A retrospective analysis of the number of therapy visits after distal radius fractures using a new provider-scored clinical severity scale

Eric Kirby OTR/L, CHT,*, Sean Sparrow OTD, MS, OTR/L
MacNeal Hospital Rehabilitation Department, Berwyn, IL, USA

Abstract

Study Design: Retrospective study.

Introduction: Fractures of the distal radius are common as is a postfracture referral to occupational therapy (OT). This article examines factors that cause greater morbidity and a greater number of OT visits.

Purpose of the Study: This study aims to analyze which of 5 common sequelae of the distal radius fracture is most significant for increasing the number of therapy visits.

Methods: Three-hundred Sixty charts were reviewed, and 89 were selected. Multiple regression was used to determine which of our 5 independent variables had the greatest predictive power for the total number of therapy visits.

Results: The regression model demonstrated significance at \( P \leq 0.01 \). Total active motion (TAM) of the digits \( (P \leq 0.01) \) and TAM of the forearm \( (P \leq 0.01) \) were the only complications that demonstrated statistical significance and a positive relationship with the number of therapy visits. In addition to this, TAM of the forearm and digits showed a strong correlation with the number of therapy visits. TAM of the wrist, pain, and edema had a weak correlation. Patients with high total group score on the clinical severity scale also had a moderate correlation.

Discussion: The results of the study illustrate the importance of digital contractures on a patient’s morbidity, function, and their need for OT visits.

Conclusion: The information from this study is important for the clinician as it identifies patients at risk for increased morbidity and identifies the complications that the clinician may want to stress early in the rehabilitation of that patient.

Level of Evidence: 3.

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Introduction

Distal radius fractures (DRFs) are the most common fractures in the upper extremity and frequently result in short-term or long-term disability due to the associated complications.1-3 After receiving treatment of the fracture, which may include casting, closed reduction, percutaneous pinning, external fixation, and open reduction with internal fixation, there can be many concomitant complications. Davis and Baratz4 reported the numerous soft tissue complications of DRF, including neurovascular dysfunction, tendon injury, skin problems, infection, compartment syndrome, chronic regional pain syndrome, and ligament dysfunction leading to instability. Chung et al5 showed that chronic incongruity leads to poorer functional outcomes.

Patients who sustain a DRF are frequently sent for occupational therapy (OT) services, where the clinician is responsible for treating many of the nonosseous complications that result from the injury. These complications include edema, decreased range of motion (ROM), weakness, pain, and a general decline in functional ability.6-8 Some studies have examined the outcomes of therapy services after a DRF6-8, specific interventions used9-11, the comparison of formal therapy with a home exercise program,11,12,13 and some have studied when OT services should be initiated after a DRF.14,15

There are also studies that examine the average number of OT visits required for regaining functional outcomes after DRF. Christensen et al16 found that participants attended 37.5 visits to reach functional outcomes in 9 months. Conversely, others have found that only a few visits are necessary. Bache et al17 as well as Wakefield and McQueen18 found that an average of 3 sessions is needed, whereas Maciel et al19 found that an average of 4.4 sessions
is needed. These results show a wide range in the utilization of therapy visits. There is a lack of explanation among the authors about why some patients receive more therapy than others. Furthermore, there has been no study regarding the number of visits required to achieve functional outcomes when faced with complications such as severe digital contractures. In fact, there is a lack of attention in the literature regarding the complications of digital contractures and its effects on functional outcomes or the speed with which functional outcomes are achieved after a DRF.

Many clinicians have studied outcomes of DRFs, and several parameters have been used as outcome measures (eg, imaging, type of osseous injury, type of medical intervention, ROM, strength, and functional questionnaires). No study has linked the type of osseous injury, type of medical intervention, ROM, strength, parameters have been used as outcome measures (eg, imaging, type of osseous injury, type of medical intervention, ROM, strength, and functional questionnaires). No study has linked the type of osseous injury, type of medical intervention, ROM, strength, parameters have been used as outcome measures (eg, imaging, type of osseous injury, type of medical intervention, ROM, strength, and functional questionnaires). No study has linked the type of osseous injury, type of medical intervention, ROM, strength, parameters have been used as outcome measures (eg, imaging, type of osseous injury, type of medical intervention, ROM, strength, and functional questionnaires). No study has linked the type of osseous injury, type of medical intervention, ROM, strength, parameters have been used as outcome measures (eg, imaging, type of osseous injury, type of medical intervention, ROM, strength, and functional questionnaires). No study has linked the type of osseous injury, type of medical intervention, ROM, strength, parameters have been used as outcome measures (eg, imaging, type of osseous injury, type of medical intervention, ROM, strength, and functional questionnaires). No study has linked the type of osseous injury, type of medical intervention, ROM, strength, parameters have been used as outcome measures (eg, imaging, type of osseous injury, type of medical intervention, ROM, strength, and functional questionnaires). No study has linked the type of osseous injury, type of medical intervention, ROM, strength, parameters have been used as outcome measures (eg, imaging, type of osseous injury, type of medical intervention, ROM, strength, and functional questionnaires). No study has linked the type of osseous injury, type of medical intervention, ROM, strength, parameters have been used as outcome measures (eg, imaging, type of osseous injury, type of medical intervention, ROM, strength, and functional questionnaires).

