

# Translating the Strengthening and Stretching for Rheumatoid Arthritis of the Hand Programme from clinical trial to clinical practice: An effectiveness–implementation study

Hand Therapy  
2020, Vol. 25(3) 87–97  
© The Author(s) 2020



Article reuse guidelines:  
sagepub.com/journals-permissions  
DOI: 10.1177/1758998320948538  
journals.sagepub.com/home/ht



Esther Williamson<sup>1,\*</sup> , Cynthia Srikesavan<sup>1,\*</sup> ,  
Jacqueline Thompson<sup>2</sup>, Eda Tonga<sup>3</sup>, Lucy Eldridge<sup>4</sup>,  
Jo Adams<sup>5</sup> and Sarah E Lamb<sup>1,6</sup>

## Abstract

**Introduction:** The Strengthening and Stretching for Rheumatoid Arthritis of the Hand programme is a hand exercise programme for people with rheumatoid arthritis. It was clinically effective when delivered during a clinical trial but there was a need to evaluate translation into routine care.

**Methods:** We conducted an effectiveness–implementation study. We adapted the trial training into an online format for National Health Service hand therapists. Educational outcomes included confidence and capability to deliver the programme. Implementation outcomes included training reach and adoption. Therapists were invited to collect clinical outcomes. Patients receiving the programme provided data on function (Michigan Hand Questionnaire function scale), pain and grip strength at baseline, treatment discharge and four-month follow-up.

**Results:** A total of 790 therapists (188 National Health Service organizations) enrolled in the training; 584/790 (74%) therapists (162 National Health Service organizations) completed the training; 448/790 therapists (145 National Health Service organizations) (57%) evaluated the training and were confident (447/448, 99.8%) and capable (443/448, 99%) to deliver the programme with 85% intending to adopt it (379/448). Follow-up data were provided by 116/448 (26%) therapists. Two-thirds (77/116; 51 National Health Service organizations) reported adopting the programme. One hundred and eighteen patients (15 National Health Service trusts) participated. Patients reported improved function (mean change Michigan Hand Questionnaire scores: 10 (95% CI 6.5–13.6) treatment discharge; 7 (95% CI 3.8–10.2) 4-month follow-up). Grip strength increased 24.5% (left) and 31% (right). Pain was stable.

**Discussion:** Online training was an effective way to train therapists with good reach. Clinical outcomes were similar to the clinical trial providing preliminary evidence of successful translation into routine care.

## Keywords

Implementation, hand exercises, rheumatoid arthritis, online training

Date received: 22 April 2020; accepted: 20 July 2020

<sup>1</sup>Centre for Rehabilitation Research, Nuffield Department of Orthopaedics, Rheumatology and Musculoskeletal Sciences, University of Oxford, Oxford, UK

<sup>2</sup>Institute of Inflammation and Ageing, University of Birmingham, Birmingham, UK

<sup>3</sup>Department of Physiotherapy and Rehabilitation, Faculty of Health Sciences, Marmara University, Istanbul, Turkey

<sup>4</sup>Oxford Clinical Trials Research Unit, Nuffield Department of Orthopaedics, Rheumatology and Musculoskeletal Sciences, University of Oxford, Oxford, UK

<sup>5</sup>Health Sciences, University of Southampton, Southampton, UK

<sup>6</sup>College of Medicine and Health, University of Exeter, Exeter, UK

\*Joint first authors.

## Corresponding author:

Esther Williamson, Centre for Rehabilitation Research, Nuffield Department of Orthopaedics, Rheumatology and Musculoskeletal Sciences, Botnar Research Centre, Old Road, Headington, Oxford OX3 7LD, UK.

