

FOLLOW-UP STUDY ON A GROUP OF OLDER AMPUTEE PATIENTS

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Editor's Note: This article is reprinted by permission of the authors from The Journal of the American Medical Association, July 18, 1959, pages 1396-1402.

Detailed interviews were held with 51 amputees followed for varying periods after fitting of prostheses and release from hospital. Psychological factors affecting attitude and motivation seemed to be operating to various degrees. Favorable morale regarding value and use of the prosthesis by individuals appeared to be related to degree of change in physical condition, mode of living, and restriction on activities. It is believed worthwhile to provide prostheses with assistive devices for older amputees in order to help them remain more functional in their self-care, ambulation, and post-hospital adjustment.

With the increasing number of older patients in the hospital population, it is pertinent to study various aspects of treatment and the outcome as it relates to such individuals. The purpose of this study was to obtain follow-up data concerning the posthospital adjustment of a group of older patients for whom the amputation of a limb or limbs had been necessary. The major areas investigated were physical status, mortality trends, personal and socio-economic adjustment, and the extent to which a prosthetic appliance had been prescribed and was actually being used.

Patients included in this study were 55 years of age or older at the time of surgery and had been out of the hospital at least one year by the time of the follow-up interview. Through the assistance of the medical record librarian, cases were identified and initial data entered on work sheets for amputee patients who were in the designated age range and who had been discharged from this 712-bed general medical and surgical hospital, the Veterans Administration Hospital, Oakland, Calif., between Jan. 1, 1950, and April 30, 1955. There were 53 such patients. We were able to obtain follow-up information on 51 men, who comprised the number in this study.

The method of investigation consisted of two parts: a review of the hospital records and a follow-up survey. Clinical, physical medicine and rehabilitation, and social work service records were examined concerning pertinent areas which were uniformly reported. A schedule was prepared and a follow-up survey was carried out through social work service. An essential part of this was a personal interview with each ex-patient as a means of making observations and of getting first-hand information.

Hospitalization Data

Background Information.—All 51 amputees were males. Sixteen were between the ages of 55 and 59.9 years, 22 between 60 and 64.9, and 13 over 65 (one man was 82). The mean age was 63.1; the median age was 62.0 years. Three-fourths of these patients were under 65 years of age. Information concerning marital status and mode of living prior to admission to the hospital is combined in table 1.

Table 1.—Marital Status and Mode of Living of Patients
Prior to Admission to VA Hospital

Mode of Living	Patients		Married	Single	Divorced	Widowed
	No.	%				
With own family	24	47.1	24	—	—	—
By self	15	29.4	—	9	4	2
Domiciliary setting	6	11.8	2	—	3	1
With relative	5	9.8	—	3	1	1
Other hospital	1	1.9	—	—	—	1
Total	51	100.0	26	12	8	5

One-half of the patients were married. All but two of these had been living at home. One had been at a state veterans home; the other, who had been in a Veterans Administration domiciliary, became ill when on holiday leave to visit relatives and was admitted to the hospital. Twenty-five patients were single, divorced, or widowed, and for them there was a diversified pattern in mode of living. Fifteen had lived by themselves in an apartment, room, hotel, or cabin; five had been residing with a relative; four were transferred for hospital treatment from a state veterans home; and one was transferred from another hospital after a cardiovascular accident.

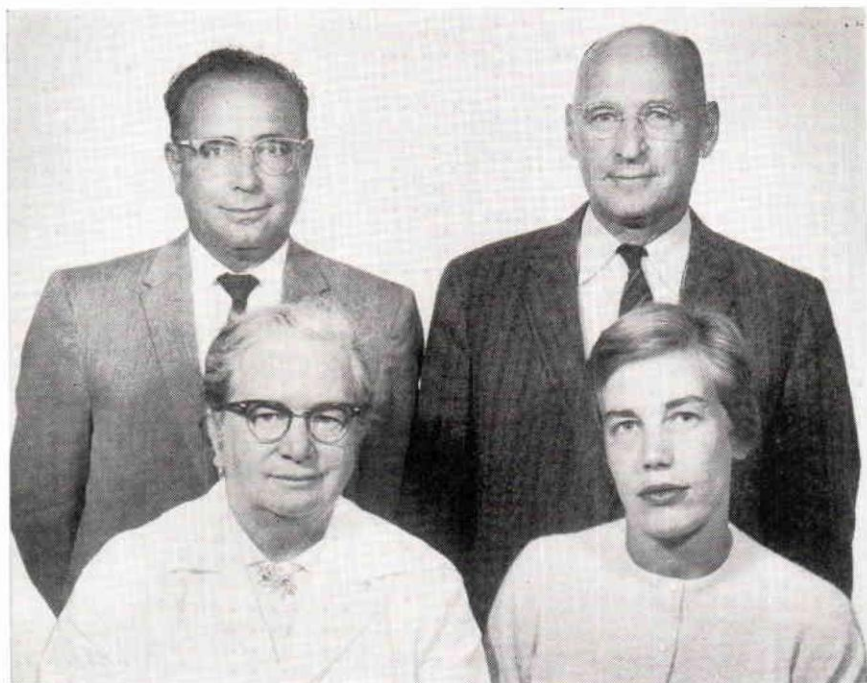
Ten of these 51 patients who were under the age of 65 were reported to have been employed prior to admission. Of those patients over that age, none was reported to have worked for some time. This employment picture appeared to be related primarily to conditions in the labor market affecting older workers and to the high incidence in this group of chronic illness which imposed limitations on occupational activity.

Major Pathological Condition and Reason for Amputation.—A characteristic of this group was the prevalence of multiple diagnoses. The major pathological condition was arteriosclerotic cardiovascular disease in 23, general arteriosclerosis in 10, diabetes mellitus with arteriosclerosis obliterans in 5, embolism and/or thrombosis in 5, traumatic fracture in 2, chronic osteomyelitis in 2, carcinoma in 2, thromboangiitis obliterans in 1, and traumatic arthritis in 1. The predominant major illness was arteriosclerotic cardiovascular disease, which occurred in 45.1% of the total number of patients. Those with some type of major arteriosclerotic involvement numbered 38 (74.5%) of the patients studied.

