

**Factors influencing self-perceived functioning after volar locking plate fixation of distal radius fractures  
a scoping review protocol**

Boel, Susanne; Vinther, Anders; Hansen, Alice Ørts; Juhl, Carsten Bogh; Landgren, Marcus; Kristensen, Hanne Kaae

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# 1 Factors influencing self-perceived functioning after volar locking 2 plate fixation of distal radius fractures: a scoping review protocol

## 3 4 **Abstract**

5 **Objective:** The objective of this review is to give an overview of the demographic, peri-, and  
6 postoperative factors that have been assessed for influence on self-perceived functioning at least  
7 three months after volar locking plate fixation of a distal radius fracture.

8  
9 **Introduction:** Most patients treated with a volar locking plate for a distal radius fracture recover  
10 within months after surgery; however, a subgroup of patients experience complications and slow  
11 recovery. A variety of demographic, peri-, and postoperative factors may influence self-perceived  
12 functioning. To facilitate functioning after surgery, supervised rehabilitation can be offered by a  
13 hand therapist. In the decision-making process about which patients to offer supervised  
14 rehabilitation, demographic, peri-, and postoperative factors may provide additional information,  
15 but no updated overview of explored factors has been found.

16  
17 **Inclusion criteria:** This review will consider all studies reporting on peri- and postoperative factors  
18 identified within six weeks after surgery, or demographic factors assessed for influence on self-  
19 perceived functioning experienced by patients at least three months after volar locking plate fixation  
20 of distal radius fractures.

21  
22 **Methods:** MEDLINE, CINAHL, Embase, Cochrane Library, PsycINFO, SPORTSdiscus, and Web of  
23 Science will be searched for eligible studies. The review will consider peer-reviewed studies  
24 published after 2005 in English and Scandinavian languages. Two reviewers will independently  
25 perform study selection and data extraction. Following a content analysis of each identified factor,  
26 the factors will be mapped to the International Classification of Functioning, Disability and Health  
27 (ICF) components by using the ICF linking rules. An overview will be depicted graphically or in tabular  
28 format for different timepoints based on assessment of the self-perceived functioning.

29  
30 **Keywords:** distal radius fracture; functioning; patient-reported outcome measures (PROM);  
31 supervised rehabilitation; volar locking plate

## 32 Introduction

33 Distal radius fracture is common in older adults.<sup>1</sup> After a distal radius fracture, the intervention aims  
34 at restoring the anatomical alignment either non-surgically or surgically.<sup>2</sup> Displaced and non-  
35 reducible distal radius fractures are commonly treated with open reduction and internal fixation  
36 with a volar locking plate to stabilize the fracture and promote functioning.<sup>3</sup> Some studies have  
37 proved that treating patients surgically with a volar locking plate achieves better self-perceived  
38 functioning compared with patients treated non-surgically.<sup>3</sup>

39 Functioning can be described as a dynamic and multifaceted experience and encompasses all  
40 aspects of living with a health condition,<sup>4</sup> such as a distal radius fracture.<sup>5</sup> A practical definition of  
41 functioning can be found in the International Classification of Functioning, Health and Disability  
42 (ICF)<sup>4</sup> biopsychosocial framework and addresses body functions and structures, as well as activities  
43 and participation influenced by contextual factors, including personal and environmental factors.<sup>6</sup>  
44 Impairments (changes in structure and function, eg, decreased range of motion), activity limitations  
45 (limitations in performance of activities, eg, wringing a cloth), and participation restrictions  
46 (decreased ability to participate in life situations and valued roles, eg, being a grandparent assisting  
47 grandchildren) are all terms used to describe a decrease in functioning for the individual.<sup>6</sup>

48 The patient perspective is important in describing the experiences of living with a health condition in  
49 a specific context.<sup>7</sup> The patient's perception of functioning can partly be captured in patient-  
50 reported outcome measures (PROMs).<sup>8</sup> Patient-reported outcome measures such as Disability of the  
51 Arm, Hand and Shoulder (DASH)<sup>9</sup>, QuickDASH,<sup>10</sup> Patient-Rated Wrist Evaluation (PRWE),<sup>11</sup> and the  
52 Michigan Hand Outcome Questionnaire (MHQ)<sup>12</sup> are frequently used with patients with distal radius  
53 fractures.<sup>13</sup> Changes in self-perceived functioning after volar locking plate fixation due to a distal  
54 radius fracture has been analyzed in a systematic review that identified substantial improvements in  
55 the first three months after surgery, and thereafter the improvements plateaued.<sup>14</sup>

