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# Managing patient expectations about recovery after a distal radius fracture based on patient reported outcomes



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## ABSTRACT

**Introduction:** PROMs are increasingly used by clinicians to evaluate recovery after distal radius fractures, but can also be used as benchmark data to help patients managing their expectations about recovery after DRF.

**Purpose of the Study:** The study aimed to determine the general course of patient-reported functional recovery and complaints during 1 year after a DRF, depending on fracture type and age. The study aimed to determine the general course of patient-reported functional recovery and complaints during one year after a DRF, depending on fracture type and age.

**Methods:** Retrospectively analyzed PROMs of 326 patients with DRF from a prospective cohort at baseline and at 6, 12, 26 and 52 weeks included PRWHE questionnaire for measuring functional outcome, VAS for pain during movement, and items of the DASH for measuring complaints (tingling, weakness, stiffness) and limitations in work and daily activities. The effect of age and fracture type on outcomes were assessed using repeated measures analysis.

**Results:** PRWHE scores after one year were on average 5.4 points higher compared to the patients' pre-fracture scores. Patients with type B DRF had significantly better function and less pain than those with types A or C at every time point. After six months, more than 80% of the patients reported mild or no pain. Tingling, weakness or stiffness were reported by 55–60% of the overall cohort after six weeks, while 10–15% had persisting complaints at one year. Older patients reported worse function and more pain, complaints and limitations.

**Conclusions:** Functional recovery after a DRF is predictable in time with functional outcome scores after one-year follow-up that are similar to pre-fracture values. Some outcomes after DRF differ between age and fracture type groups.

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## Introduction

The most common fracture amongst adults is the distal radius fracture (DRF), accounting for about 20% of all fractures.<sup>1</sup> The incidence in the Dutch population is 20–30 per 10,000 persons per year, and is comparable to the international incidence.<sup>2</sup> Treatment involves either conservative treatment with cast-immobilization or surgery, depending on the fracture type, dislocation and/or loss of congruity of the anatomical position of the wrist. After treatment, the rehabilitation of patients is focused on optimization of

the functional outcome, the ability to resume activities of daily life (ADL) and minimize pain. The majority of patients with a DRF attain a good function and range of motion within 3 to 6 months. A minority of patients do not return to work within 1 year after DRF, and up to 20% of the patients do not lose any time from work.<sup>3</sup>

The outcome after a DRF is traditionally assessed by the clinician based on radiological imaging and objective parameters such as range of motion. However, these parameters do not correlate well with outcomes as perceived by patients.<sup>4</sup> The patient's perspective on their recovery after a DRF has therefore gained importance for determining the outcome of treatment. Consequently, patient reported outcome measures patient-reported outcome measures (PROMs) are increasingly used to evaluate functional recovery after treatment.<sup>5</sup> These data are being used to inform the clinician but a more modern approach would be to inform the patient directly by providing them with available benchmark data.

Conflict of interest: All named authors hereby declare that they have no conflicts of interest to disclose.

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Pre-treatment patient expectations have been shown to influence post-treatment outcomes,<sup>6</sup> so it is important to inform patients about the course of recovery.

The objective of the study was to determine the general course of patient-reported functional recovery, pain and associated complaints of tingling, weakness and stiffness during the first year after the fracture, depending on fracture type and age. These results may be used to inform patients better and manage their expectations about recovery after a DRF from a patient's point of view.

## Material and methods

### Study design and patients

This study was a secondary, retrospective analysis of data from the prospective Warrior study.<sup>7</sup> This multicenter randomized controlled trial evaluated the effect of reduced routine imaging during recovery after wrist and ankle fractures in the Dutch population. The study was performed between 2014–2016 and included 326 patients with a DRF, who had filled out PROMs. These patients were followed for the duration of 1 year to measure the pain, function and quality of life at fixed points in time using PROMs. Written informed consent was obtained before randomization in the trial.

### Outcome measures

The patients filled out the PROMs at the day of presentation in the Emergency Department (baseline measurement, reflecting the pre-fracture situation) and 6 weeks, 3 months, 6 months and 1 year after the injury or surgery. The primary outcome of the present study was the overall functional status of the hand/wrist, measured using the validated Dutch version of the Patient-Rated Wrist/Hand Evaluation (PRWHE) questionnaire.<sup>8,9,10</sup> The PRWHE is a 15-item questionnaire with 2 scales measuring pain and disability in activities of daily living. The scoring scale ranges from 0 to 100, with 0 reflecting no pain/disability. Another commonly used PROM for measuring the patient-perceived disability of the arm is the Disability of the Arm, Shoulder and Hand (DASH) questionnaire. For the present study, 3 questions of the validated Dutch version of the DASH were used to measure the presence of 3 complaints (tingling, weakness and stiffness).<sup>11</sup> Tingling, weakness and stiffness were considered present if the severity of these complaints was scored as moderate to extreme. The question in the DASH about limitations in work and other regular daily activities due to problems of the arm, shoulder or hand was also analyzed. Pain intensity during movement was measured with a Visual Analogue Scale (VAS) on a scale from 0 (no pain) to 10 (worst possible pain).<sup>12</sup>

### Statistical analysis

Statistical analyses were performed using SPSS statistical software (IBM SPSS Statistics for Windows, Version 25.0. Armonk, NY: IBM Corp.). Patient characteristics at baseline are presented as number and percentage. Differences in PRWHE and pain scores between baseline (pre-fracture situation) and 1 year in the total study group were compared using paired *t*-tests.

