**PROSTHETICS**

**NUMBER OF AMPUTEES**

The best sources of information on the total number of amputees in the country are the household interview surveys conducted by the National Center for Health Statistics (NCHS)². For the time periods 1963-1965 (7), 1965-1967 (8), 1969 (8), and 1971 (8), these surveys resulted in estimates of 257,000, 305,000, 260,000, and 274,000 amputees respectively in the civilian, non-institutional population. Taking an average of these figures and guessing at the number of amputees in military and Veterans Administration hospitals, convalescent homes, and other institutions, brings the total to at least 300,000 or about 1.5 amputees per 1000 population³. This figure corresponds quite well with statistics from Great Britain.

The NCHS surveys show that the ratio between upper-limb and lower-limb amputees is 30% to 70%.

**LEVELS OF AMPUTATION**

For use in estimating the distribution by level of amputation, only the results of surveys conducted by the Committee on Prosthetic-Orthotic Education (CPOE) in 1961-1963 (3) and 1965-1967 (2) are available (Table 1).

These surveys consisted of contacts solely with prosthetics facilities and include only those amputees showing up for prosthetic treatment. The 1961-1963 study consisted of data only from the initial fitting of patients for a given period. The 1965-1967 study consisted of data from all patients fitted at a selected number of prosthetics facilities for a given period. The first study involved approximately 12,000 cases; the latter, about 4,000. Since not all amputees wear prostheses, the CPOE surveys obviously do not yield a complete picture. Therefore, it seems appropriate to show the distribution by level of amputation in upper- and lower-limb groups (Table 2). The results of the two surveys are quite similar. The noticeable change is the reversal in numbers of above-knee and below-knee amputations. Presumably this is because of the benefits of immediate postsurgical prosthetic management and improved methods of elective surgery allowing greater length to be saved. A repeat of the 1961-1963 survey is currently underway as a cooperative effort of CPRD-CPOE and the American Orthotic and Prosthetic Association (AOPA).

³Based on a population of 200,000,000.

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1Staff Engineer, Committee on Prosthetics Research and Development, National Academy of Sciences—National Research Council, Washington, D.C.

2National Center for Health Statistics, Health Services and Mental Health Administration, Public Health Service, Department of Health, Education, and Welfare, 5600 Fishers Lane, Rockville, Maryland 20852.

Maurice A. LeBlanc, M.S., C.P.
There are several sets of figures available from which amputees can be broken into age groups. One useful breakdown is given in Table 3. Taking an average of these figures gives about 10%, 60%, and 30% in the under 21, 21-64, and 65-and-over age groups respectively.

**USE OF PROSTHESES**

It has long been a rule of thumb that 50% of arm amputees and 75% of leg amputees wear prostheses. These estimates are reinforced by a 1969 NCHS survey (10) which cites the use of 46,000 upper-limb prostheses and 126,000 lower-limb prostheses or 52% and 76% of the arm and leg amputees respectively in that survey of the civilian, non-institutional population.

A 1964 NCHS survey (9) of homes for the aged and chronically ill estimated 2,100 artificial limbs being used by residents.

**MANPOWER**

Records at the American Board for Certification (ABC) office indicate that there are 395 certified prosthetists and 235 certified prosthetist-orthotists for a total of 630 certified prosthetists (including 1972 examinees). Therefore, the ratio of amputees to certified prosthetists is 300,000/630 or 476/1 and the ratio of artificial limbs to certified prosthetists is 203,000/6304 or 322/1. From a CPOE manpower survey (14) and other indications from the field, additional qualified prosthetists are needed.

**ORTHOTICS**

**NUMBER OF ORTHOTIC PATIENTS**

The total number of orthotic patients is difficult to estimate because orthotic treatment is usually more complicated than prosthetic treatment and because records are not kept in a way so this information is accessible. A list of various

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In some cases interpolation of given statistics has been used to arrive at figures for some of the age groups.

TABLE 3

The neuromuscular dysfunctions for which orthotics is commonly part of the treatment scheme is given in Table 4. We have insufficient knowledge at present to arrive at the total number of orthotic patients from this table showing neuromuscular dysfunctions or from surveys or records in the

<table>
<thead>
<tr>
<th>Neuromuscular Dysfunction</th>
<th>Estimated Patient Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paralysis/Paresis of Upper Limb(s)</td>
<td>172,000^1</td>
</tr>
<tr>
<td>Paralysis/Paresis of One Lower-Limb</td>
<td>330,000^2</td>
</tr>
<tr>
<td>Hemiplegia/Hemiparesis</td>
<td>340,000^2,5</td>
</tr>
<tr>
<td>Paraplegia</td>
<td>77,000^2-200,000^7</td>
</tr>
<tr>
<td>Quadriplegia</td>
<td>38,000^2</td>
</tr>
<tr>
<td>Cerebral Palsy</td>
<td>153,000^2-750,000 (12)</td>
</tr>
<tr>
<td>Spina Bifida</td>
<td>27,500 (12)</td>
</tr>
<tr>
<td>Multiple Sclerosis</td>
<td>500,000 (12)</td>
</tr>
<tr>
<td>Muscular Dystrophy</td>
<td>200,000 (12)</td>
</tr>
<tr>
<td>Osteogenesis Imperfecta</td>
<td>10,000-30,000 (13)</td>
</tr>
<tr>
<td>Parkinson’s Disease</td>
<td>1,000,000 (12)</td>
</tr>
<tr>
<td>Disabling Arthritis</td>
<td>2,201,000^4,9</td>
</tr>
<tr>
<td>Upper-Limb Deformity</td>
<td>819,000^2</td>
</tr>
<tr>
<td>Lower-Limb Deformity</td>
<td>2,916,000^2</td>
</tr>
<tr>
<td>Spinal Deformity</td>
<td>1,135,000^2</td>
</tr>
</tbody>
</table>