Email: esther.williamson@ndorms.ox.ac.uk

## Introduction

Rheumatoid arthritis (RA) is one of the most common form of inflammatory arthritis. It affects 1.4% of women and 0.7% of men in the UK.<sup>1</sup> RA commonly affects the hands and manifests as pain, swelling, stiffness and muscle weakness resulting in difficulty with everyday tasks and affecting quality of life.<sup>2-4</sup>

The Strengthening and Stretching for Rheumatoid Arthritis of the Hand (SARAH) programme is a tailored and progressive 12-week exercise programme designed to improve hand function in people with RA affecting their hands and wrists.<sup>5</sup> We demonstrated that the SARAH programme was clinically and cost-effective in a large clinical trial at 12-month follow-up and national guidelines recommend its use.<sup>6,7</sup> In the trial, therapists received face-to-face training to deliver the SARAH programme (one-half to one day in duration) but it was unfeasible to provide this training to facilitate implementation. Therefore, we adapted the face-to-face training into a free, online training course (iSARAH <https://isarah.octr.uox.ac.uk/>) to provide National Health Service (NHS) therapists with the knowledge and skills to deliver the SARAH programme to their patients and to facilitate the translation of an intervention designed for a clinical trial into routine NHS care.<sup>8</sup> Online training is easily accessed by large numbers of learners and is cost-effective in terms of time, effort and travel.<sup>9</sup> It has the potential to be an effective method of reaching and training health professionals on a large scale.<sup>10,11</sup> We followed best practice recommendations for developing the training.<sup>12</sup> A full description of iSARAH development is published elsewhere.<sup>8</sup> iSARAH was launched in April 2017.

The overall aim of this study was to evaluate translation of the SARAH programme into routine NHS care. The objectives were as follows:

1. To evaluate the education and implementation outcomes amongst NHS therapists who undertook the online training
2. To evaluate clinical outcomes in patients enrolled in a service evaluation and who received the SARAH programme as part of routine NHS care and to compare findings with those from the clinical trial.

## Methods

### Study design

We used an effectiveness–implementation hybrid study design based on implementation guidance produced by the USA Department of Veterans Health Administration.<sup>13</sup> We utilized a Hybrid Type III

design with two stages.<sup>13</sup> Stage 1 measured the impact of an implementation strategy and we evaluated the online training as way to facilitate translation into clinical practice using education and implementation outcomes. Stage 2 gathered information about the clinical effectiveness of the intervention being implemented in routine clinical practice rather than during a randomized controlled trial and we collected clinical outcomes to evaluate the impact on patients receiving the SARAH programme as part of routine care.

### Recruitment

**Stage 1.** We advertised iSARAH to the relevant professional groups (British Association of Hand Therapists, Chartered Society of Physiotherapy and Royal College of Occupational Therapists). We promoted iSARAH during conference presentations and on social media. Physiotherapists and occupational therapists with an NHS email address were eligible to register and access the iSARAH training.

**Stage 2.** Therapists who completed the training were invited to evaluate clinical outcomes in their patients who received the SARAH programme as part of routine care. Therapists who agreed to participate invited patients who they deemed suitable for the SARAH programme to take part in stage 2. The SARAH programme is recommended for adults experiencing difficulties with hand function with stable RA (defined as a stable drug regimen for at least three months or on no drugs). Patients were provided with an information sheet and those who chose to participate signed a consent form that included permission to share their contact details with the SARAH implementation team to collect follow-up data.

### Interventions

**Stage 1.** iSARAH has four modules covering the SARAH trial, SARAH programme, behavioural support strategies and how to deliver the programme to patients.<sup>8</sup> The main components of the SARAH programme are described below. We used written text, pictures, videos demonstrating the exercises and delivery of the programme including baseline setting, exercise progressions/regressions and behavioural support strategies, a self-assessment quiz to check and reinforce knowledge and a library of downloadable patient and therapist resources. The training takes 2–3 hours. After completing the modules and training evaluation, therapists downloaded their training certificates. The training can be viewed here: <https://isarah.octr.uox.ac.uk/>.