A trend in connection with age appeared when compared with diagnostic groupings. Of the 38 patients suffering from a major arteriosclerotic involvement, 78.9% were 60 years of age or older. For the 13 having other major pathological conditions, 61.5% were under 60.

By far the most frequent complication which was the reason for performing an amputation was that of gangrene. This occurred in 37, or 72.5%, of the cases. There were four instances of osteomyelitis; three each of ulcer and embolism; and one each of vascular insufficiency, nonunion old fracture, purulent drainage, and epidermoid carcinoma.

Fifteen patients had sympathetic blocks, 4 of them having had more than one block; 17 patients had sympathectomies, of whom 5 had bilateral sympathectomies. Six of the above 32 had both a sympathetic block and a sympathectomy. In spite of these therapeutic surgical interventions to improve circulation, it was still necessary to perform an amputation at a later date on all of these patients.



Reading from left to right back row: Arthur A. Buckley, Rehabilitation Coordinator, PM&R; Howard F. Palmer, Chief, Social Service. Reading from left to right in front row: Carrie E. Chapman, M.D., Chief, PM&R Service; Dorothy Bell, Social Service Worker.

Site of Amputation.—The site of amputation was above the right knee in 24, above the left knee in 14, bilateral in 10, upper part of the left arm in 2, and below the left knee in 1. There was a preponderance of amputations above the knee on the right side. It was thought that one factor affecting this might be poor sitting posture, namely, with the leg on the dominant side being crossed more often.

Of the 10 bilateral amputees, 9 had a major arteriosclerotic involvement. Two had double above-knee amputations while hospitalized, and eight had had previous amputations. For these eight, the time intervening between the two surgical procedures tended to fall into two patterns; for five the interval was from 12 to 24 months, and for three it was between 56 and 62 months. The resulting situation was that, of the 10 bilateral amputees, 6 had both amputations above the knee and 4 had one above-knee and one below-knee amputation. The high incidence of amputations above the knee, whether unilateral or bilateral, posed a greater problem in terms of rehabilitation and ambulation training.

Deaths in the Hospital.—Four of the 51 patients died in the hospital. All had suffered from arteriosclerotic cardiovascular disease. Their ages were 63, 68, 71, and 78, all being older than the average age for the total group. There were, then, 47 amputee patients who were discharged from the hospital.

Patients Receiving Prosthetic Appliances.—The decision as to whether or not a patient was going to be issued a permanent prosthesis was based primarily on a careful medical appraisal of the nature and extent of the patient's illness or injury in relation to his physical and mental capacity to

use a prosthesis and the effect on his functional efficiency in performing activities of daily living outside of the hospital environment.

Such an evaluation required a thorough and comprehensive review of not only all the medical factors involved but also the nonmedical aspects. In this respect, the importance of peripheral vascular tests cannot be overlooked as a base line in evaluating the circulation of the limb or limbs concerned. These tests were significant not only in determining the necessity for amputation but as a follow-up evaluation of the condition of the extremity or extremities under medical and physical therapy treatment.

Of the 47 patients, 26, or 55.3%, were fitted with and trained in the use of prosthetic appliances. This included one arm amputee. For the second arm amputee, the stump was too short for a prosthesis to be feasible. There was variation according to age and major pathological conditions in patients who received prosthetic appliances. Of the patients aged 55 to 59.9 years, 10 received prostheses and 6 did not; of those aged 60 to 64.9, 14 received prostheses and 7 did not; and of those aged 65 and over, 2 received prostheses and 8 did not. Of the 34 patients with a major arteriosclerotic involvement, 15 (44.1%) received prostheses; of the 13 with other major pathological conditions, 11 (84.6%) received prostheses.

Of the 10 bilateral amputees, prostheses were issued to 3. Two were 55 and one was 59 years old. One used a prosthesis which he had, plus crutches. One used an old prosthesis plus a new one and crutches, and the third was issued an above-knee-right and a below-knee-left prosthesis and crutches.

Physical Medicine and Rehabilitation Prosthetic Training Program.—The prosthetic program comprised four phases. Phase 1—bed training—consisted primarily of body positioning, general conditioning, and bedside stump exercises. Phase 2—clinical training—consisted of preambulatory and crutch training, bandaging, and exercises such as mat, general conditioning, and Buerger-Allen exercises. Phase 3—pylon training—consisted of progressive resistive exercises to stump, pylon training, balancing in parallel bars, and continuation of Buerger-Allen exercises, bandaging, and mat exercises as indicated. Phase 4—prosthetic training—consisted of a continuation of all activities of phase 3, when indicated, except that prosthetic training was conducted instead of pylon training. Concurrent with this prosthetic training, the patients participated in an intensive self-care program.

The use of a pylon in ambulation training was one of the most important phases of the amputation program. Generally, about six to eight weeks after surgery a plaster bucket was made of the patient's stump, either above-knee or below-knee. The plaster bucket was then inserted into the leather cuff of the pylon, which could be adjusted to the individual patient's needs.

Pylons have proved advantageous in our program in (a) shrinking and seasoning a stump for preparation of a permanent prosthesis; (b) retraining of the proprioceptive tracts during the shrinking period, thus enabling the patient to build confidence in balance and coordination while ambulating; and (c) eliminating the cost of expensive bucket adjustments which are necessary when preparing a stump during training for a permanent artificial limb.

Social Work Service.—A number of these patients came to the attention of social work service at an early point as the result of personal difficulties connected with hospitalization or impending surgery or because of financial or family difficulties. Because of social, economic, or emotional complica-

TABLE 2.—*Period of Hospitalization of Patients*

	Patients No.	Days Hospitalized Median No.	Days from Amputation to Discharge Median No.
With prosthesis	26	192.5	133.0
Without prosthesis	21	129.0	90.0
Total	47	154.0	112.0

tions, other patients became known later on. Some requests for a social evaluation, as a part of rehabilitative or treatment planning, were made initially and some at a subsequent point in hospitalization. Despite the specific problem presented, the factors of the threat represented by amputation, the imposition of limitations of activity, and concern about the future were reactions with which the patients needed help. In the process of discharge planning, it was necessary to mobilize to the utmost the capacities existing in the patient and his family, including all relatives, and to utilize all available community resources. With a number of these older patients a problem was to counteract their reluctance to leave the hospital. The general pattern was not so much one of continuous activity with the patient but rather that of giving the needed services according to an integrated timing with on-going treatment and rehabilitative planning.