Functional outcome (PRWHE) and pain were analyzed for subgroups of patients based on age (categorized as 18–49, 50–69 and 70 years and older) and fracture type (categorized as extra-articular, AO-type A; partial articular, AO-type B; and intra-articular, AO-type C). The median PRWHE and pain scores with interquartile range (IQR) are graphically presented in a Box-plot for the total group and by age group and by fracture type for each

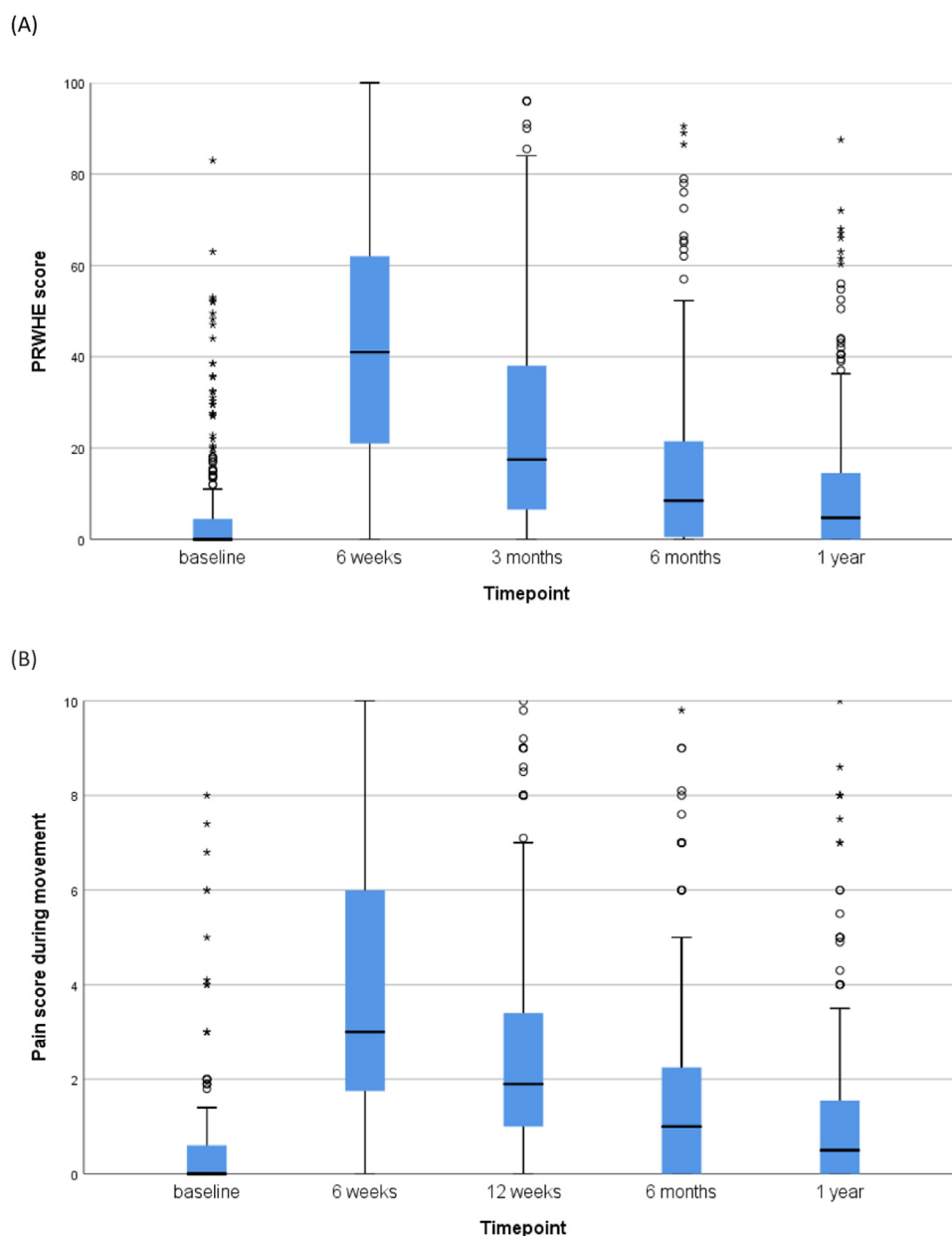
**Table 1**  
Baseline patient characteristics

Characteristic	n=320
Gender, n (%)	
Male	76 (23.8)
Female	244 (76.3)
Age, mean (SD)	56.5 (17.9)
Age, n (%)	
18 - 49 y	89 (27.8)
50 - 69 y	153 (47.8)
70+ y	78 (24.4)
Fracture dominant hand, n (%)	
yes	126 (39.4)
no	187 (58.4)
Fracture classification AO-Müller, n (%)	
A	215 (67.2)
B	33 (10.3)
C	72 (22.5)
Currently smoking, n (%)	
Yes	53 (16.7)
No	264 (83.3)
Alcohol use, n (%)	
Yes	215 (67.8)
No	102 (32.2)
Treatment, n (%)	
Conservative	279 (87.2)
Operative	41 (12.8)
Type A	18/215 (8.4)
Type B	3/33 (9.1)
Type C	20/72 (27.8)

time point. The Kruskal-Wallis test was used to compare PRWHE and pain scores between age groups and fracture types for each time point.

To assess the independent effect of age category and fracture type over time on the PRWHE score and VAS pain scores, linear mixed models were constructed. For these analyses, PRWHE scores were log-transformed as  $\text{logit}(\text{PRWHE}+1)$ , because this outcome variable had a skewed distribution for most time points. First, a linear mixed model was fitted with timepoint, age category and fracture type as independent categorical variables (base model). As a second step, an interaction term for time with age and for time with fracture type was added separately to the base model, to assess whether the effect of age and fracture type differed between the timepoints using an F-test. If statistically significant, the interaction term was included in the base model. Finally, the base model was adjusted for biologically plausible confounding factors (fracture in the dominant hand, treatment and pre-fracture PRWHE score) to assess whether this changed the effect of age category and fracture type on the outcome. The results were back-transformed to the original scale.

