

Barriers to Adherence with Post-Operative Hand Therapy Following Surgery for Fracture of the Distal Radius

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Abstract The success of hand surgery relies heavily on post-operative therapy. The ability to identify barriers to patient adherence with therapy may therefore allow for improvement in therapeutic and surgical decisions and results. The purpose of this study was to identify significant barriers to adherence with hand therapy following surgery for distal radius fracture. A questionnaire addressing demographic, social, psychological, occupational and medical factors was administered to 20 subjects undergoing surgery for distal radius fracture. Adherence was evaluated by the therapist and by the number of missed sessions. There were 9 males and 11 females. Average age was 46.2 (19–88). The therapists' evaluation of adherence and number of missed appointments were significantly correlated ($R^2=0.86$, $p<0.0001$, Spearman's test). Gender, distance from therapy, and driving status were significantly related to adherence. Difficulty in reaching the therapy sessions was negatively related to adherence with hand therapy in our population. Other parameters such as smoking, were borderline significant. Further study is needed to investigate the effect of additional parameters, in a larger population in order to better define barriers to patient postsurgical adherence.

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Introduction

Hand surgery relies on post-operative and sometimes pre-operative hand therapy for good results [1, 2]. Though in some types of surgery it is more critical than others, adherence to therapy is recognized as an important predictor of results [3, 4]. Because of this, the ability to recognize barriers to patient adherence prior to surgery may be helpful to the hand surgeon in preoperative, operative and postoperative planning. This information could have a significant impact on the surgeon's decision-making, affecting the difference between pinning and fusing a joint and repair as well as helping the treating therapist to identify barriers to adherence that can then be addressed postoperatively.

The world health organization (WHO) in a meeting on 4–5 June 2001 published a report titled: Adherence to Long-Term Therapy a Policy of Action [5] This report identified non-adherence to treatment of chronic diseases as a “worldwide problem of striking magnitude”. Adherence was defined as the extent to which the patient follows medical instructions therefore including not only treatment with medication but also different behavioral instructions. The model for non-adherence was recognized as being multifactorial including four general groups of elements: health care team and system-related factors, condition-related factors, characteristics of therapies and patient-related factors. Much of the research performed has concentrated on organ transplant surgery and chronic conditions such as human immunodeficiency virus (HIV) and tuberculosis since continued adherence is so critical to success and these constitute major health issues in developing countries [6–8]. However, adherence to other forms of

medical treatment has been studied including hand washing and universal precautions in surgery [9, 10].

Hand therapy is inherently different from treatments for the aforementioned medical problems because it requires following fundamentally different instructions, can be time consuming, and often painful. Furthermore, patient populations who rely primarily on medication therapy often face lifestyle challenges that are different than the ones faced by orthopedic patient populations. Differing from medication, some people are nonadherent in that they do too much, while others do too little and since the therapist and treating surgeon often have to make adjustments in the instructions during the course of treatment, the therapeutic demands will constantly change. On the other hand, the adherence does not need to last a lifetime (as in transplant surgery) but rather always has a limited time frame making it easier to comply with (acute as opposed to chronic).

Another factor that simplifies adherence with hand therapy is the fact that adherence entails immediate feedback in the form of pain relief, joint flexibility etc.... as opposed to taking medication with no immediate response (though final therapy results take longer, and do require repeated exercise and sessions, there is immediate feedback such as edema reduction following any type of treatment). As such, it cannot be assumed that the major barriers to adherence in medical patients carry over to patients who have musculoskeletal injuries. Despite these differences, barriers to adherence with hand therapy have remained largely unexplored [1, 3].

The purpose of this pilot study was to identify significant types of barriers to adherence with hand therapy using a preliminary questionnaire. Specifically: what are the barriers to attending and adhering to hand therapy after distal radius fracture open reduction and internal fixation (ORIF) in our population (a mixed rural and inner city setting). These factors can then be used to create a shorter, more focused questionnaire that can identify barriers to post-operative adherence to hand therapy in a particular patient. This concise questionnaire can then be validated in future studies, allowing the surgeon and therapeutic team not only to identify the barriers to adherence but to further enable the removal of those barriers, potentially improving clinical results of surgery. We hypothesized that we will identify characteristics that prevent patient adherence with hand therapy.