56 To promote functioning and improve patients' everyday lives, rehabilitation starts within six weeks  
57 after volar locking plate fixation.<sup>15</sup> Most patients treated surgically after a distal radius fracture  
58 recover well; however, a subgroup of patients experience complications and slow recovery.<sup>16</sup>  
59 Guidelines recommend that patients with slow recovery should be referred to hand therapy<sup>2,17</sup> to  
60 improve their functioning.<sup>2,18</sup> One study found that at least one-fifth of the patients with a distal  
61 radius fracture were offered supervised rehabilitation by a hand therapist. However, patients who  
62 were surgically treated were more likely to be referred to hand therapy than patients who were  
63 treated non-surgically.<sup>18</sup> Furthermore, the researchers found substantial variance in referral  
64 practice,<sup>18</sup> and because of lack of evidence,<sup>19</sup> it can be difficult to determine the best form of  
65 rehabilitation. Therefore, which patients are offered supervised rehabilitation is at the discretion of  
66 the hand surgeon or hand therapist and often based on impairment measures,<sup>19</sup> although, in

67 patients with upper extremity injuries, other factors such as social and psychological factors were  
68 more often associated with disability than impairment measures.<sup>20</sup>

69 In the decision-making process regarding which patients are offered supervised rehabilitation, a  
70 variety of factors may be considered. Factors within the first six weeks after surgery and  
71 demographic factors may influence the patients' self-perceived functioning at three months and  
72 thereafter. Factors impacting self-perceived functioning after a distal radius fracture managed non-  
73 surgically or surgically (volar locking plate, Kirschner wires, or external fixation) were summarized in a  
74 literature review by MacIntyre and Dewan.<sup>1</sup> Age, workers' compensation, and education level were  
75 factors associated with self-perceived functioning. MacIntyre and Dewan's literature review was  
76 published in 2016<sup>1</sup> and a preliminary search revealed studies published more recently that can  
77 provide additional knowledge. For example, pre-injury activity level could predict self-perceived  
78 function in a study retrospectively analyzing prospectively collected data.<sup>21</sup> In another recent study  
79 analyzing data retrospectively, self-perceived functioning did not differ in patients with a body mass  
80 index (BMI) of  $\geq 30$  or a BMI of  $< 30$ .<sup>22</sup> In the same study, non-smokers reported a better self-  
81 perceived function compared to smokers three months after surgery.<sup>22</sup> A variety of different study  
82 designs exploring demographic, peri-, and postoperative factors assessed for influence on patients'  
83 self-perceived functioning may provide additional information in the decision-making process.

84 However, the factors found in the literature review<sup>1</sup> and recent original studies<sup>21,22</sup> exhibit significant  
85 differences which advocates for a scoping review for generating an overview of the extent and  
86 nature<sup>23</sup> of factors assessed in the literature.

87 Given the multitude of demographic, peri-, and postoperative factors, the ICF framework<sup>6</sup> can be  
88 used to map the factors and thus outline a broad and holistic overview of the evidence that will be  
89 identified in this scoping review. The biopsychosocial perspective in the ICF framework offers a  
90 comprehensive understanding of factors relevant for describing functioning<sup>6</sup> and highlights that all  
91 facets are relevant to all patients.<sup>6</sup> The ICF framework can be used to explore the impact of a health  
92 condition,<sup>4,6</sup> and, therefore, evaluate the impact of a distal radius fracture on functioning.<sup>5,24</sup> Hence,  
93 the ICF framework will be used to map demographic, peri-, and postoperative factors assessed for  
94 influence on patients' self-perceived functioning, and outline an overview of factors assessed in  
95 patients with a distal radius fracture after volar locking plate fixation. An overview will give an insight  
96 into the extent and nature of factors and may act as a precursor for a systematic review that can  
97 inform the development of a decision aid for shared decision-making and clinical decision-making  
98 about which patients should be offered supervised rehabilitation.<sup>23</sup>