The percentages of patients with complaints (tingling, weakness and stiffness in arm, shoulder or hand) and with limitations in work or other regular daily activities for a total study group at each time point are graphically presented. The effect of age and fracture type over time on the presence of tingling (defined as moderate, severe or extreme tingling), weakness (defined as moderate, severe or extreme weakness) and stiffness (defined as moderate, severe or extreme stiffness), and on limitations in work or daily activities (defined as moderately or severely limited, or unable to perform these activities) over time was analyzed using generalized estimating equations (GEE) logistic regression analysis. For these outcome measures, the same analysis plan was followed as for functional outcome and pain, including fitting a base model with timepoint, fracture type and age category as independent variables (base model) after testing interaction of fracture type and age with time, and a final model with correction for potential confounders (fracture of the dominant wrist and treatment).



**Fig. 1.** Boxplots with the unadjusted scores for (A) the PRWHE and (B) pain during movement measured using a VAS over time after a distal radius fracture.

Missing data handled by using mixed-effects models.  $P$ -values  $< .05$  were considered statistically significant.

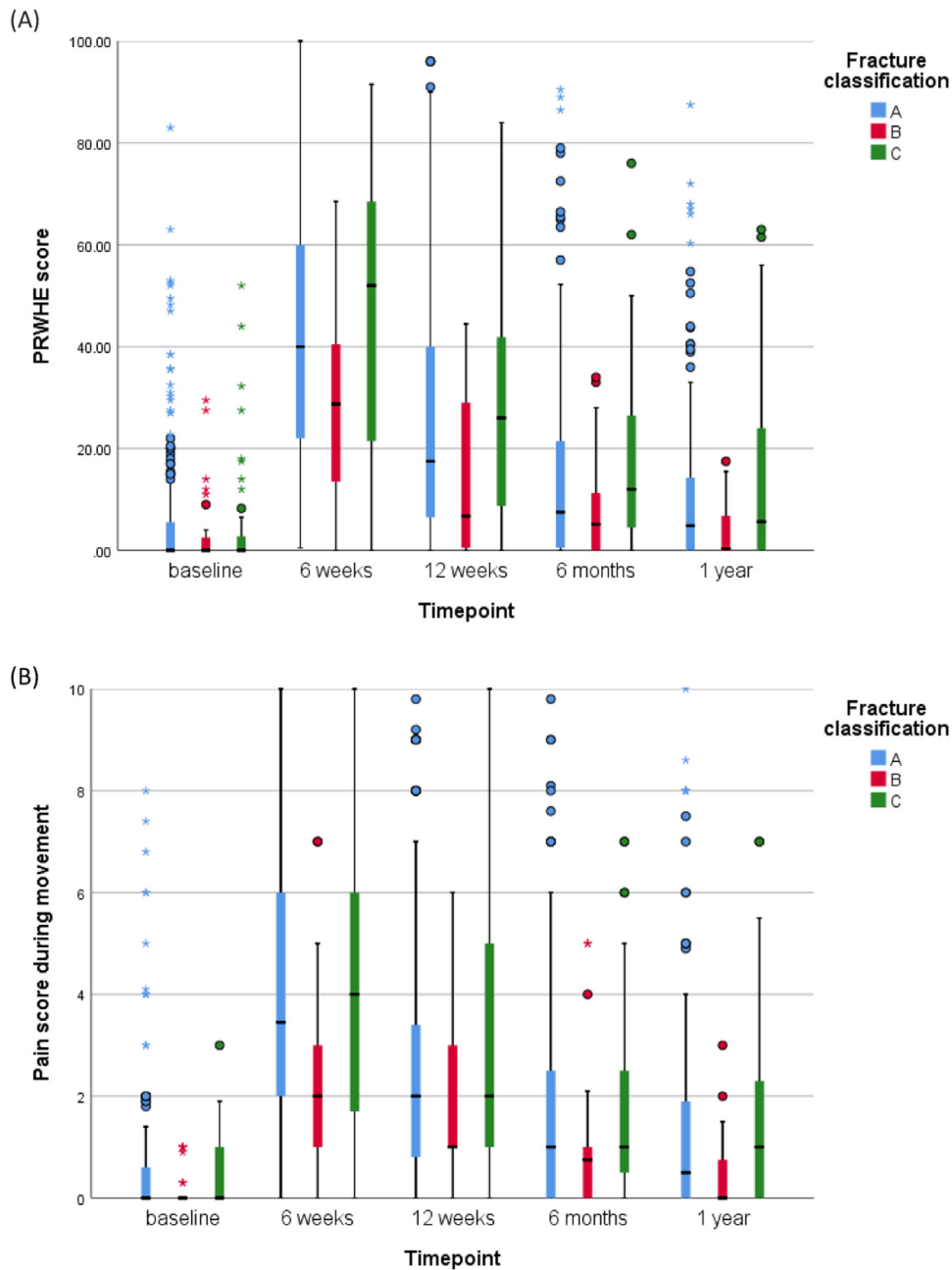
## Results

From the study cohort of 326 patients, 6 patients had not filled out PROMs at baseline and were excluded from the current analysis. Baseline characteristics are listed in Table 1. The mean age was 56.6 years (SD 17.9) and the majority were women (76.3%). The vast majority of patients had an extra-articular fracture (AO type A; 67.2%) and most patients were treated conservatively (87.2%), type C fractures were operatively treated in 28%, type A in 8% and B in 9%. Some loss of follow-up occurred, leaving 301 patients (94%) for analysis at 6 weeks, 290 patients (91%) at 3 months, 272 (85%) patients at 6 months and 262 patients (82%) at 1 year. The course of the scores for PRWHE and pain during movement over time for the entire cohort is shown in Figure 1. Patient-reported disability and pain were worst at 6 weeks and decreased thereafter. On aver-

age, the PRWHE scores after 1 year were 5.4 points higher (95% CI 3.2–7.6; paired  $t$ -test  $P < .001$ ) and the VAS pain scores 0.8 points higher (95% CI 0.5–1.0;  $P < .001$ ) than the patients' pre-fracture scores.