Methods

Institutional review board (IRB) approval was obtained prior to study commencement. Participants with radiologically confirmed distal radius fractures necessitating surgery for open reduction and internal fixation were eligible for the study. They were enrolled in a consecutive fashion.

Criteria for exclusion were the clinical inability to perform hand therapy, or refusal by the patient to participate in the study.

In order to include those patients who would be non-adherent and never return for therapy, patients filled in a questionnaire at the first encounter (after signing consent to participate in the study). Since some of the questions (questionnaire questions 85–91) asked the participants to evaluate their own adherence with therapy, and since this was the same questionnaire that was given to the patients after the surgery, the participants could not evaluate their adherence with therapy in this first encounter but were able to answer all of the other questions. The questionnaire consisted of 103 open-ended multiple choice, visual analogue scale, number ranking, and short answer questions ascertaining data on subject demographics, transportation capabilities, logistics, occupational tasks, lifestyle habits, medical traits, hand dominance, current pain levels, self-esteem, psychosocial parameters, perception of the efficacy of therapy, and predictions of therapy outcomes. Participants were allowed to spend an unlimited amount of time in a private room while completing the questionnaire.

The questionnaire was devised to include multiple questions regarding possible barriers to adherence with hand therapy. It included only some of the factors identified by the WHO as barriers to adherence since an extremely long and complex questionnaire would possibly filled out only by certain patients thus producing a bias in favor of adherent patients.

The barrier domains were chosen by the investigators according to patient parameters perceived to influence adherence to therapy as well as factors already identified as barriers to adherence with other types of medical treatment. O'neil et al. found that low income as well as drug addiction was inversely related to adherence with human immunodeficiency virus (HIV) therapy, while age, gender and systems factors such as enrollment in a comprehensive adherence assistance program were positively associated with adherence [11]. Multiple studies have found demographic and occupational factors to be significantly associated with adherence to therapy. Kane et al. looked at age, occupation, a family history of inflammatory bowel disease, length of remission, quality-of-life score, and method of recruitment and found male gender to be significantly and negatively associated with adherence to mesalamine treatment in ulcerative colitis [12]. In another study looking at adherence to treatment with infliximab, they found female gender and Medicaid insurance to be significantly associated with nonadherence. Similar to our study, they evaluated adherence to clinic appointments looking at factors such as indication for treatment, patient area code and race [13]. Cummings et al. looked at psychosocial factors and "general, situational factors" and their association with adherence to hemodialysis treatment. Chen et al. evaluated different

assessment scales in home exercise programs for upper extremity rehabilitation [14, 15]. Though patient beliefs, general outlook and expectations vary and affect adherence with therapy, we did not include questions regarding this aspect in our questionnaire since we felt it would become too large to adequately answer.

The general domains in our study included:

1) Demographic/social

Since adherence with therapy often requires monetary fees in the form of co-pays, as well as gasoline for drives to and from the therapist, this section of the questionnaire included demographic data including social and employment/salary status, self-employed, workers compensation.

2) Systems related

This section included distance from the hand therapist, living conditions and practical support systems (for example, does the patient own a car and is he/she able to drive it).

3) Psychological

This section included the patient's ability to cope with stressful situations such as coping scales and active vs. passive personalities. This section included anxiety scales and the Rosenberg self-esteem scale [16].

4) Occupational/condition related factor

This section included information regarding handedness, occupation, whether the injured hand is the dominant hand.

5) Medical

This domain included pertinent medical information such as smoking, background diseases, and previous surgeries.

Questionnaire: (See [Attached Document](#))

Therapists treating patients were issued a form for the subjective and objective evaluation of patient adherence with therapy outcomes. Primary outcome measures included subject attendance of therapy sessions, therapist perception of patient performance both in clinic and at home, and surgical or treatment complications (dirty wound/dressing, lost splint, infection, wound dehiscence, protective attitude, disproportionate pain, loss of ROM, edema, loss of strength). Therapists were only allowed to evaluate subjects after at least 3 therapy sessions.

A complete data set was considered to be a completed patient questionnaire, and a completed therapist evaluation of the corresponding patient. Data acquisition continued on a rolling basis until these data sets were obtained, after which, data collection was stopped.

