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I Project Title: Comparison of Energy Consumption while ambulating of the femoral abduction fitted AK amputee with the femoral adduction fitted AK amputee.

II Objectives: To determine the Influence of Mediolateral Alignment on the Energy Expenditure of Walking in the Unilateral AK amputee.

III Medial Application:

1. Unpublished studies at FAMC indicate standard<sup>ML</sup> alignment of AK prostheses do not provide sufficient mediolateral stability to the amputated femur.
2. Prosthetic adjustments and revised fabrication procedures have been implemented at FAMC.
3. Clinical observations indicate that ambulation for the AK amputee wearing the prosthesis under new fabrication criteria is accomplished easier and with less energy expenditure.
4. Objective data relating to actual energy consumption is necessary to validate these observations.

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#### IV. STATUS

Although the classical ~~course~~ <sup>teaching</sup> in the fabrication, alignment and checkout of above-knee prosthetics offered by the University of California, Los Angeles; Northwestern University and New York University indicate that an adduction position is desirable for the above-knee amputee prosthesis, it has been determined by Mayfield and others, that in fact, using strict criteria and radiographic examination that the desirable position of adduction of the femur is seldom, if ever accomplished by the standard techniques of alignment of the above-knee prosthesis. As a result, at Fitzsimons Army Medical Center, beginning in 1973 and continuing at this time, the comprehensive radiographic examination is performed on all above-knee amputees prior to refitting and after fitting of an above-knee prosthesis. Because no studies on the energy requirements for an above-knee amputee has been performed, each patient who is refitted at Fitzsimons Army Medical Center will require energy consumption studies of ambulation prior to refitting and after fitting of the amputee into the adduction prosthetic position. The modification of a prosthetic fitting has been increasingly advocated by Mr. Ivan Long, CPD, of the Denver area. Clinically, we have found, in following some 70 patients at Fitzsimons Army Medical Center who have been fit in this position, that the subjective energy requirement is considerably less with this new adduction fitting position. In order to further document the efficacy of this modified fitting procedure, documented energy consumption studies are necessary, ~~at this time~~.

#### PLAN AND METHOD

Twenty-five adult patients with above-knee amputations and amputation stumps of sufficient length to be adequately fitted with an above-knee prosthesis, who have worn a standard, fabricated prosthesis for six months

or longer and whose femoral alignment by radiographic evaluation demonstrate relative femoral abduction will constitute the test population for this study. The energy consumption will be measured through gas analysis through the facilities of Dr. Hazlett and the Pulmonary Function Laboratory at Fitzsimons Army Medical Center. The energy consumption, with the patient walking at his standard pace, will be measured over a prescribed distance so that the rate of walking and the distance can be calibrated and compared to similar studies performed after refitting of the prosthesis with the femoral segment in adduction. Each patient will constitute his own control. Following two months of wearing of the prosthesis, which has been rebuilt in the new adducted position, the patient will be re-tested in order to compare the energy consumption after a sufficient period of practice with the new prosthesis.

#### FACILITIES TO BE USED

1. Pulmonary Function Laboratory under the direction of Dr. Hazlett will provide support for gas analysis and energy consumption determinations.
2. The Physical Therapy Clinic will constitute a measured course where the ambulation studies can be conducted.
3. The Prosthetics Services at Fitzsimons Army Medical Center in the Prosthetic Facility of the Orthopedic Service will be used to modify the prostheses in the fashion which is generally maintained for refitting of prostheses at Fitzsimons Army Medical Center.