### Effect of age and fracture type on functional outcome

Univariable analysis showed significantly lower PRWHE scores for patients with a type B fracture at every timepoint (Kruskall Wallis test,  $P < .05$ ; Fig. 2A). In the base linear mixed model, PRWHE scores of patients with a type B fracture were 53% (95% CI 37%–78%) lower on average than the scores of patients with a type A fracture (Table 2). The effect of fracture type on PRWHE scores did not change over time (F test for interaction between time and fracture type (6 df)=0.501,  $P = .81$ ), so this interaction term was not included in the base model. Patients of 50 years and older reported higher PRWHE scores after 6 weeks and 3 months than younger patients (Kruskall Wallis test,  $P < .05$ ; Fig. 3A). Also,



**Fig. 2.** Unadjusted scores for (A) the PRWHE questionnaire and (B) pain during movement measured using a VAS over time after a distal radius fracture per fracture classification group.

in the base linear mixed model, patients of 50 years and older reported higher PRWHE scores on average over time: compared to patients younger than 50 years, PRWHE scores of 50–69 year-old patients were on average 41% (95% CI 8%–84%) higher and those of patients aged 70 years and older were 45% (95% CI 7%–97%) higher (Table 2). The effect of age on PRWHE scores did not change significantly over time (F test for interaction between time and age group (6 df)=1.829,  $P = .09$ ). The effects of fracture type and age on PRWHE scores did not relevantly change after inclusion of potential confounders in the final model (Table 2).

#### Effect of age and fracture type on pain

After 6 months of follow up, 83.2% of the patients reported mild or no pain. Mild or no pain after 1 year follow up was experienced

by 84.5% of the patients. The unadjusted median VAS pain scores during movement were generally lower for the AO type B fractures (Fig. 2B), although the differences were only statistically significant after 6 weeks and 1 year (Kruskal Wallis test,  $P < .05$ ). In the base linear mixed model, pain scores of patients with a type B fracture were 70% (95% CI 57%–85%) lower on average than the scores of patients with a type A fracture (Table 2). The effect of fracture type on PRWHE scores did not change over time (F test for interaction between time and fracture type (6 df)=0.886,  $P = .50$ ), so this interaction term was not included in the base model. Patients of 50 years and older reported higher PRWHE scores after 6 weeks and 3 months compared to younger patients (Kruskal Wallis test,  $P < .05$ ; Fig. 3B). In the base linear mixed model, the effect of age on pain scores also changed over time (F test for interaction between time and age group (6 df)=2.642,  $P = .015$ ). This interaction term

**Table 2**

Linear mixed models predicting functional outcome (measured using the PRWHE questionnaire) and pain during movement (measured using a Visual Analogue Scale) over time in patients with a distal radius fracture

Outcome	Base model <sup>1</sup>		Adjusted model	
	Estimate (95% confidence interval) <sup>2</sup>	P value	Estimate (95% confidence interval) <sup>2</sup>	P value
PRWHE				
Intercept	26.66 (20.95-33.95)	<.0001	29.34 (19.45-44.26)	<.001
Time <sup>3</sup>		<.0001		<.001
3 mo	0.44 (0.38-2.01)	<.0001	0.44 (0.38-2.00)	<.001
6 mo	0.21 (0.19-0.24)	<.0001	0.21 (0.18-0.24)	<.001
1 y	0.14 (0.12-0.16)	<.0001	0.14 (0.12-0.16)	<.001
AO fracture type <sup>4</sup>		.001		.004
B	0.53 (0.37-0.78)	.001	0.60 (0.42-0.85)	.005
C	1.16 (0.89-1.52)	.280	1.18 (0.90-1.55)	.222
Age category <sup>5</sup>		.022		.045
50-69 y	1.41 (1.08-1.84)	.018	1.37 (1.06-1.77)	.017
70+ y	1.45 (1.07-1.97)	.012	1.34 (0.99-1.82)	.062
Fracture of dominant wrist <sup>6</sup>	-	-	1.09 (0.88-1.36)	.431
Conservative treatment <sup>7</sup>	-	-	0.73 (0.52-1.03)	.069
Baseline PRWHE score <sup>8</sup>	-	-	1.02 (1.10-1.03)	<.001
VAS pain				
Intercept	3.30 (2.85-3.83)	<.0001	3.69 (2.91-4.67)	<.001
Time <sup>3</sup>		<.0001		<.001
3 mo	0.72 (0.63-0.83)	<.0001	0.72 (0.63-0.83)	<.001
6 mo	0.58 (0.50-0.67)	<.0001	0.58 (0.50-0.67)	<.001
1 y	0.56 (0.48-0.65)	<.0001	0.56 (0.48-0.65)	<.001
AO fracture type <sup>4</sup>		.001		.004
B	0.70 (0.57-0.85)	<.0001	0.72 (0.59-0.88)	.001
C	1.05 (0.90-1.21)	.562	1.01 (0.87-1.18)	.87
Age category <sup>5</sup>		.027		.023
50-69 y	1.41 (1.18-1.68)	<.0001	1.40 (1.18-1.67)	<.001
70+ y	1.31 (1.07-1.60)	.009	1.37 (1.11-1.68)	.003
Interaction time*age category		.015		.015
3 mo / 50-69 y	0.94 (0.79-1.11)	.452	0.94 (0.79-1.12)	.477
6 mo / 50-69 y	0.83 (0.70-0.99)	.044	0.84 (0.70-1.02)	.052
1 y / 50-69 y	0.72 (0.60-0.86)	<.0001	0.72 (0.60-0.86)	<.001
3 mo / 70+ y	0.95 (0.78-1.16)	.621	0.93 (0.76-1.13)	.454
6 mo / 70+ y	0.85 (0.70-1.04)	.120	0.84 (0.68-1.03)	.086
1 y / 70+ y	0.77 (0.63-0.94)	.009	0.72 (0.59-0.89)	.002
Fracture of dominant wrist <sup>6</sup>			1.03 (0.91-1.16)	.695
Conservative treatment <sup>7</sup>			0.83 (0.69-0.99)	.044
Baseline VAS pain <sup>8</sup>			1.02 (1.00-1.03)	.012

<sup>1</sup> Model with timepoint, age category and fracture type as independent variables.