After subjects were consented and filled out the initial questionnaire, they were contacted via telephone. Four contact attempts were made at participant's home telephones, work telephones (if available), and emails (if available—for a maximum total of 12 contact attempts spread over a period of several weeks—after which participants were considered either lost to follow up if they had attended therapy or nonadherent if they had not. Patients attending therapy but lost to follow up were not included in the statistical analysis. Patients who were contacted and issued a patient questionnaire, but who did not attend any hand therapy sessions were included in the statistical analysis as patients who attended 0 % of their therapy sessions as well as those patients who filled in the questionnaire originally but did not follow up with therapy. Their initial questionnaires were retained and included in the analysis.

The role of hand therapy following surgery for a good outcome in distal radius fractures is important. However there is still some controversy as to the exact type and frequency of hand therapy [17–19]. Basic therapy protocols were confirmed with the hand therapists prior to initiation of therapy sessions. The protocols used in our institution for post-operative therapy included 2–3 sessions per week, sessions that were 60 min in length, with passive and active range of motion exercises, and resistance strength training.

Data Analysis

Chi square test was used for the analysis of qualitative data. Unpaired *t* test was used for the comparison of continuous data between adherent and nonadherent patients. Repeated measures of ANOVA and post Hoc Tuckey-Kramer test were used to evaluate differences among time points. *P* was considered significant at 0.05.

Results

Thirty-four patients were enrolled in the study. Fourteen patients were lost to follow up. Nine of the participants were male, and 11 were female, with a mean age of 46.2 (19–88) years. Complete therapist evaluations were obtained for all subjects who completed patient questionnaires and who scheduled therapy appointments. For the subset of participants who attended zero appointments, therapist evaluations only included the number of appointments attended (zero). Out of the 20 participants from which we were able to obtain complete data, ten attended all appointments, seven attended zero appointments, one attended one out of six scheduled appointments, one attended 19 out of 21 scheduled appointments, and one attended 22 out of 23 scheduled appointments.

Five variables were found to be significantly associated with <50 % attendance of therapy sessions: male gender ($P=0.001$), lack of car ownership ($P=0.034$), living far away from the therapy clinic in minutes ($P=0.016$), living far away from the therapy clinic in miles ($P=0.017$), being driven to the therapy session by someone else ($P=0.02$). The mean number of self-reported estimated miles from subject's homes to therapy locations was 25.2 (0.5–140) miles. The mean number of self-reported estimated minutes from subject's homes to therapy locations was 33.5 (5–100) minutes.

Other subject factors were not significantly associated with non-adherence. However there are some factors that were borderline, and may be significantly associated with non-adherence with an increase in the number of subjects. These should probably be included in further studies and include: smoking, anxiety, workers compensation status, and factors related to economical and work status.

The therapists' evaluation of adherence (based on a visual analogue scale) and number of missed appointments were significantly correlated ($R^2=0.86$, $p<0.0001$, Spearman's test). No factors were significantly associated with how well therapists subjectively felt patients were adhering to home self-directed hand therapy, or how well therapists felt patients performed their hand therapy sessions in clinic. An insufficient number of subjects were available to report adverse effect associations with adherence, so this data was inconclusive.

Discussion

This pilot study found that gender and transportation logistics are significant barriers to adherence with hand therapy after ORIF of distal radius fractures. Specifically male gender, lack of car ownership, the requirement of help in getting to therapy sessions, and living farther away from therapy clinics in both miles and minutes were found to be associated with non-adherence to hand therapy in our population. It must be noted that certain parameters are likely associated with each other. For example, the number of miles and minutes from subject's homes to therapy clinics must have some level of association to each other, but the extent to which this is the case is not clear due to our limited sample. While it is possible that only one of the aforementioned variables is truly associated with non-adherence, the opposite may be true as well. Miles to therapy is likely a surrogate marker of gasoline cost. Time to therapy may be a surrogate marker of traffic, road conditions, and frustration experienced on the way to therapy. Clearly there is overlap, but both parameters may represent important markers for independent factors that influence therapy adherence.

Another important parameter that must be evaluated in a more powerful study is the ratio of miles: minutes (M: M) to therapy. A low M: M ratio may represent poor traffic/road conditions, but decreased distance to therapy. A high M: M ratio may indicate good traffic/road conditions, but increased distance to therapy. It is unclear if the more powerful deterrent to therapy attendance would be perception of "long" distance to therapy clinics, or the perception of "bad" traffic/road conditions.