**Stage 2.** The SARAH programme was designed to be delivered to patients in six sessions with a therapist.

The programme consists of 11 mobility and 4 strengthening exercises supplemented with evidence-based behavioural support strategies such as an exercise diary, joint goal setting and action planning to encourage exercise adherence. Teaching the patient to progress and regress their exercises in response to their symptoms is a core component of the programme. A detailed description of the SARAH programme is available elsewhere.<sup>5</sup>

We anticipated from speaking with therapists that providing patients with the six sessions offered in the SARAH trial in routine NHS settings would be difficult. Therefore, the number of sessions was left to the discretion of the therapist. We recommended a minimum of four sessions to ensure exercise progression and the use of behavioural support strategies.

### Data collection

**Stage 1.** During registration, therapists provided demographic information, including profession, age, experience in treating people with RA and the average number of RA patients they treated each month. Therapists provided the name of the NHS Trust in which they worked to determine the reach of the training into the NHS.

On training completion, we collected education and implementation outcomes. Education outcomes included two items from the Perceived Confidence Scale to rate confidence and capability to deliver the SARAH programme.<sup>14</sup> Implementation outcomes, categorized according to the taxonomy proposed by Proctor et al.,<sup>15</sup> included implementation intention (adoption), satisfaction with the training (acceptability) and any potential barriers to implementation (appropriateness) (Table 1).

Therapists who completed all modules, the self-assessment quiz, training evaluation and downloaded the training certificate were classified as 'training completers'. Six months post-training, training completers were emailed a follow-up questionnaire to complete online to collect implementation outcomes (Table 1). We sent reminder emails to non-responders two and four weeks later. We asked if therapists had delivered the SARAH programme in clinical practice (adoption) and if so, the number of patients prescribed the programme in the past six months. We collected ratings on clinical usefulness (appropriateness), patient satisfaction (acceptability) and future intended use (adoption). Therapists were asked details of programme delivery (fidelity) and to identify aspects of the SARAH programme that were helpful or unhelpful in its implementation (appropriateness). Respondents who reported they had not implemented the programme

were asked to describe barriers to implementation (appropriateness).

**Stage 2.** Therapists were provided with booklets to collect patient data at the first and last (discharge) session. During session 1, patients provided demographic information and baseline ratings of hand function and pain. Hand function was measured by the Michigan Hand Outcomes Questionnaire – overall hand function scale (range 0–100; higher scores indicating better hand function).<sup>16</sup> This was the primary outcome for the SARAH trial, which would enable us to compare findings with the trial. Pain in hands and wrists was measured by a 5-point Likert scale ranging from 'Very mild' to 'Very severe'. If a dynamometer was available, therapists measured full-hand grip strength. The average of the three measurements was calculated for each hand in kilograms.

At the discharge session, patients provided ratings of hand function and pain, perceived usefulness and satisfaction with the programme, and self-rated improvement. Patient perceived usefulness and satisfaction were measured with 5-point Likert scale ranging from 'Not at all useful' to 'Extremely useful' and 'Very dissatisfied' to 'Very satisfied', respectively. Self-rated improvement was measured using a 7-point Likert scale of global rating of change (Completely recovered to Vastly worsened). Handgrip strength was re-assessed, where possible, by the therapist. The therapist also completed a treatment log to record patient attendance and use of the core components of the SARAH programme delivered during each session. On discharge, therapists returned the booklets to the SARAH implementation team. If the booklets were not returned then the study team contacted the therapists to encourage their return.

All patients were sent a four-month follow-up postal questionnaire and a postage-paid envelope to return it to the SARAH implementation team. Patients were asked to rate their pain, hand function, self-rated improvement and adherence to SARAH exercises at home. If the questionnaire was not returned after two weeks, then another was sent. If it was still not received after a further two weeks, then the patient was contacted by telephone and follow-up was completed over the phone where possible to minimize the amount of missing data.

### Sample size

**Stage 1.** The British Association of Hand Therapists had 500 members at the time of planning this study. We aimed to reach 50% of hand therapists so we set a target of training 250 NHS therapists to deliver the SARAH programme.