<sup>2</sup> Model estimates after back transformation to the PRWHE scale: EXP[model estimate].

<sup>3</sup> Compared to time=6 weeks (reference).

<sup>4</sup> Compared to fracture classification A (reference).

<sup>5</sup> Compared to age group 18-49 (reference).

<sup>6</sup> Compared to fracture on the non-dominant side (reference).

<sup>7</sup> Compared to operative treatment (reference).

<sup>8</sup> Per 10% increase.

was therefore included in the base model (Table 2). Compared to the patients younger than 50 years, pain scores of 50-69 year-old patients were 41% (95% CI 18%-68%) higher at 6 weeks, 33% (ie 1.41\*0.94 times) higher at 3 months, 17% (ie 1.41\*0.83 times) higher at 6 months and not (ie 1.41\*0.72=1.02 times) higher at 1 year (Table 2). For patients aged 70 years and older, pain scores were 31% times higher at 6 weeks, 25% (ie 1.31\*0.95 times) higher at 3 months, 11% (ie 1.31\*0.85 times) higher at 6 months and not (ie 1.31\*0.77=1.01 times) higher at 1 year compared to patients younger than 50 years (Table 2). The effects of fracture type and age on pain scores did not relevantly change after inclusion of potential confounders in the final model (Table 2).

#### Tingling, weakness, and stiffness

In the cohort, 26.6% reported moderate to severe tingling at 6 weeks which decreased to 8.2% after 1 year (Fig. 4). Patients with a type B fracture had a 41% (95% CI 18%-94%) lower risk of tingling compared to patients with a type A fracture. Patients of 50

years and older had a more than twofold risk of tingling compared to younger patients (50-69 years: OR=2.24, 95% CI 1.27-3.95; 70+ years: OR=2.15, 95% CI 1.14-4.06). No interaction with time was found. The results of the base model were not affected much by adjusting for confounding (Table 3).

Weakness was reported by 58.5% of the patients at 6 weeks and by 12.4% after 1 year (Fig. 4). Presence of weakness was not associated with fracture type. Patients aged 50-69 years had an increased risk of weakness (OR=1.74, 95% CI 1.09-2.78). No interaction with time was found. The results of the base model stayed unchanged after adjusting for confounders (Table 3).

Presence of stiffness decreased from 55.1% at 6 weeks to 15.1% at 1 year follow up. Compared to patients with a type A fracture, patients with a type B fracture had a lower risk of stiffness (0.54, 95% CI 0.30-0.98) and patients with a type C fracture had an increased risk (OR 1.83, 95% CI 1.16-2.88). No interaction with time was found. (Table 3). There was no statistically significant effect of age on presence of stiffness. The results of the base model remained unchanged after including potential confounders.