Period of Hospitalization.—There was a wide range in the number of days of hospitalization, varying from 52 days to periods of 573 and 579 days for two patients with resistive bone infections. The mean was 147 days, there being four patients with that period of hospitalization. Because of the two atypical cases, the median, rather than the mean, was computed for each group (table 2). For the total group the median number of days hospitalized was 154.0, and the median interval between the date of amputation and the date of hospital discharge was 112.0 days. It is of interest to note that the difference in number of hospital days from amputation to discharge was only 43 days higher among those who had received prostheses than those who had not.

Capacity for Self-care and Ambulation.—At the time of leaving the hospital 32 of the 47, or 68.1%, were completely able to care for their personal needs, while 15 needed partial assistance. Since the capacity to ambulate was not involved for the two arm amputees, the number reviewed here is 45. The categories used were based on the prevalent or customary way of getting around.

Twenty-five leg amputees had been fitted with prostheses. One ambulated with the prosthesis alone, 10 with the prosthesis plus a cane, and 13 with the prosthesis plus crutches. One 71-year-old man, who was insistent that he be given a prosthesis, was able to use it only part of the time with the aid of crutches, but he actually depended on crutches to get about, and was so classified. Six ambulated with crutches alone. Fifteen got about in a wheel chair, seven of them being the bilateral amputees for whom prosthetic appliances were not believed to be advisable. All of these patients were given intensive self-care training so as to be functional in a wheel chair.

Posthospital Living Arrangements.—Of the 47 patients who were discharged, 21 of the 24 married men returned to live with their own family. Six single, three divorced, and one widowed went to live by themselves in an apartment, room, hotel, cabin, or a place where they had room and board. This mode of living had been their pattern in the past and was one which they preferred to try again on leaving the hospital. Of the eight who went to a domiciliary setting or state veterans home (three of whom were married, one single, two divorced, and two widowed), five had been transferred from there, and this was the most feasible discharge plan for an additional three. Of the seven who went to live with relatives (four of whom were single and three divorced), three went to a sister, two to a daughter, one to a son, and one to his wife's mother. One single man was transferred to a county hospital for care of chronic conditions.

When the mode of living prior to admission was compared with that at the time of discharge, it was found that the percentage of those in their own home remained about the same. There was a drop in the number of those living by themselves and an increase for those going to a domiciliary setting or to live with a relative.

Follow-up Data and Survey

Mortality Data.—On completion of the follow-up survey, it was found that, of the 47 patients who had been discharged from the hospital, 15 had died. These, added to the 4 who had died in the hospital, totaled 19, or 37.3%, of the original 51 patients in the study.

TABLE 3.—*Major Pathological Condition of Patients Who Died*

Major Diagnosis	Total	Died	
		No.	%
Diabetes mellitus with arteriosclerosis obliterans	5	3	60.0
Arteriosclerotic cardiovascular disease	23	12	52.2
General arteriosclerosis	10	2	20.0
Embolism and/or thrombosis	5	1	20.0
All other	8	1	12.5
Total	51	19	37.3

Of the 15 who died after having been discharged, 9 had been readmitted to this hospital for a total of 21 times, usually for treatment of the same conditions or for complications connected with them. In four instances a stump revision was necessary. For one patient with general arteriosclerosis the amputation of the other leg had to be done within six months. Some of the patients died in this hospital, but a number did not; therefore, we do not have uniform data as to the specific cause of death.

A correlation between major pathological condition and mortality trend appears in table 3. The mortality trend was considerably greater for those in whom arteriosclerotic involvement was complicated by a diabetic or a cardiovascular condition. It was the same for those having general arteriosclerosis and those with embolism and/or thrombosis and was much less for those with other diagnoses.

The mortality trend according to unilateral and bilateral amputees and in regard to those having and those not having prostheses is given in table 4. The intervening time for the total number who died after leaving the hospital ranged from 14 to 45 months, with an average of 27.9 months, or well over two years. The average for the bilateral amputees was slightly higher than for those with one leg amputed.

Of the total, four had prostheses when they left the hospital. Subsequently one unilateral and one bilateral amputee had been fitted with a prosthesis. For another patient, the amputation of the remaining leg had been necessary and an additional prosthetic appliance had been prescribed. Thus, the total having prostheses became six; these lived from 24 to 45 months, or an average of over three years. The nine who had no prostheses lived from 14 to 35 months, with an average of less than two years.

As to age, the average time out of the hospital for the 15 amputees who later died was 32.0 months for six in the 55-to-59.9-year age group, 28.2 months for the five in the 60-to-64.9-year age group, and 21.5 months for the four who were 65 years of age or older.

Method of Survey.—Of the patients discharged, 32, or 68.1%, were interviewed by a social worker at their place of residence. In this way the items in the survey schedule were covered and an opportunity was provided for direct observation. These contacts were usually made without prior notification to the ex-patient. Twenty who lived within the geographical area around the hospital were seen by one of us (D. M. B.). Nine who were living in different parts of the state and three who were in other states were interviewed by social workers from various Veterans Administration regional offices. In nearly all instances, these former patients felt that the visit was an indication of interest in how they were doing and they were quite willing to discuss their situation.

Period Between Hospital Discharge and Follow-up Interview.—One of the criteria for selection of this group was that each patient be out of the hospital at least one year by the time of the follow-up survey in 1956. The actual interval between hospitalization and follow-up ranged from 14 to 72 months, with the frequency distribution being fairly even. The mean was 39.4 months and the median 36.0 months.

Physical Status.—Considering the age of these amputees and the prevalence of degenerative disorders, it was not surprising that 20 of the 32 had been rehospitalized here or elsewhere. Seven, including three who had been rehospitalized, had received treatment from a private physician, and one had been treated at a county hospital. Of the 20 who were rehospitalized, 9 experienced difficulty with the stump, 5 had a stump revision, 2 reported continuance of phantom pain, and 3 (all of whom had arteriosclerotic cardiovascular disease) required an above-knee amputation of the other leg within 11, 14, and 24 months respectively. Of the total of those in the follow-up survey and those who died after having left the hospital, nine, or 19.1%, had to have a stump revision, and for four, or 8.5%, the amputation of the other leg became necessary.