Table 1. Data collection.

Stage 1	Outcomes	Scales
On completion of online training Educational outcomes		
Implementation outcomes	Adoption	<p>Perceived confidence and capability: I feel confident/capable to implement the SARAH programme</p> <p>Implementation intention: I intend to use the SARAH programme in my clinical practice</p> <p>Barriers: Do you foresee any barriers to delivering the SARAH programme?</p> <p>Satisfaction: Please indicate how satisfied/dissatisfied you are with the training</p>
	Appropriateness	
	Acceptability	
Six-month follow-up Implementation outcomes	Adoption	<p>Actual use in practice: During the last six months, how many patients have received SARAH programme?</p> <p>Future intended use: During the next six months, I intend to use the SARAH programme in my clinical practice.</p> <p>Clinical usefulness: Please indicate how useful you think SARAH programme has been for helping your patients?</p> <p>Implementers: what do you find (1) useful and (2) unhelpful</p> <p>Non-implementers: what were the barriers?</p> <p>Patient satisfaction: Please indicate how satisfied you think patients have been with SARAH programme?</p> <p>Number of sessions used to deliver the SARAH programme</p> <p>Frequency of delivering individual components of the programme and provision of exercise equipment</p>
	Appropriateness	
	Acceptability	
	Fidelity	
	Clinical outcomes	
Stage 2		
	Demographics: age, sex, ethnicity, employment, handedness, disease duration	
	Self-reported hand function and pain	
	Grip strength (if possible)	
	Self-rated improvement	
	Patient satisfaction and perceived usefulness of the programme	
	Self-reported home exercise adherence	
	Attendance, components of the SARAH programme delivered	
		<p>1 – Not at all true to 7 – Very true</p> <p>Responses 1–3 = not confident or capable/Responses 4–7 = confident or capable</p> <p>1 – Strongly disagree to 7 – Strongly agree</p> <p>Responses 1–3 = not intending/Response 4 = unsure/Responses 5–7 = intending</p> <p>Yes/No, if yes, please indicate: Lack of time; Lack of suitable patients; No exercise equipment available; Other (Free text response)</p> <p>1 Not at all satisfied to 5 Extremely satisfied</p> <p>Responses 1–2 = not satisfied/Responses 3–5 = satisfied</p> <p>0, 1–5, 5–10, 11–15, 16–20, 21–25, ≥25</p> <p>1 – Strongly disagree to 7 – Strongly agree</p> <p>Responses 1–3 = not intending/Response 4 = unsure/Responses 5–7 = intending</p> <p>1 – Not at all useful to 5 – Extremely useful</p> <p>Responses 1–2 = not clinically useful/Responses 3–5 = clinically useful</p> <p>Free text</p> <p>1 – Not at all satisfied to 5 – Extremely satisfied</p> <p>Responses 1–2 = not satisfied/Responses 3–5 = satisfied</p> <p>1–6 sessions</p> <p>Always; Often; Sometimes; Rarely; Never</p> <p>Time points</p> <p>First session</p> <p>First session, discharge, four-month follow-up</p> <p>First session, discharge</p> <p>Discharge, 4-month follow-up</p> <p>Discharge</p> <p>4 months</p> <p>Each session – recorded in treatment log by therapist</p>

SARAH: Strengthening and Stretching for Rheumatoid Arthritis of the Hand.



**Stage 2.** We proposed a target of enrolling 100 patients in the 16-month study period. This was a pragmatic target based on the time frame we had available.

## Analysis

**Stage 1.** We summarized the post-training evaluation responses from the therapists. Ratings of capacity and capability to deliver the SARAH programme, and satisfaction with training and intention to implement were categorized as described in Table 1. Barriers to implementation were grouped into categories (by CS and checked by EW), and their frequency summarized. We compared characteristics of those completing the training with those who did not using a Mann–Whitney test.