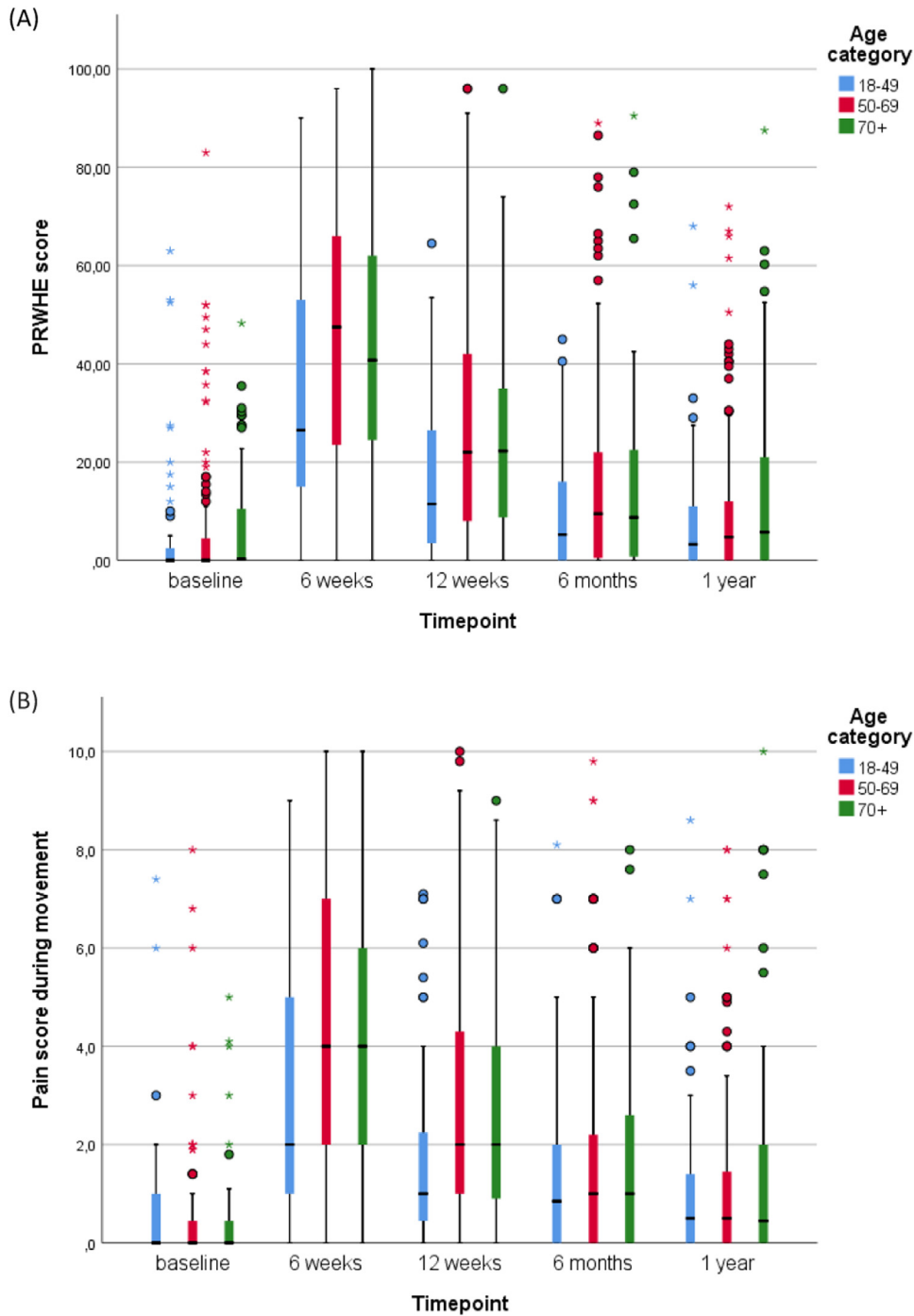


Fig. 3. Unadjusted scores for (A) the PRWHE questionnaire and (B) pain during movement measured using a VAS over time after a distal radius fracture per age category.

*Limitations in work and other daily activities*

At 6 weeks, 51.5% of the patients reported moderate or worse limitations in their work or other regular daily activities due to their fracture. This percentage decreased in time to 20.7% at 3 months, 8.5% at 6 months and 6.2% at 1 year (Fig. 5). Patients with a type B fracture had a decreased risk of moderate or worse limitations in work or daily activities (OR 0.36, 95% CI 0.18-0.71). Patients older than 50 years had a higher risk of limitations in work or daily activities compared to younger patients (50-69 years: OR 2.33, 95% CI 1.35-4.02; 70+ years: OR=2.27, 95% CI 1.26-4.10). No interaction with time was found. The re-

sults of the base model remained the same after correction for confounders.

**Discussion**

In this secondary, retrospective analysis of data from a prospective multicenter cohort with 12 months of follow-up, we found a stable and predictable course of functional recovery assessed by PROMs after DRF within 1-year time period. The results showed that irrespective of age and fracture type, the functional recovery after a DRF is good with an average PRWHE functional score that is only marginally worse after 1 year compared to baseline.

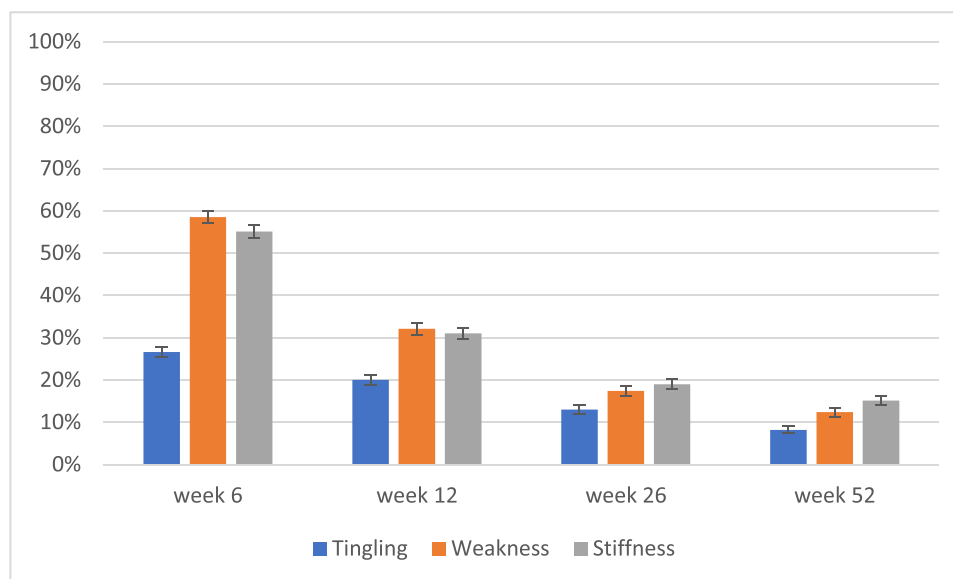


Fig. 4. Percentage of patients with complaints of moderate to extreme tingling, weakness and stiffness during follow up. Bars represent the standard error.

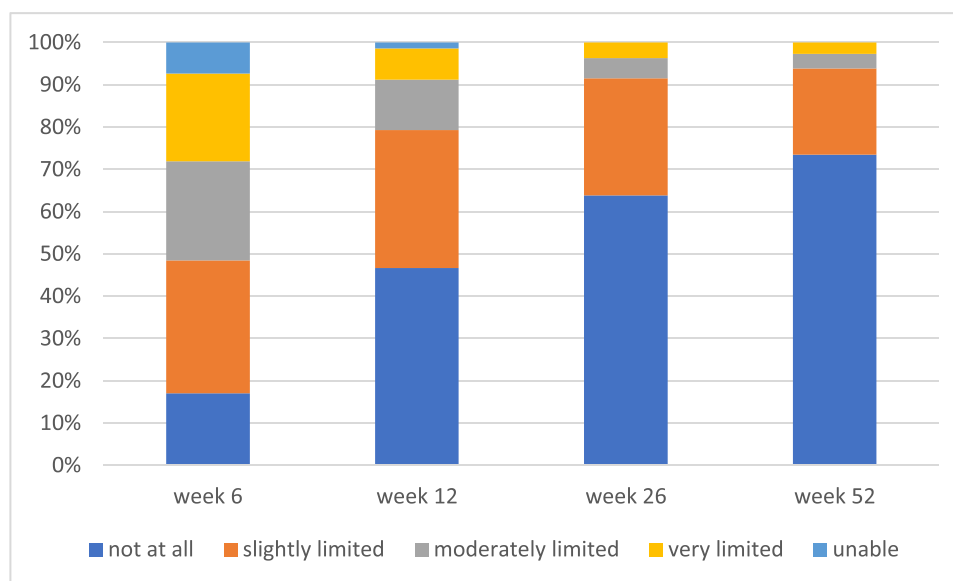


Fig. 5. Limitations in work or other regular daily activities during follow-up.