Inasmuch as the individual's feeling about his physical condition played an important part in his general attitude and adjustment, this point was covered with each amputee. Fourteen reported their conditions were good, 13 fair, and 5 poor. These subjective reactions appeared to be related not only to presence of symptoms or of discomfort and the recency of having received treatment but also to their ability to ambulate or to move about and to their capacity for caring for their personal needs.

TABLE 4.—Number of Months Between Hospital Discharge and Death of Fifteen Patients

Site of Amputation	Patients No.	Months Intervening
		Av. No.
Unilateral—above knee	9	26.2
With prosthesis	3	33.3
No prosthesis	6	22.7
Bilateral—above knee	6	30.5
With prosthesis	3	42.3
No prosthesis	3	18.7
Total	15	27.9
With prosthesis	6	37.8
No prosthesis	9	21.3

It was interesting to note that only four of the amputees were still protesting the loss of a limb. The others had, in varying degrees, and better for the unilateral than the bilateral amputees, come to a psychological acceptance of the loss of their limb or limbs. One man, an obviously poor candidate for a prosthesis, was resentful because he had not been given one. There seemed to be the possibility that his feeling was related to others having been issued prosthetic appliances in the domiciliary where he was living. Three former patients expressed the reaction that their hospitalization had not included sufficient treatment or had not been long enough. On checking the records, however, it was found that considerable effort had been expended in their treatment, that they had all been trained in the use of their prostheses, and that they had all been hospitalized much longer than the average.

TABLE 5.—Mode of Living and Marital Status of Amputees at Time of Follow-up

Mode of Living	Patients		Married	Single	Divorced	Widowed
	No.	%				
With own family.....	14	43.8	14	—	—	—
With a relative.....	6	18.7	1	3	1	1
By self	4	12.5	—	2	2	—
Domiciliary setting	4	12.5	—	—	2	2
Other hospital	4	12.5	2	1	1	—
Total	32	100.0	17	6	6	3

Ability for Self-care.—The ability for self-care at the time of follow-up compared with that at time of leaving the hospital was as follows: There was a drop in the number of those who were capable of taking care of their own needs (from 24 patients to 19), a slight increase among those requiring partial assistance (from 8 patients to 9), and a definite increase for those needing full-time care (from no patients to 4). Of the four in the last category, one was a bed patient at home, and three were in the hospital unit at a state veterans home.

With age and physical limitations, there appeared to be a decrease in capacity for self-care and an increase in the need for arrangements where more care or supervision could be provided. This observation was reflected also in the material in the next section.

Mode of Living and Marital Status.—Table 5 shows data on the mode of living of the amputees at the time of follow-up. Of the 17 married men, 14 were living with their families, 1 was with a relative, and 2 were hospitalized at a state veterans home. Of the 15 who were either single, divorced, or

widowed, 5 were living with a relative, 4 were living independently, 3 were residing at a state veterans home, one was at a Veterans Administration domiciliary, and 2 were hospitalized at a state veterans home.

A comparison of percentages as to the mode of living at the time of admission, at the time of hospital discharge, and subsequently at the time of follow-up revealed the following trends: The number of those living with their own family remained the most constant, with only a small decrease in the percentage; there was a marked drop in the number of those living alone and an increase for those in a domiciliary setting. Twice the number were living with a relative, while there was a noticeable increase in number of those in another hospital.

Only 6 of the 32 amputees had made shifts in living arrangements between the time of hospital discharge and follow-up. Two had merely moved from the home of one relative to that of another. Four had been living alone; of these, two had moved to the home of a relative and one had gone to a Veterans Administration domiciliary and one to a state veterans home. This relative lack of mobility may be partially explained by the age and physical disability of this population. It also indicated that the plan at the time of leaving the hospital, if suitably made, was likely to be the continuing living arrangement for a person in a group such as this.

Vocational and Financial Situation.—One amputee was gainfully employed full time at reconditioning valves in his own shop. Three others were working part time; one did repair work and saw-filing in his workshop at home, one supported himself and his wife by operating a concession in an amusement park, and the third operated a lodge in the hills where he lived during the hunting season. All four men were between 61 and 66 years old, all had an above-knee amputation of the right leg, and all had been fitted with prostheses. They had been out of the hospital for 14, 26, 36, and 62 months respectively. They all expressed the opinion that having a prosthesis was most helpful in enabling them to pursue a vocational activity. Their general attitude was observed to be very good.

Financially, it was found that two men were fully self-supporting. Another received Social Security and Old Age Assistance benefits. The remaining 29 were in receipt of Veterans Administration benefits. For 14 of these, this was their sole source of income. This income for the other 15 was supplemented by Social Security or retirement benefits, by the wife working in five instances, by part-time work for two, and by Old Age Assistance for one. Of the 32 amputees, 6 who were married and 4 of the others reported having a difficult time financially. Twenty-two stated that they were managing adequately.

Recreational Activities.—The recreational activities of this group seemed to be influenced by the individual's capacity to move about, his attitude toward his physical condition, and his living situation. An examination of the changes in recreational patterns was not possible inasmuch as there was little information available regarding recreational activities prior to the amputation. Our observations will be limited to the activities in which these amputees were engaging when they were interviewed for this study.

Recreational activities were classified as active or passive. Active recreation included gardening, walking, hiking, fishing, dancing, bowling, or such creative hobbies as wood carving or metal work. The passive forms of recreation were reading, listening to music, watching television, attending motion pictures, or card playing.

Thirteen amputees engaged in active types of recreation (this of course, did not exclude passive recreation), while 19 were interested only in

passive amusements. Of those who engaged in active recreation, 10 had prostheses and 3 did not. It appeared that a family living situation was more conducive to active recreational activities.