Similarly, we summarized the six-month follow-up data as described in Table 1. Helpful and unhelpful aspects of the programme and barriers to implementation were grouped into categories (by CS and checked by EW), and their frequency summarized. We compared the characteristics of implementers and non-implementers, and those who completed follow-up and did not complete follow-up using a Chi-square test.

**Stage 2.** The Michigan Hand Questionnaire (MHQ) overall hand function scale and pain ratings were collected at session 1, discharge session and follow-up (four months). We anticipated that patients would complete their discharge session before the four-month follow-up. However, if patients attended the therapy sessions over a longer time frame than anticipated, we analysed the MHQ and pain rating in chronological order for those patients based on the date of data collection. We estimated changes in hand function, pain and grip strength between baseline and each follow-up point as mean or median difference (95% confidence interval, CI) using a paired t-test or Wilcoxon signed-rank test as appropriate. We also calculated Cohen's *d* in order to estimate an effect size which were interpreted as small (0.2), medium (0.5) and large (0.8).<sup>17</sup>

We summarized the number of hand therapy sessions provided, the core components delivered during the sessions and the number and proportion of participants in each response category for self-rated improvement, usefulness and satisfaction with the programme, home exercise adherence and frequency of home exercise sessions.

For all analyses, we used all available data, and as missingness varied, the contributors are not the same in all analyses.

## Results

### Stage 1

A total of 790 therapists were registered between 3 April 2017 and 30 September 2018. Therapists were from 188 NHS organizations across the UK and 6 non-NHS providers of NHS treatment (England) (Supplementary Table 1). Their demographic characteristics are presented in Table 2. The majority of registrants were female occupational therapists with a good spread across age groups. The majority reported a graduate-level professional education and less than five years of work experience. Over 90% of therapists reported treating at least some patients with RA each month, ranging from <5 to 11–15 per month.

**Training outcomes.** Of those registered, 448 therapists (57%) were classified as 'training completers'. There was at least one training completer from 145 different NHS organizations and 6 non-NHS providers of NHS treatment. However, a further 136 therapists (17%) completed all the modules but did not complete the self-assessment quiz or training evaluation so were unable to download the certificate. Module completers were from 85 different NHS organizations. In total, 584 (74%) therapists had undertaken all the modules needed to deliver the SARAH programme representing at least one therapist from 162 NHS organizations and 6 non-NHS providers of NHS treatment. Two hundred and six therapists (26%) did not complete the modules. The characteristics of training completers were compared to module completers and those who did not complete the modules (Table 2). Training completers and module completers reported treating more patients with RA than those who did not complete ( $p < 0.001$ ).

The majority of training completers felt confident (447/448, 99.8%) and capable (443/448, 99%) to deliver the SARAH programme and were satisfied (443/448, 99%) with the training. Nearly 85% (379/448) of training completers intended to use the programme, but 70% (314/448) anticipated potential barriers to implementation. Lack of time was the most anticipated barrier ( $n = 80$ ) followed by low numbers of suitable patients in their caseload ( $n = 48$ ) and lack of exercise equipment ( $n = 29$ ). A small number of therapists anticipated difficulty booking follow-up appointments and patient attendance, limited clinic space and changes in work role to be potential barriers.

**Implementation.** One hundred and sixteen out of 448 therapists (26%) provided six-month follow-up data. At least one therapist from 70 NHS organizations and 2 non-NHS providers of NHS treatment responded. There was a higher proportion of therapists