TABLE 4

^1 All figures for paralysis and deformity are averages of the statistics from the NCHS household interview surveys of 1963-1965 (7), 1965-1967 (8), 1969 (8), and 1971 (8).

^2 In reference (11) the National Institute for Neurological Diseases and Stroke estimates that there are 2,000,000 total cases of stroke (CVA—cerebrovascular accidents) in the U.S.A. However, there is no way to arrive at the number of hemiplegic and hemiparetic people from this estimate.

^3 In reference (12) the National Paraplegic Foundation guesses there are 125,000 to 200,000 paraplegic people in the U.S.A.

^4 The NCHS survey reported in reference (5) estimates that due to arthritis and rheumatism there are 3,248,000 people with limitation of activity and 1,541,000 people with limitation of mobility among the civilian, non-institutional population.

^5 The Social Security Administration survey reported in reference (4) estimates that among the civilian, non-institutional population between ages 18-64 there are 2,201,000 people with major disabling arthritis and rheumatism causing limitation of work.
field. Thus, the best estimate now is the rule-of-thumb ratio 10 to 1 of orthotic patients to amputees, which gives about 3,000,000 orthotic patients or 15 per 1,000 population.

**USE OF ORTHOSES**

NCHS surveys of 1958-1959 (6) and 1969 (10) showed 695,000 and 1,102,000 braces respectively being used in the civilian, non-institutional population. A 1964 NCHS survey (9) of homes for the aged and chronically ill estimated 5,400 braces being used by residents.

**MANPOWER**

Records at the ABC office indicate that there are 515 certified orthotists and 235 certified prosthetist-orthotists for a total of 750 certified orthotists (including 1972 examinees). Therefore, the ratio of potential orthotic patients to certified orthotists is roughly 3,000,000/750 or 4,000/1 and the ratio of actual braces to certified orthotists is roughly 1,107,000/750 or 1,476/1. From a CPOE manpower survey (14) and indications from the field, additional qualified orthotists are in serious demand, especially in view of the large number of patients and the changing practice of orthotics away from the use of metal toward the use of plastics and new fabrication methods.

**COST OF SERVICES**

In fiscal year 1972 the Veterans Administration (VA) spent about $5,106,000 for prosthetic services (15). From the CPOE surveys of 1961-1963 and 1965-1967, it was estimated that the VA paid for 12.7% and 14.3% respectively of the prostheses in the country. (With Medicare going strong, the lower figure probably is more accurate now.) Therefore, we can extrapolate that $5,106,000/12.7% or roughly $40,000,000 was spent in fiscal year 1972 for prosthetic services in the U.S.A.

If we assume that the ratio of certified prosthetists to certified orthotists is proportional to the cost of prosthetic and orthotic services, then $40,000,000 \times 750/630 or $48,000,000 was spent for orthotic services in fiscal year 1972. Consequently, a total of roughly $40,000,000 + $48,000,000 or $88,000,000 was spent on prosthetic and orthotic services.

**EXPENDITURES IN RESEARCH**

Actual funding figures obtained from the VA and Department of Health, Education, and Welfare (including both the Social and Rehabilitation Service and the Maternal and Child Health Service) and estimates of funding from various other sources show a total of $5,709,000 spent on research (including design, development, and evaluation) in prosthetics and orthotics during calendar year 1972. This figure is $5,709,000/$88,000,000 or about 6 1/2% of the total spent on services:

| Cost of Prosthetic and Orthotic Services | $88,000,000 |
| Expenditures on Prosthetics and Orthotics Research | $5,709,000 |
| Percentage of Research to Services | 6 1/2% |

**TABLE 5**

$1,102,000 in the civilian, non-institutional population (10) plus 5,400 in the institutional population (9).
Figures 1 and 2 provide a graphical summary of the information presented on prosthetic and orthotic estimates. Figure 3 provides a graphical display of information only partly presented in the text on the numbers of certified personnel in prosthetics and orthotics over the years.

Figure 1. Estimates in Prosthetics.
Figure 2. Estimates in Orthotics.

Figure 3. Manpower in Prosthetics and Orthotics\textsuperscript{12}

\textsuperscript{12}These figures were obtained from the ABC registries for the years shown.
REFERENCES


13. Osteogenesis Imperfecta Foundation, Unpublished estimate that includes infants to young adults.