TABLE 6.—*Mode of Ambulation*

Mode	When Leaving Hospital			At Follow-up		
	Total No. of Patients	Unilateral	Bilateral	Total No. of Patients	Unilateral	Bilateral
Prosthesis alone or plus aid	19	17	2	15	14	1
Crutches alone	4	4	—	4	4	—
Wheel chair	7	4	3	9	4	5
Bed patient	—	—	—	2	—	2
Total	30	25	5	30	22	8

Ability to Ambulate or to Move About.—The capacity to ambulate did not affect the two arm amputees; therefore, the number considered in this section will be the 30 leg amputees. At the time they left the hospital there were 24 above-knee, 1 below-knee unilateral, and 5 bilateral amputees. Between that time and the follow-up interview, it had become necessary to remove the other leg for three above-knee amputees, which increased the number of bilateral amputees to eight. In addition, 21 amputees in the follow-up survey had been fitted with prostheses while hospitalized, but afterward two others obtained prostheses, making a total of 23 by the time of follow-up.

Considering the changes mentioned above, comparative data in table 6 regarding typical mode of getting about are based on both that at the time of leaving the hospital and that at the time of follow-up. There were no over-all changes among the unilateral amputees in regard to mode of getting about except for three who had required the amputation of the other leg. Of the eight bilateral amputees, however, only one (who had an above-knee and Symes amputation) was able to ambulate adequately, whereas five were confined to a wheel chair and two had become bed patients.

Next, the mode of moving about was examined more specifically, and the extent of ability to get about was appraised (table 7). At the time of leaving the hospital only one amputee had been able to ambulate with his prosthesis alone. At the time of follow-up this was true for eight, who could go as far as they wished or walk for moderate distances. The seven

TABLE 7.—*Ability to Move About*

Mode	Total No. of Patients	As Much as Desired	Moderate Distances	Around Quarters Only	Not at All
Prosthesis alone	8	5	3	—	—
Prosthesis plus cane	4	2	2	—	—
Prosthesis plus crutches	3	1	—	2	—
Crutches alone	5	1	1	3	—
Wheel chair	8	—	1	7	—
Bed patient	2	—	—	—	2
Total	30	9	7	12	2

who ambulated with their prostheses plus a cane or crutches did equally well, except for two who were restricted to moving about their quarters. Of the 13 who got about on crutches or in a wheel chair, 10 moved about their quarters only, and two had become bed patients.

Extent of Use of Prosthesis.—Of the 32 amputees, 24, or 75%, had received prostheses by the time of the follow-up interview (table 8). This

number included one arm amputee who used his prosthesis some each day but who tended to do most things with his uninvolved arm. Thirteen, or 54.2%, were using their prosthetic appliances regularly and consistently, and 3 used theirs some each day, but not as extensively as the 13.

That a certain amount of complications for a group of this age could be anticipated was borne out by their experiences. Nine reported pain, swelling, dermatitis, or other trouble with their stumps; two had a continuation of phantom pain; and five required stump revisions. Twelve, or one-half, reported having mechanical trouble or difficulty with the fit of the prosthesis. Most had had theirs repaired; two had been issued new prostheses.

TABLE 8.—*Extent of Use of Prosthesis*

Extent	Total No. of Patients	Unilateral Prosthesis	Bilateral Prosthesis
Regularly and consistently.....	13	12	1
Some each day.....	3	3	—
Infrequently	2	2	—
Not at all	6	5	1
Total	24	22	2

It appeared, however, that such physical or mechanical complications did not wholly explain the individual's adjustment to and use of the prosthesis. Psychological factors affecting attitude and motivation seemed to be operating to various degrees. Difficulty with stumps or prosthetic appliances did not appear to assume as much significance for those who used theirs consistently as it did for some of the others. For example, the three men who used their prostheses some each day were reported as being bored and inactive, afraid because of several falls, and complaining and seeking sympathy. Of the two who used their appliance only infrequently, one was reported to have "given up." His wife stated that he used his appliance very little because he "was afraid" and "had no nerve." The other man tended to project all blame for his situation outside himself and doubted if he "could do anything about it." This aspect also appeared to be operating with two of the amputees who were not using their prostheses at all.

Of the six men who were not using their prosthetic appliances at all, two, aged 62 and 71, both with arteriosclerotic cardiovascular disease, had within 11 and 14 months had an amputation of the other leg and had been confined to a wheel chair. Two other men, one aged 55 who had arteriosclerotic cardiovascular disease and one aged 59 who had diabetes mellitus with arteriosclerosis obliterans, had had cerebral accidents and were wheel-chair patients.

The remaining two had discarded their prostheses. One, a 60-year-old single man and an alcoholic, was living on skid row and getting about on crutches. The other, a 65-year-old single man who was living with a relative, depended on crutches and had never tried to use his prosthesis. He said that he felt he was "about to die" and that he "did not care anymore."

Thus, it was found that, of the 24 amputees who had prostheses, 16, or 66.6%, used theirs regularly or some each day. Four, or 16.7%, had been forced to discontinue the use of theirs because of another amputation or because of a stroke. Four, or 16.7%, used their prosthetic appliances only infrequently or had discarded them.

General Attitude.—Based on the various aspects which have been discussed and on statements made by the 32 amputees interviewed, a composite evaluation showed the general attitude was good for 13, fair for 12, and poor for 7. The majority of those whose attitude was good were found to be experiencing less physical discomfort or symptomatology, caring for their own personal needs, living with their own family or with a relative, engaging in a more active type of recreation, and capable of ambulating in a satisfactory manner. To the extent that negative changes occurred in physical condition, mode of living, ability to get about, and restrictions in activities, the attitude tended to become fair and in a few instances poor.

SUMMARY

A study, based on a review of hospital records and on a follow-up survey, was made on 51 amputee patients who at the time of amputation were 55 years of age or older. There was a prevalence of chronic conditions and of multiple diagnoses. The most frequent complication necessitating an amputation was gangrene for slightly under two-thirds of these amputees. After a careful evaluation, including physical condition, age, and personal and socioeconomic factors, 26 of 47 patients were fitted with prosthetic appliances while hospitalized.

Data relative to physical status at the time of leaving the hospital compared with those at the time of follow-up revealed a considerably shifting picture. For example, evidence obtained concerning those who had died indicated that a fairly large number had required further medical care, had had trouble with stumps, or had had difficulty with prosthetic appliances. Nineteen patients (37.3%) had died, 4 during the period of hospitalization when the amputation was performed and 15 after having been discharged. There was a higher incidence of mortality for those whose arteriosclerotic involvement was complicated by a diabetic condition or by cardiovascular disease.