99 A preliminary search of PubMed, the Cochrane Database of Systematic Reviews, and *JBI Evidence*  
100 *Synthesis* was conducted on 5 October 2021, and no current systematic reviews or scoping reviews  
101 on the topic were identified. However, a protocol for a systematic review with a meta-analysis aimed

102 at investigating predictors of pain and self-perceived functioning at six months after a distal radius  
103 fracture treated surgically or non-surgically was identified at PROSPERO.<sup>25</sup> Our scoping review has a  
104 broader view than this systematic review<sup>23</sup> and aims at providing an overview of demographic, peri-,  
105 and postoperative factors assessed for influence on self-perceived functioning and will include all  
106 study designs without any limitations regarding the timepoints for self-perceived functioning at  
107 three months and thereafter by patients with a distal radius fracture fixated with a volar locking  
108 plate. Our scoping review is not just an up-date of the literature review from 2016,<sup>1</sup> but will present  
109 a comprehensive and detailed overview of the extent and nature<sup>23</sup> of factors assessed for influence  
110 on self-perceived function, regardless of whether it is a positive or negative direction increasing the  
111 relevance for research and clinical practice.

112 The aim of this scoping review is to identify and systematically map demographic, peri-, and  
113 postoperative factors assessed for influence on self-perceived functioning after volar locking plate  
114 fixation of a distal radius fracture.

115

## 116 **Review question**

117 Which peri-, and postoperative factors identified within six weeks after surgery and demographic  
118 factors have been assessed for influence on self-perceived functioning at least three months after  
119 volar plate fixation of a distal radius fracture?

120

## 121 **Inclusion criteria**

122 The eligibility criteria were discussed and adapted by the authors of this scoping review protocol.  
123 Prior to this discussion, the titles and abstracts of 25 references from an initial limited search of  
124 MEDLINE (PubMed) were screened independently by the authors.

125

## 126 *Participants*

127 This scoping review will consider studies including adults ( $\geq 18$  years) undergoing open reduction  
128 and internal fixation with a volar locking plate after a distal radius fracture. Studies that included  
129 adults with different hand surgery conditions will be considered for inclusion if data can be extracted  
130 specific to adults with volar locking plate fixation after a distal radius fracture. Studies comparing  
131 volar locking plate fixation to non-surgical interventions, other surgical interventions for fixation of  
132 the distal radius fracture, or using older T-plates (ie, volar non-locking plates, or dorsal locking  
133 plates) will be included if data can be extracted specific to patients with volar locking plates.

134

## 135 *Concept*

136 The core concept of interest in this scoping review is factors influencing self-perceived functioning.  
137 Quantitative studies will be included if they report on peri- or postoperative factors assessed within  
138 the first six weeks after surgery, or demographic factors. In addition, included studies have to  
139 explore self-perceived functioning at least three months after surgery with PROMs, such as the  
140 DASH,<sup>9</sup> the QuickDASH, PRWE,<sup>11</sup> the Patient-Rated Wrist Hand Evaluation (PRWHE),<sup>11,26</sup> the MHQ,<sup>12</sup>  
141 or the BriefMHQ.<sup>27</sup> Further, qualitative studies will be included if the patients explored peri- or  
142 postoperative factors within the first six weeks after surgery, or demographic factors influencing  
143 their self-perceived functioning at least three months after surgery.  
144

## 145 *Context*

146 Studies from any context will be included regardless of origin of country or health care setting.

## 147 *Types of sources*

148 This scoping review will consider quantitative, qualitative, and mixed methods study designs for  
149 inclusion. Systematic reviews that meet the inclusion criteria will be identified in order to review  
150 their original source papers for potentially relevant studies.