**Purpose of the study**

The authors of this study have made the clinical observation that patients who experience more severe complications with regard to their contractures, edema, nociception, and kinesiophobia experience extended periods of functional decline. Furthermore, we think that patients who present with severe finger contractures take the longest to recover. Our study aims to determine if the objectively measurable complicating factors of a DRF can be used to predict the total number of OT visits. More specifically, we are interested to know which of 5 common postfracture complications have the greatest impact on the number of therapy visits.

A secondary possible outcome of this study is the development of a new, objective, clinician-scored, clinical severity scale (CSS) that may be used as a clinical predictor for the number of therapy visits necessary after a DRF. This would be done by calculating a total group score, which is the average score derived from the 5 postfracture complications.

**Hypotheses**

Wrist contractures associated with fractures of the distal radius are not a significant predictor for the number of therapy visits.

Digital contractures associated with fractures of the distal radius are a significant predictor for the number of therapy visits.

**Methods**

**Chart selection**

Institutional review board approval was obtained, and charts of patients with the diagnosis of a DRF were identified by International Classification of Diseases, Ninth Revision codes from outpatient hand therapy clinics from 4 regional hospitals. To ensure patient privacy and confidentiality, the authors deidentified all clinical data to a nonidentifiable format before analysis. Three hundred sixty charts were reviewed, and 89 charts were qualified for the study.

Men and women between the ages of 18 and 85 with a postoperative or conservatively treated DRF with or without a concomitant ulnar styloid fracture were selected for this study. Their injury had to have occurred between January 1, 2005 and January 1, 2015. Patients were excluded if the reason for discharge was not apparent in their medical record. Additional exclusion criteria included the following:

- Previous DRFs on the injured side
- Workers’ compensation claims
- Tendon ruptures
- Bilateral injuries
- Self-pay clients
- Co-pays >15 dollars
- Visit limit <20
- Patients referred precast removal that did not continue OT postcast removal
- Prior limitation in finger flexion
- Relies on a caregiver for basic functioning

**Data collection**

Before the chart review, an ordinal scale was developed to rank the severity of 5 common complications of a DRF from 1 to 10, 10 being the most severe ranking (Table 1). These complications include total active motion (TAM) of the wrist, TAM of the digits, TAM of the forearm, numeric pain rating (1-10), and circumferential edema measurements of the wrist (centimeters). These served as our independent variables. Patients were excluded if any of these 5 independent variables were not documented. TAM of the digits is defined as total active flexion less the extension deficit. If composite flexion and extension was assessed, patients were excluded, unless measurements were also taken in degrees. TAM of the wrist is the sum of the total arc of motion of flexion and extension or pronation and supination for forearm TAM. Circumferential measurements of the wrist were chosen due to the ubiquity with which they were documented despite some patients having additional measurements taken at other landmarks.

Data collected from the chart review included information from the OT evaluation, progress notes, and discharge notes. From the evaluation, data were collected on TAM for the wrist and forearm, numerical pain rating, and circumferential edema measurements. TAM was also collected on the index, middle, ring, and small digits (either TAM was already calculated or the authors calculated TAM from the measurements that were present). The TAM measurements were summed and divided by 4 to get an average digital TAM for the hand. Edema was compared with the uninjured extremity, and the percent difference was documented and ranked in severity from 1 to 10. A total group score was also calculated for each patient by the summation of the ranking of each of the 5 groups and then divided by 5.

Other data collected from the chart included number of days from injury or surgery to first OT visit, from first OT visit to OT discharge, reasons for discharge, method of fracture management, gender, age, grip and pinch strength measurements, insurance information for co-pay amount and visit limit, clinician credentials

<table>
<thead>
<tr>
<th>Rank no.</th>
<th>TAM digits</th>
<th>TAM FA pro/sup</th>
<th>TAM wrist flex/ext</th>
<th>Edema (% difference)</th>
<th>Pain</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>271</td>
<td>180</td>
<td>180</td>
<td>&gt;0% but &lt;2%</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>241-270</td>
<td>160-179</td>
<td>160-179</td>
<td>&gt;2% but &lt;4%</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>211-240</td>
<td>140-159</td>
<td>140-159</td>
<td>&gt;4% but &lt;6%</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>181-210</td>
<td>120-139</td>
<td>120-139</td>
<td>&gt;8% but &lt;10%</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>151-180</td>
<td>100-119</td>
<td>100-119</td>
<td>&gt;10% but &lt;12%</td>
<td>5</td>
</tr>
<tr>
<td>6</td>
<td>121-150</td>
<td>80-99</td>
<td>80-99</td>
<td>&gt;12% but &lt;14%</td>
<td>6</td>
</tr>
<tr>
<td>7</td>
<td>91-120</td>
<td>60-79</td>
<td>60-79</td>
<td>&gt;14% but &lt;16%</td>
<td>7</td>
</tr>
<tr>
<td>8</td>
<td>61-90</td>
<td>40-59</td>
<td>40-59</td>
<td>&gt;16% but &lt;18%</td>
<td>8</td>
</tr>
<tr>
<td>9</td>
<td>31-60</td>
<td>20-39</td>
<td>20-39</td>
<td>&gt;18% but &lt;20%</td>
<td>9</td>
</tr>
<tr>
<td>10</td>
<td>0-30</td>
<td>0-19</td>
<td>0-19</td>
<td>&gt;20%</td>
<td>10</td>
</tr>
</tbody>
</table>

TAM = total active motion; FA = forearm; Pro/sup = pronation/supination; Flex/ext = flexion/extension.

TAM is measured in degrees.
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