In the follow-up survey, 32 (62.7%) former amputee patients were interviewed at their places of residence. The time intervening since the termination of hospitalization ranged from 14 to 72 months. Four men who had been fitted with prostheses were gainfully employed. In all, 22 were managing financially, usually with the assistance of various benefits.

The number of amputees living with their own family remained the most constant, twice as many were living with relatives. There was a marked drop in the number living by themselves and an increase for those in a domiciliary setting or hospital. Nineteen men were completely self-caring, nine required partial assistance, and four needed full-time care. Thirteen engaged in active and 19 in passive type of recreation.

Twenty-four of the 32 men had, by the time of the follow-up survey, been fitted with prosthetic appliances. Of these, two-thirds were using their prostheses regularly and for part of each day, one-sixth had become unable to use theirs, and one-sixth preferred not to use theirs.

Favorable morale or general attitude appeared to be related to less extensive changes regarding physical condition, mode of living, ability to ambulate, and restrictions on activities. It is believed that it was worthwhile to have given these older amputees the benefit of the use of prostheses with assistive devices in order to help them remain more functional in their self-care, ambulation, general activity, and posthospital adjustment.

Virginia Bowman, medical record librarian, assisted with identification of cases and entering of initial data on work sheets for amputee patients in this study.

KNEE SPECIFICATIONS CORRECTED

Editor's Note: Mechanical difficulties resulted in a transposition of text on pages 76-79 of the September Journal. The correct order is given here:

THE VARI-GAIT-V100 KNEE UNIT

Nomenclature: Vari-Gait—V100

Functional Code: S-4-RB-RFE

Source of Supply: Fillauer Surgical Supplies (German Import)
930 East Third Street, Chattanooga 1, Tenn.

General Description: Basically willow wood construction, 18½" overall length.

Functional Description:

1. *Swing Phase:*

- a. *Swing Control (friction):* Adjustment screw *E* (Figure 1) forces brake shoe lining *C* to engage fibre braking surface *B* of knee. The eccentric contour of the knee provides variable mechanical friction through the swing phase.
- b. & c. *Extension Bias and Resistance to Flexion (excessive heel rise):* Wire yoke (stick type) linkage engages two (2) rubber bumpers; bumper *H* resists excessive flexion and aids extension bias bumper *G*.
- d. *Terminal Deceleration or Impact Control:* Elastic terminal deceleration strap *I* is attached to wire yoke *F* damping full knee extension. Terminal deceleration is also provided by eccentric contour of fibre braking surface *B*. Rubber bumper *J* engages metal knee stop providing a cushion against terminal impact.

2. *Stance Phase:*

- a. *Weight Bearing Brake:* Dual compression springs *A* permit knee assembly to drop engaging fibre braking surface of knee *B* with brake shoe *C* of shank. Brake adjustment bolt *D* has dual eccentric surfaces acting against compression spring *A* controlling space between *B* and *C*.

Description of Sub-Assemblies:

1. *Knee Section:*

- a. *Width (Bolt):* Various sizes, depending on calf measurement.
- b. *Length:* 5" from top to knee center.
- c. *External Contour and Top Diameter:* Partially shaped, top diameter 6".
- d. *Internal Contour:* 3" depth, 3" diameter.
- e. *Bushing:* Phenolic bushing (2 halves) in a two-piece plastic housing.
- f. *Friction:*

1. *Swing Phase:* Adjustment for terminal deceleration.

2. *Stance Phase:* Contoured fibre knee surface mates with balata belt brake shoe to provide weight bearing brake.

Remarks: Three-piece laminated willow wood knee section.

2. *Shank Section:*

- a. *Length:* 14" from base to knee center.
- b. *External Contour and Base Diameter:* Partially shaped, 3¼" x 2¾" oval shape.
- c. *Internal Contour:* Hollow (finished).

Remarks: Transverse hardwood dowel serves as platform for extension bias mechanism. Transverse metal rod serves as anchorage point for elastic strap.

3. *Side Straps:*

- a. *Material:* Flat Bar — Carbon Steel.
- b. *Bar Size and Shape:* 5" long modified "T" bar.
- c. *Joint Head Size:* 31/32" o.d., 7/32" thick.

Remarks: Joint heads plated — Permanently attached.

4. *Knee Control Assembly:*

- a. *Knee Bolt:* Carbon steel, hollow bolt, 5/8" o.d., external thread on medial side, internal thread on lateral side for lock screw.
- b. *Bearing and/or Housing:* Two section plastic knee bolt bearings (floating, spring loaded) functioning within two-piece plastic bushings.
- c. *Linkage Mechanisms:* Carbon steel 5/32" o.d. wire frame forms two guide rod ends. Two rubber bumpers are installed on guide rod ends to provide extension bias and knee flexion control.

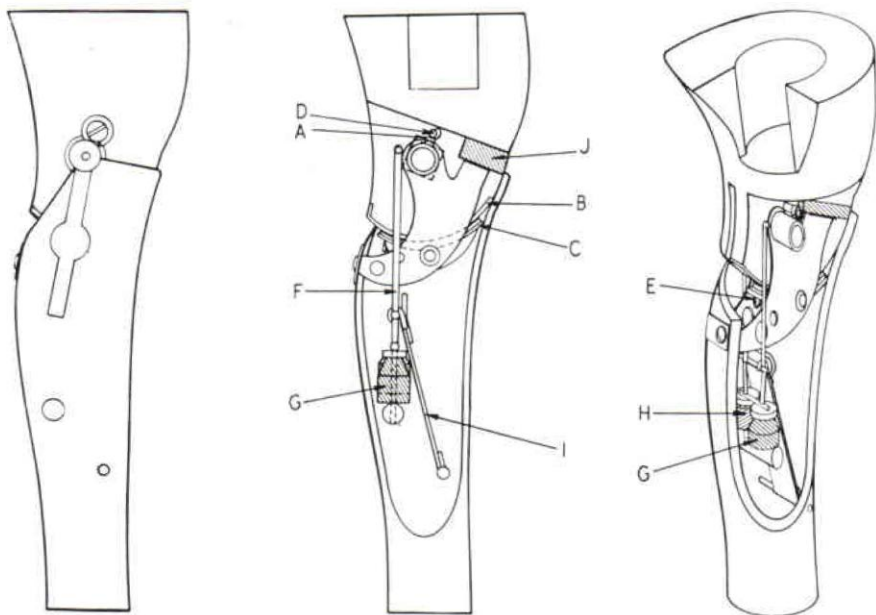


Fig. 1—Schematic Drawings of the Vari-Gait V100 Knee.