151 Full-text, peer-reviewed studies are eligible; studies only available as protocols or abstracts will be  
152 excluded. Gray literature, such as unpublished studies, clinical guidelines, standards of care, or  
153 master and PhD theses, will be excluded as we cannot be sure of a formal peer-review process that  
154 ensures the academic scientific quality and, therefore, that it provides sufficient evidence for this  
155 scoping review to act as a precursor to a systematic review that can inform a future decision aid and  
156 clinical decision-making.  
157

## 158 *Methods*

159 The proposed scoping review will be conducted in accordance with the JBI methodology for scoping  
160 reviews.<sup>23</sup> Reporting of this scoping review will follow the Preferred Reporting Items for Systematic  
161 Reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR).<sup>28</sup>  
162

## 163 *Search strategy*

164 The search strategy aims to locate published peer-reviewed studies. An initial limited search of  
165 MEDLINE (PubMed) and CINAHL (EBSCO) was undertaken to identify articles on the topic. The text  
166 words contained in the titles and abstracts of relevant articles, and the index terms used to describe  
167 the articles, were used to develop a full search strategy for MEDLINE (PubMed; Appendix I). The  
168 search strategy, including all identified keywords and index terms, will be adapted to each of the

169 included databases. The reference lists of all included sources of evidence will be screened for  
170 additional studies.  
171 Studies published in English or Scandinavian languages will be included, due to the linguistic  
172 competencies of the authors. Studies published from 2005 onwards will be included, reflecting the  
173 timeframe during which open reduction and internal fixation with volar locking plates have become  
174 common practice.<sup>29</sup>  
175 The databases to be searched include MEDLINE (PubMed), CINAHL (EBSCO), Embase (Ovid),  
176 Cochrane Library (Cochranelibrary.com), PsycINFO (EBSCO), SPORTSdiscus (EBSCO), and for citation  
177 tracking, Web of Science (Clarivate).

178

### 179 *Study selection*

180 Following the search, all identified citations will be uploaded into Covidence systematic review  
181 software (Veritas Health Innovation, Melbourne, Australia) and duplicates removed. Following a  
182 pilot test of the first 25 citations, titles and abstracts will be screened by two independent reviewers  
183 for assessment against the inclusion criteria for the review. Potentially relevant studies will be  
184 retrieved in full and assessed in detail against the inclusion criteria by two independent reviewers.  
185 Any disagreements that arise between the reviewers at any stage of the selection process will be  
186 resolved through discussion or by arbitration with an additional reviewer.  
187 Any studies excluded at full text for not meeting the inclusion criteria will be recorded and reported  
188 in the scoping review. The results of the search and the study selection process will be presented in  
189 a PRISMA flow diagram.<sup>30</sup>

190

### 191 *Data extraction*

192 Data will be extracted from papers included in the scoping review by two independent reviewers  
193 using a data extraction form developed by the reviewers. The data extracted will include specific  
194 details about the population; study characteristics; post-operative rehabilitation; details about  
195 demographic, peri-, and postoperative factors; and details about self-perceived functioning (patients  
196 descriptions or patient reported outcomes). A draft data extraction form is provided (see Appendix  
197 II). The draft data extraction form will be modified and revised as necessary during the process of  
198 extracting data from each of the included studies. Modifications will be detailed in the scoping  
199 review. Any disagreements that arise between the reviewers will be resolved through discussion or  
200 by arbitration with an additional reviewer.

201

## 202 Data analysis and presentation

203 The ICF framework will be used to summarize and map the extracted factors. The content of each  
204 extracted factor will be identified using content analysis.<sup>31</sup> The factor will then be linked to the ICF  
205 component<sup>4</sup> that most precisely represents the content by using the ICF linking rules.<sup>30</sup> This can be  
206 illustrated by studies by Hooper et al. and Hall et al.<sup>21,22</sup> Hooper *et al.*<sup>21</sup> evaluated whether patients'  
207 physical activity level before the distal radius fracture influenced self-perceived functioning. Pre-  
208 injury physical activity level was stratified using the Rapid Assessment of Physical Activity (RAPA),  
209 measuring the level and intensity of physical activity affecting the heart rate.