DRFs are common and research has been focused on determining optimal surgical therapy, but do not provide much data for managing patient expectations.

The information in literature and presented in this study can be used to manage patients' expectations about the course of recovery. If the PROMS data are presented or explained to patients in selected time intervals, they can guide patients in their recovery. Expectations on the "usual" complaints during rehabilitation will comfort patients in their recovery. Providing understandable insight into their own recovery process, will decrease duration of control appointments.<sup>13</sup> With the data, E-health innovations such as apps and online scoring lists could also be used in the near future: ie normal recovery with build-in cut-off values for impaired recovery can be followed up with alerts for arranging outpatient control. Hughes et al. and Little et al. described a virtual fracture clinic as an efficient

follow-up system after hand and wrist fractures. Their analysis showed excellent functional outcome and good satisfaction scores.<sup>14,15</sup> Expectation management, cut-off points and knowledge on uncomplicated recovery after DRF will make this follow up possible.

The results showed better functional outcome in patients with AO type B fractures than those with AO types A and C. Up to 3 months, the median PRWHE score of patients with a type B fracture was more than 10 points lower than for other fracture types (Fig. 2A), which can be interpreted as a clinically meaningful difference from the patients' perspective.<sup>16</sup> This is in line with the literature that showed better functional outcome in patients with AO type B fractures on short and longer term than those with AO type A and C fractures.<sup>3,5</sup> Recent literature, eg the VIPER trial described worse outcome for non-complex type A fracture compared to type B fractures.<sup>17</sup>

**Table 3**  
Generalized estimating equations logistic regression models predicting symptoms and limitations in work and daily activities over time in patients with a distal radius fracture

Outcome	Base model <sup>1</sup>		Adjusted model	
	Odds ratio (95% confidence interval)	P value	Odds ratio (95% confidence interval)	P value
<b>Tingling</b>				
Intercept	0.21 (0.125-0.36)	<.0001	0.26 (0.13-0.55)	<.001
Time <sup>2</sup>		<.0001		<.001
3 mo	0.70 (0.50-0.97)	.034	0.67 (0.47-0.94)	.02
6 mo	0.39 (0.27-0.58)	<.0001	0.39 (0.26-0.58)	<.001
1 y	0.24 (0.15-0.38)	<.0001	0.23 (0.14-0.37)	<.001
AO fracture type <sup>3</sup>		.106		.162
B	0.41 (0.18-0.94)	.035	0.45 (0.20-1.03)	.057
C	0.97 (0.60-1.59)	.915	0.97 (0.59-1.59)	.894
Age category <sup>4</sup>		.017		.012
50-69 y	2.24 (1.27-3.95)	.005	2.27 (1.26-4.07)	.006
70+ y	2.15 (1.14-4.06)	.017	2.51 (1.29-4.89)	.007
Fracture of dominant wrist <sup>5</sup>	-		1.36 (0.88-2.11)	.168
Conservative treatment <sup>6</sup>	-		0.64 (0.35-1.14)	.128
<b>Weakness</b>				
Intercept	0.99 (0.64-1.53)	.970	1.27 (0.65-2.46)	.484
Time <sup>2</sup>		<.0001		<.001
3 mo	0.33 (0.25-0.43)	<.0001	0.32 (0.24-0.43)	<.001
6 mo	0.15 (0.10-0.21)	<.0001	0.14 (0.10-0.21)	<.001
1 y	0.10 (0.06-0.14)	<.0001	0.09 (0.06-0.14)	<.001
AO fracture type <sup>3</sup>		.051		.058
B	0.57 (0.31-1.06)	.074	0.59 (0.32-1.10)	.098
C	1.35 (0.86-2.12)	.192	1.37 (0.87-2.15)	.172
Age category <sup>4</sup>		.068		.050
50-69 y	1.74 (1.09-2.78)	.021	1.78 (1.10-2.86)	.018
70+ y	1.50 (0.88-2.56)	.141	1.72 (0.99-2.99)	.054
Fracture of dominant wrist <sup>5</sup>	-		1.13 (0.77-1.66)	.541
Conservative treatment <sup>6</sup>	-		0.68 (0.39-1.18)	.174
<b>Stiffness</b>				
Intercept	0.97 (0.64-1.46)	.871	1.57 (0.82-3.03)	.177
Time <sup>2</sup>		<.0001		<.001
3 mo	0.35 (0.26-0.45)	<.0001	0.33 (0.25-0.44)	<.001
6 mo	0.18 (0.13-0.25)	<.0001	0.17 (0.12-0.24)	<.001
1 y	0.13 (0.09-0.19)	<.0001	0.13 (0.08-0.19)	<.001
AO fracture type <sup>3</sup>		.001		.002
B	0.54 (0.30-0.98)	.043	0.54 (0.30-0.98)	.041
C	1.83 (1.16-2.88)	.009	1.75 (1.11-2.77)	.017
Age category <sup>4</sup>		.087		.134
50-69 y	1.51 (0.96-2.39)	.077	1.55 (0.98-2.46)	.063
70+ y	0.97 (0.56-1.68)	.911	1.12 (0.64-1.97)	.692
Fracture of dominant wrist <sup>5</sup>	-		1.17 (0.80-1.73)	.420
Conservative treatment <sup>6</sup>	-		0.52 (0.30-0.90)	.018
<b>Limitations in work/daily activities</b>				
Intercept	0.60 (0.37-0.97)	.036	0.51 (0.24-1.11)	.089
Time <sup>2</sup>		<.0001		<.001
3 mo	0.23 (0.17-0.31)	<.0001	0.22 (0.16-0.30)	<.001
6 mo	0.08 (0.05-0.12)	<.0001	0.07 (0.05-0.11)	<.001
1 y	0.06 (0.04-0.09)	<.0001	0.05 (0.03-0.08)	<.001
AO fracture type <sup>3</sup>		.002		.001
B	0.36 (0.18-0.71)	.003	0.38 (0.19-0.75)	.005
C	1.42 (0.88-2.31)	.155	1.54 (0.95-2.50)	.082
Age category <sup>4</sup>		.006		.004
50-69 y	2.33 (1.35-4.02)	.002	2.42 (1.38-4.23)	.002
70+ y	2.27 (1.26-4.10)	.007	2.56 (1.38-4.23)	.003
Fracture of dominant wrist <sup>5</sup>	-		1.42 (0.92-2.20)	.110
Conservative treatment <sup>6</sup>	-		0.95 (0.49-1.85)	.875