Furthermore, this study was performed in a specific area with a characteristic population and the results may not be applicable to all locations and populations. Many of the participants recruited at our clinic locations originated from rural locations. Car ownership is likely a more stringent requirement for therapy attendance for rural residents, who must drive farther distances, as compared to urban residents, who may have shorter distances to travel and who have access to public transportation.

In this pilot study, occupation and work status were not found to be related to adherence with therapy. Other studies have found occupation and work status to be significantly related to adherence with therapy and this seems logical, while others such as the study by Charupanit, like our study, did not find that occupation was related to adherence [20, 21]. It is possible that our study was underpowered to detect a significant association.

The question of adherence based on gender is one that must be approached with caution because of the ethical and legal implications of basing clinical decisions on frankly inborn traits like gender. While there is no consensus on the effect of male gender on adherence to medical treatment, many studies have demonstrated that male gender can be associated with increased medical adherence. Since the different studies investigated different forms of therapy (thus requiring diverse procedures to follow) further validation in a better-powered study is warranted [10, 11].

We were able to obtain substantial results despite a small cohort of patients because we had a large number of nonadherent patients. This is most likely due to our patient population that consisted of on one hand patients from rural areas and on the other hand inner city patients with no medical insurance. The protocol of therapy sessions 2–3 times a week postoperatively is demanding but almost all of the patients were either completely non-adherent (came to 0–1 session) or completely adherent coming to all sessions, so in this study attendance acted as a categorical outcome measure and was probably unrelated to the number of scheduled sessions.

Patients were considered lost to follow up after four telephone calls to their homes and work (with messages, if available), and after four reminder emails (if available), all spread out throughout several weeks. If subjects became lost to follow up prior to filling out the patient questionnaire, then these subjects were not included in the statistical analysis for

adherence. We were limited to this recourse because of the timing of issuing the questionnaire, which was given after initial enrollment in the study at a follow up visit. During the interim between being enrolled and the follow up visit where-by subjects would be issued the questionnaire, some patients became lost to follow up before providing important data for statistical analysis. We were therefore unable to include this particular subset of potentially non-adherent patients in our analysis. For patients who became lost to follow up after completing their questionnaires, they were included in the statistical analysis as subjects who attended zero therapy sessions, but no other therapist evaluation parameters were completed. Unfortunately, this made it impossible to assess the association of factors with other therapist evaluation parameters, such as wound complications, and subjective evaluation of patient therapy performance at the clinic and at home. Ultimately, it is impossible to truly know how engaged subjects who were lost to follow were with home or in-clinic therapy. While unlikely, it is possible that subjects who were lost to follow up did in fact attend physical therapy, but did not inform us. It is also possible that a fraction of the subjects who did not follow up with us, did so because they were pain free and highly functional; making this a subject subset who could be considered a clinical success despite lack of therapy adherence. Due the scope of this pilot study, we were limited in the patient characteristics that we were able to assess and we did not assess objective recovery measures such as ROM, and strength, which will be important outcome measures in future validation studies.

The process of adherence to medical therapy is complex, related to many factors, many of which are specific to a certain area and culture [22]. Further complicating matters, there is very little literature on adherence to physical or occupational therapy and even less specifically regarding post-surgical hand therapy. Many of the factors evaluated are dependent and interrelated rendering the analysis even more complicated [2]. This pilot study attempted to initiate an investigation into the model of adherence to hand therapy in our population (more specifically to identify barriers to adherence). We were limited by the number of questions we could ask and investigated parameters that had been addressed in literature regarding adherence to other types of medical therapy that may not be relevant to hand therapy. Therefore this study should be seen as a very preliminary study that may be relevant to only one area of the world.

Future studies should encompass a larger array of regions and centers where subjects will be recruited as well as factors related to the health care team and systems related factors. As a pilot study it is also inherently limited due to the small sample size, thus results found within this study will require future studies for validation. Future, more powerful studies may build on the results of this study and further evaluate these factors, and others, and their utility in predicting non-

adherence to post-operative therapy in order to better guide surgical and therapeutic recommendations.

Conflict of Interest Author Sergio Hickey, Author John Rodgers, and Author Ronit Wollstein declare that they have no conflict of interest.

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