A Cost Analysis of Continuous Passive Motion versus Physical Therapy After Arthroscopic Release of Elbow Contracture

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INTRODUCTION:
The superiority of continuous passive motion (CPM) in terms of motion restoration and speed of recovery as compared to physical therapy (PT) following arthroscopic contracture release of the elbow has been previously established. However, the cost differences between these interventions remain unknown.

Aim: The purpose of this study was to compare the direct and indirect costs between CPM and physical therapy following arthroscopic release of elbow contracture.

METHODS: A cost-analysis was conducted as part of a randomized controlled study comparing CPM with PT in patients who underwent arthroscopic release of elbow contracture by a single surgeon. A total of 51 patients were randomly assigned to either CPM (n = 24) or PT (n = 27). Costs due to the study treatment consisted of three components: costs of the index procedure, costs of follow-up therapy and costs due to lost wages. Costs of the index procedure for CPM patients consisted of the complete in-hospital stay (3 days) and a brachial plexus block. Index costs for PT patients consisted charges incurred only on the date of surgery, as the procedure was done as a same-day outpatient discharge. Hospital-based facility fees were valued by multiplying the billed charges with department level cost-to-charge ratios based on the Medicare cost reports. Provider services were valued using reimbursement rates based on the Medicare Fee Schedule. Follow-up therapy costs consisted of a six-week period post-surgery. For CPM patients, these costs consisted only of the rental fees for the use of the CPM device. For PT patients these costs included physical therapy sessions along with a one-time cost of an elbow extension orthosis. Costs due to lost wages were based on patient reported impairment of work activities. These data were prospectively collected using the Work Productivity and Activity Impairment (WPAI) Questionnaire every week for the first 6 weeks after surgery. Weekly salaries for all patients were estimated based on the 2020 US median salary based on the US Bureau of Labor Statistics for their self-reported occupations from the WPAI Questionnaire. Recognizing that work impairment would not be equal for all occupations, we sought to investigate potential differences in lost wages based on job type. Patients were stratified into manual labor (n = 23, 9 CPM and 14 PT) and non-manual labor (n = 28, 15 CPM and 13 PT) occupations.

RESULTS: Patients who received CPM had higher total costs ($15,069 vs 9,028) and direct costs ($14,688 vs $9,834) compared to patients who received PT. This difference in direct costs was mainly driven by the room and board costs associated with the in-hospital stay of the CPM patients. When excluding all the in-hospital costs from the CPM group and comparing only the surgical day between the two groups, the direct costs of CPM and PT were similar ($10,664 vs $9,834). In contrast to direct costs, indirect costs were lower in the CPM group than in the PT group. The average wage lost per week over the six-week period is shown for the two study groups in Fig. 1. Across the entire six-week period, the PT group had a greater wage loss than the CPM group ($722 vs 381) suggesting that the CPM group was potentially able to recover wage losses more efficiently than the PT group. This difference in indirect costs was mainly driven by the manual labor patients. Among manual laborers, the PT group took longer to recover their wages (Fig. 2) and had nearly double the total wage loss compared with the CPM group ($1160 vs $590) over the first 6 weeks post-surgery. Among the non-manual laborers, the total wage loss for the CPM group was 256 and 250 for the PT group, which would arguably be the same wage loss for both groups, with a similar temporal trend in wage loss recovery between groups.

DISCUSSION AND CONCLUSION: The use of CPM, using a protocol that includes 3 days of in-hospital stay, is more expensive than PT but results in less loss wages for patients and a faster recovery among manual laborer patients shown by the fact that they were able to recover more of their wages quicker than their PT comparators. This finding indicates that CPM may be best suited for manual laborer patients and further refines the indications of CPM in our practice. Our results also showed that most of the costs differences between CPM and PT are related to the room and board costs as our current CPM protocol includes a 3-day in-hospital stay. Thus, the feasibility and effectiveness of an outpatient CPM protocol after elbow contracture release should be evaluated in further studies aiming to decrease CPM costs.

Figure 1. Average weekly wage lost during the first 6 weeks after surgery for all included patients .

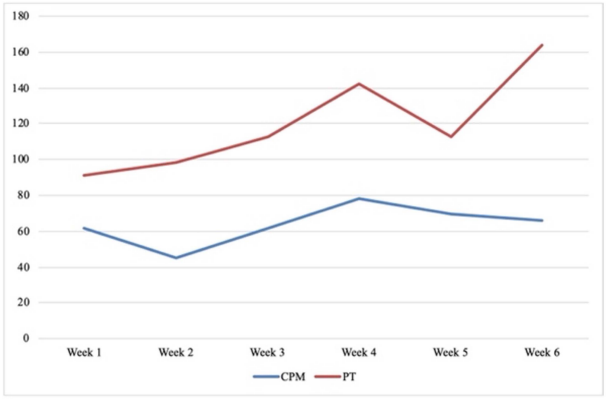

Figure 2. Average weekly wage lost during the first 6 weeks after surgery among manual laborers