<sup>1</sup> Model with timepoint, fracture type and age category as independent variables.

<sup>2</sup> Compared to time=6 weeks (reference).

<sup>3</sup> Compared to fracture classification A (reference).

<sup>4</sup> Compared to age group 18-49 (reference).

<sup>5</sup> Compared to fracture on the non-dominant side (reference).

<sup>6</sup> Compared to operative treatment (reference).

Pain is an important parameter in recovery, patients describe recovery as “good recovery” when they have no pain. Multiple studies have described the course of and predictors for pain after DRF.<sup>17,18,19</sup> This study shows comparable overall outcomes after DRF between the patients with different fracture types and age groups after 1 year and 85% of the patients reported minimal

to no pain after 1 year. Patients with type B fractures had less pain than the other fracture groups up to 1 year after fracture. More pain is described in patients with inadequately reduced fractures, and in patients with a lower educational level.<sup>18,19,20</sup> The association between more pain and lower education might explained by the type of job of lower educated patients, which

might be more physical and also not permit as much time off. Moore et al. described 11% of the patients suffering moderate to severe pain 1 year after DRF, which is comparable with 15% in our cohort. Previous studies indicate that elderly patients experience more pain and have reduced function after a DRF, even after 6 months and 1 year.<sup>21</sup> Bobos et al. showed worse dexterity with increasing age.<sup>22</sup> Using measurement tools for dexterity is, besides PROMs, a good alternative for measuring outcome after DRF.<sup>23</sup> This is in line with our study, which showed that patients older than 50 years had more complaints during early recovery.

Less described complaints after DRF are tingling, weakness and stiffness. These complaints are less noticed, but can be invalidating and need to be explained in expectation management. Tingling, weakness or stiffness were reported by 55%–60% of the overall cohort after 6 weeks, while 10%–15% had persisting complaints at 1 year. Younger patients reported less problems with work or other daily activities and less complaints of tingling, weakness and stiffness. Patients with AO type C fracture and operatively treated patients complained significantly more frequently of stiffness.

A strength of this prospective study is the large and multicenter cohort of patients with DRFs which provides a good overview of functional recovery during a relevantly follow-up period of 1 year. A few prior studies used such a large group (N>300) or described this population. Another strength is that queries were also taken at baseline. These data enable a comparison of functional outcomes with the pre-fracture status, which is important information for treating surgeons.

Also, this study has limitations that should be considered when interpreting the results. Firstly, participation decreased over time, indicating fewer results after 1 year compared to the original sample size at the baseline. Patients with an uncomplicated course might be more inclined to stop responding, leading to selection bias due to loss of follow-up. According to Fogel et al, usability of different studies on PROMs in DRF is limited, but collection of PROMs in the treatment of DRFs can give insight into the most important outcomes for patients. This study shows the possibility to inform patients about their recovery using collected PROMs.<sup>24</sup> Furthermore, our analysis did not take into account that this was a secondary analysis of a previously conducted randomized controlled trial studying the effect of reduced radiographic imaging in the follow-up after a distal radius fracture. However, we believe it to be unlikely that this may have affected the results of the present study, because the characteristics of the patients in both arm were very similar and because there were no differences in outcomes between the intervention groups.<sup>7</sup>

Concluding, the functional recovery after a DRF is predictable in time with functional outcome scores after 1-year follow-up that are similar to pre-fracture values. Some outcomes after DRF differ between age and fracture type groups. The results of this study could be relevant for managing expectations during functional recovery in patients with DRFs. In their outpatient follow-up, surgeons should use the presented data involving complaints such as tingling, stiffness and pain levels within different time intervals during their 1-year recovery.

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# JHT Read for Credit

## Quiz: # A02

**Record your answers on the Return Answer Form found on the tear-out coupon at the back of this issue or to complete online and use a credit card, go to [JHTReadforCredit.com](https://www.jhtreadforcredit.com). There is only one best answer for each question.**

- # 1. Traditional outcome parameters such as X-ray and ROM
- are notoriously unreliable for measuring success
  - have been abandoned by the ASSH
  - have a poor correlation with patients' perception of outcomes
  - have an excellent correlation with patients' perception of outcomes
- # 2. Subjects were
- a prospective cohort
  - a retrospective cohort
  - all 65 years old or older
  - all under 65 years old
- # 3. Outcome measures included
- the DASH
  - the PRWHE
  - a VAS
  - all of the above
- # 4. Which category had better scores throughout
- A
  - B
  - C
  - D
- # 5. The PROMs showed a stable and predictable course of functional recovery over the term of the investigation
- not true
  - true

When submitting to the HTCC for re-certification, please batch your JHT RFC certificates in groups of 3 or more to get full credit.