210 The content in the factor "physical activity" is "heart rate." The specific ICF code for "Heart rate" is  
211 b4100 and physical activity measured as heart rate will, therefore, be mapped to the ICF component,  
212 "body functions and structures."<sup>4</sup> Hall *et al.*<sup>22</sup> analyzed whether BMI and smoking history influenced  
213 self-perceived functioning after volar plate fixation. The content of the factor "BMI" is "Weight  
214 maintenance function." The specific ICF code for Weight maintenance function is b530 and BMI will  
215 be mapped to the ICF component, "body functions and structures."<sup>4</sup> The content of the smoking  
216 history is a habit or lifestyle that is not classified in the ICF but belongs to the ICF component,  
217 "personal factors."<sup>4</sup> See Appendix III for a draft table.

218 Two reviewers will independently link the factors to the ICF components, and disagreements will be  
219 resolved through discussion or by arbitration with an additional reviewer.

220 Depending on the findings, the evidence may also be presented in tables or graphics for different  
221 timepoints based on the findings of timepoints for assessment of the patients' self-perceived  
222 functioning in the included studies. A summary will accompany the depicted results and will describe  
223 how the results relate to the scoping review's objective and research question.



## 224 **Author contributions**

225 All authors have made contributions to the conception of this protocol. SB, AV, AØH, and HKK  
226 conceived the study. SB, AV, and CBJ developed and piloted the data search strategy. SB and AV  
227 designed and piloted the data extraction tools. SB drafted the protocol and AV, AØH, CBJ, ML, and  
228 HHK reviewed the manuscript. All authors have given approval of the final version of the protocol.

## 229 **Conflicts of interest**

230 The authors declare no conflict of interest.

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317

318 **Appendix I: Search strategy**

319 **MEDLINE (PubMed)**

320 Search conducted on 22 October 2021

Search	Query	Records retrieved
#1a Radius fracture	"Radius fractures" [MeSH] OR "Wrist Injuries" [MeSH] OR "Radius fracture*" [TW] OR "Colles fracture*" [TW] OR "Wrist fracture*" [TW] OR "Smith* fracture*" [TW] OR "Barton* fracture*" [TW] OR "Radial fracture*" [TW]	17,470
#1b Volar plate fixation	"Fracture fixation, internal" [MeSH] OR "Bone plates" [MeSH] OR "Open fracture reduction" [MeSH] OR Osteosynthes* [TW] OR "Open reduction and internal fixation" [TW] OR ORIF [TW] OR "Internal fixation" [TW] OR "Plate fixation" [TW] OR "Volar locking plate" [TW] OR "Anterior locking plate*" [TW] OR "Surgical repair*" [TW]	70,233
#2 Functioning	Function* [TW] OR Disabilit* [TW] OR "Models, Biopsychosocial" [MeSH] OR "Biopsychosocial" [TW] OR "Patient reported outcome measures" [MeSH] OR "Patient-reported outcome*" [TW] OR "Patient-rated outcome*" [TW] OR "Patient-Rated Wrist Evaluation" [TW] OR PRWE [TW] OR "Patient-rated Wrist Hand Evaluation" [TW] OR PRWHE [TW] OR "Disability of the Arm, Shoulder and Hand" [TW] OR DASH [TW] OR QuickDASH [TW] OR "Michigan Hand Outcomes Questionnaire" [TW] OR MHQ [TW] OR "Brief Michigan Hand Outcomes Questionnaire" [TW] OR BriefMHQ [TW] OR "Qualitative Research" [MeSH] OR Interview* [TW] OR "Patient Preference" [Mesh] OR "Patient preference*" [TW] OR "Patient experience*" [TW] OR "Patient perception*" [TW] OR "Daily life" [TW] OR "Activities of daily living" [MeSH] OR "Activities of daily living" [TW] OR Activit* [TW] OR ADL [TW] OR Occupation* [TW] OR Participation [TW] OR "Social activit*" [TW]	7,810,495
#3	#1a AND #1b	5098
#4	#2 AND #3	2130
#5	Limits: year 2005 to present	1676

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323 Appendix II: Data extraction form <level 1 heading>

Scoping review details	Article #	Article #	Article #
Study characteristics			
- First author			
- Year			
- Country			
- Study aim			
- Study design			
- Sample size			
Population			
- Age			
- Gender			
Post-operative rehabilitation			
Single factor(s)/factors in model			
- Type			
- Timepoint of exploration			
Self-perceived functioning			
- Identifier (PROM, patient description)			
- Timepoint of exploration			