d. **Elastic Resistors:** An elastic strap is attached to the wire frame to permit terminal deceleration. Two springs located in the plastic bushings are adjusted by a cam rod to control the amount of knee bolt excursion. Weight applied to knee section depresses springs and allows contoured fibre surface to engage brake shoe to provide weight-bearing brake.

e. **Hydraulic:** None.

Remarks: Cam rod has a graduated screw adjustment indicator (for springs).

5. **Knee Stop Control and/or Terminal Deceleration:**

a. **Stick:** None.

b. **Rubber or Felt:** Rubber on knee section engages with metal knee stop control.

c. **Straps or Cord:** None.

d. **Metal Knee Control:** Carbon steel sheet metal provides pivoted attachment for brake shoe.

Remarks: Brake shoe has screw type adjustment to control terminal deceleration.

Special Considerations:

1. **Physical Dimensions:**

a. Supplied in rights and lefts, can be ordered in various knee widths (widths determined by circumferential calf measurements).

b. Components and parts are dimensioned in metric system.

2. **Functional Controls:**

a. All controls provided are contained within the unit.

3. **Adaptability:**

a. This unit can be used in conjunction with most foot-ankle units currently available.

b. Will accommodate A/K stumps to within approximately 2" of knee center.

c. Can be used with A/K adjustable leg and alignment duplication jig.

THE OTTO BOCK SAFETY KNEE UNIT

Nomenclature: Otto Bock Safety Knee

Functional Code: S-4-RFB-RFE

Source of Supply: Otto Bock Orthopedic Industry, Inc. (German Import)
219 Fourteenth Ave., N., Minneapolis 11, Minn.

General Description: Basically willow wood construction, 18" overall length.

Functional Description:

1. *Swing Phase:*

- a. *Swing Control (friction):* Slotted bolt *F* (Figure 2) expanded in plastic knee bolt bushing by internal cap screw provides adjustable mechanical friction which is constant through the swing phase.
- b. *Extension Bias:* Plastic yoke (stick type) *G* engages plastic spring compressor *H*. Compression of spring *I* provides extension bias.
- c. *Resistance to Flexion (Excessive heel rise):* Combination of paragraphs *a* and *b* provide resistance to flexion.
- d. *Terminal Deceleration or Impact Control:* Rubber bumpers *J* and *K* provide cushion against terminal impact.

2. *Stance Phase:*

- a. *Weight Bearing Brake:* Compression of spring "A" permits knee assembly to drop, engaging braking groove *B* (in knee section) with braking segment *C* of shank. Pivot bolt *D* permits vertical movement of (floating) knee section; adjustment pin *E* governs space between *B* and *C*.

Description of Sub-Assemblies:

1. *Knee Section:*

- a. *Width (Bolt):* 3½".
- b. *Length* Approximately 5" from top to knee center.
- c. *External Contour and Top Diameter:* Partially shaped, top diameter 6".
- d. *Internal Contour:* 3" depth, 2½" diameter.
- e. *Bushing:* Plastic knee bushing (2 piece).
- f. *Friction:*
 1. *Swing Phase:* Internal type of Knee Bolt Expansion.
 2. *Stance Phase:* Female braking groove (hardwood) mates with hardwood male member (plastic lined).

Remarks:

2. *Shank Section:*

- a. *Length:* 13" from base to knee center.
- b. *External Contour:* Partially shaped, 3¼" x 3" oval base. Available in calf circumference of 30, 32, 34, 36, 38, 40 centimeters.
- c. *Internal Contour:* Hollow (finished).

Remarks: Male component of hardwood braking segment engages with female component of knee segment to provide weight bearing brake.

3. *Side Straps:*

- a. *Material:* Flat Bar — Carbon Steel.
- b. *Bar Size and Shape:* 5" long modified flat "T" bar.
- c. *Joint Head Size:* 29/32 diameter x ¼" head.
Remarks: Joint heads plated — Permanently attached.

4. *Knee Control Assembly:*

- a. *Knee Bolt:* Slotted carbon steel expansion bolt ⅝" o.d., external thread (for side strap). Internal thread left hand for lock screw (bolt). Internal thread for expansion cap screw (friction).
- b. *bearing and/or Housing:* Full plastic bearing (two-piece) with (plastic) swing lever and carbon steel bolt, mounted in phenolic bearing. Plastic axis bearing, spring loaded.

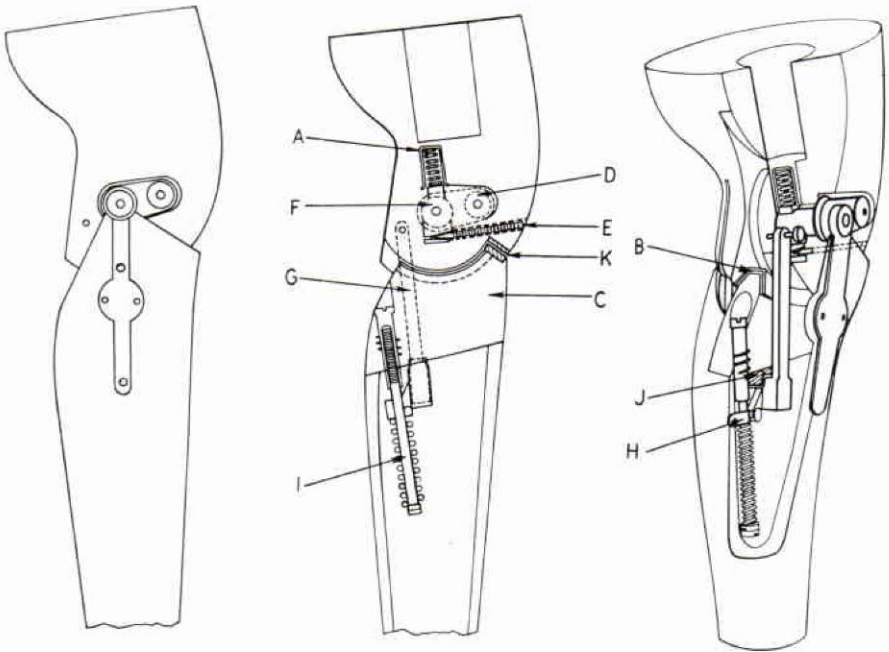


Fig. 2—Schematic Drawings of the Otto Bock Safety Knee.

- c. Linkage Mechanisms: Plastic covered carbon steel linkage with plastic yoke to compress extension bias spring; a 3/16" carbon steel linkage (bearing) bolt is secured by two round nuts. Plastic covered carbon steel guide bolt with threaded end to provide spring adjustment.
 - d. Elastic Resistors: Extension bias control mechanism having a compression spring with plastic T bar. Rubber cushion rings for plastic (axis bearing) mountings.
 - e. Hydraulic: None.
5. *Knee Stop Control and/or Terminal Deceleration:*
- a. Stick: None.
 - b. Rubber or Felt: Rubber inserts in knee and shank sections.
 - c. Straps or Cord: None.
 - d. Metal Knee Control: None.
- Remarks: Lower shank section rubber stop engages knee section rubber stop to cushion terminal impact.

Special Considerations:

1. *Physical Dimensions:*
 - a. Supplied in rights and lefts, can be ordered in knee width size 3 1/2" and calf sizes 30, 32, 34, 36, 38, 40 centimeters.
 - b. Parts and components are dimensioned in metric system.
2. *Functional Controls:*

All controls provided are contained within the unit.
3. *Adaptability:*
 - a. This unit can be used in conjunction with most foot-ankle units currently available.
 - b. Will accommodate A/K stumps to within approximately 2" of knee center.
 - c. Can be used with A/K adjustable leg and alignment duplication jig.



Mr. Leavy with the Cessna Plane Which He Flies throughout the Country.

FLYING WITHOUT HANDS

By BILL E. BURK

Editor's Note: We are indebted to the *AOPA Pilot*, for permission to reprint this interesting story about Jerry Leavy. It originally appeared in the July 1959 issue of the *Pilot*, the organ of the Aircraft Owners and Pilots Association. Mr. Burk, the author, is Aviation Editor of the Memphis, Tennessee Press-Scimitar Newspaper. He is a private pilot and met Jerry Leavy when the latter flew into the Memphis Airport in his own plane.

There was nothing different about the way this Cessna 182 circled Memphis Municipal Airport.

It entered the traffic pattern at 1,000 feet. It made a smooth glide on final approach. Just before touching down, the pilot lifted the nose skyward and the plane greased in for a smooth landing. The pilot taxied on to the Dixie Air Associates hangar at the southwest corner of the field and was guided to the tie-down area by an attendant.

Once stopped, the pilot—a trim young businessman in a brown sport coat and brown slacks, white shirt and bow tie—nonchalantly gave orders for servicing the plane. He reached into the cabin of the plane and picked up a briefcase, then walked away to catch the airport limousine into town—fresh and ready for a day of business.

He looked no different than any of the hundreds of other businessmen who fly their own planes into Memphis, except for one thing—he had no hands.

The pilot was Jerry D. Leavy, 32, (AOPA 130948) of Santa Clara, Calif., vice president and traveling representative of A. J. Hosmer Corporation, manufacturers of artificial arms, hooks, wrist units and elbows. Leavy

is a wonderful walking advertisement for their business because he has artificial arms. He uses steel hooks for hands. Persons who have seen him fly attest to the fact that he isn't handicapped when it comes to controlling an airplane.

600 Hours in the Air

A veteran of more than 600 hours in the air, Leavy has flown coast-to-coast four times. His only restriction was that he once could not fly at night. "But that was removed long ago," he says. In 1958, he flew about 90,000 passenger miles, using airline standards.

Leavy began his flight training under Russell Hill at San Jose, Calif., Municipal Airport about three years ago in an Aeronca *Champ*.

"Hill insisted I learn on a stick," he said. "I argued the point, but he insisted that I learn spins and spin recovery, even though they were no longer a part of the private license test." He was thankful some months later when he went for the check ride. The FAA inspector asked him to put the plane in a spin and recover. Leavy passed hands down.

He soon switched to the Cessna line and the tricycle landing gear "because it was easier to handle." Leavy's own Cessna 182 has only one special attachment, a ring on the throttle to replace the knob. All other equipment is normal and he flies the plane as any unhandicapped person would. He will soon be ready to try for his instrument ticket and, should he pass, plans to try his hand (hooks, if you prefer) at multi-engine flying.

Leavy was born in Columbus, Neb. He fell out of a cherry tree when he was 13 and smashed both arms. Gangrene set in. The left arm had to be amputated below the elbow; the right arm above. He was given artificial arms when he was 14, but couldn't use them well.

Jerry was with the Government nine years doing research in artificial limbs for handicapped people. He continued this work at the University of California at Los Angeles and finally entered the same field in private enterprise.

Leavy finds that flying his own plane is more satisfactory than traveling on commercial airlines. In calling on customers, he doesn't like to be hurried. He doesn't like to have to be at the airport at a certain time to catch a flight. With his own plane, he can stay with a customer as long as he desires and feel relaxed.

He is married and has three children, aged from three to seven. He doesn't think of himself as handicapped—well, not much.

Asked why he took up flying, Leavy said: "I have to call on about 400 wholesale accounts from California to New York. I had been driving the distance. It was too long; too tiring. I found myself fatigued as I went into my sales pitch. Flying seemed the answer."

He was asked if he weren't afraid his hooks would handicap him in a tight situation.

"A plane is only as safe as the man who flies it," Leavy answered. "I fly by the rules, avoid bad weather, and try to make sure that I am safe at all times. I have never been in a spot where my hooks have handicapped me."