**Table 2.** Demographic characteristics of therapists registered between April 2017 and September 2018.

Characteristics	Total registrants N = 790 n (%)	Training completers <sup>a</sup> N = 448 n (%)	Module completers N = 136 n (%)	Did not complete modules N = 206 n (%)
Age				
21–30 years	181 (23%)	98 (22%)	27 (19.8%)	56 (27.2%)
30–40 years	270 (34%)	151 (33.7%)	44 (32.3%)	75 (36.4%)
40–50 years	212 (27%)	131 (29.2%)	38 (27.9%)	43 (20.9%)
>50 years	127 (16%)	68 (15.2%)	27 (19.8%)	32 (15.5%)
Gender				
Male	89 (11.2%)	51 (11.4%)	17 (12.5%)	21 (10.2%)
Female	701 (88.8%)	397 (88.6%)	119 (87.5%)	185 (89.8%)
Profession				
Occupational therapy	523 (66.2%)	313 (70%)	84 (61.76%)	125 (60.7%)
Physiotherapy	267 (33.8%)	135 (30%)	52 (38.24%)	81 (39.3%)
Qualification				
Graduate	552 (69.8%)	311 (69.4%)	97 (71.3%)	143 (69.4%)
Post-graduate	143 (18.1%)	78 (17.4%)	22 (16.2%)	43 (20.9%)
Other	95 (12%)	59 (13.2%)	17 (12.5%)	20 (9.7%)
Professional experience				
<5 years	375 (47.5%)	207 (46.2%)	61 (44.9%)	104 (50.5%)
5–10 years	178 (22.5%)	101 (22.5%)	35 (25.7%)	43 (20.9%)
11–15 years	114 (14.4%)	68 (15%)	16 (11.8%)	31 (15%)
>15 years	123 (15.5%)	72 (16.1%)	24 (17.6%)	28 (13.6%)
Average RA patients treated per month				
None	19 (2.4%)	4 (0.9%)	3 (2.2%)	12 (5.8%)
Less than 5	285 (36%)	141 (31.5%)	52 (38.2%)	93 (45.1%)
5–10	219 (27.7%)	124 (27.7%)	35 (25.7%)	61 (29.6%)
11–15	267 (33.7%)	179 (40%)	46 (33.8%)	40 (19.4%)

RA: rheumatoid arthritis.

<sup>a</sup>Therapists who completed modules, self-assessment and training evaluation survey, and downloaded training certificate.

with post-graduate qualifications amongst the responders (25% versus 15% of non-responders). Two-thirds of respondents (77/116) implemented the SARAH programme, and it was implemented by at least one therapist in 51 NHS organizations across the UK. Approximately, a third (32.5%) of implementers (25/77) had used the SARAH programme with 1–5 patients each month, 40% (31/77) used it with between 5 and 15 patients per month, and around 27% (21/77) of respondents used it with 15 or more patients each month. The majority of implementers reported that the programme was useful (75/77, 97%), would continue using the programme (67/77, 87%) and that their patients were satisfied with the programme (72/77, 93.5%).

Most commonly, therapists provided four sessions (25/77, 32.5%) with three sessions (20/77, 26%) and five sessions (15/77, 19.5%) being the next most commonly reported. A small proportion delivered the SARAH programme in one to two sessions (5/77, 6.5%) or six sessions (7/77, 9.1%). A small number of therapists (5/77, 6.5%) reported alternative methods

of delivery, such as incorporating the SARAH programme into the Lifestyle Management Programme. Many therapists (48/77, 62%) provided exercise equipment to their patients while the remaining advised patients on how to purchase equipment.

Patient education, exercises and the progression or regression of the exercises were the core components delivered by most therapists (Table 3). Therapists reported less frequent use of the behavioural elements. Forty per cent of therapists rarely or never used the exercise diary with their patients and 17% rarely or never used goal setting and exercise planning. Advice to continue the exercises long term was common (80%) but 8% of therapists rarely or never provided this advice.

Implementers described aspects of the programme that helped to implement it. They described the SARAH exercises as simple, clear, comprehensive and easy to implement and felt that the structured format and evidence-based background of the SARAH programme was helpful. The programme was appealing to patients as the exercises had been thoroughly

**Table 3.** Self-reports on the delivery of SARAH programme in daily practice (n = 77).

SARAH components	Always n (%)	Often n (%)	Sometimes n (%)	Rarely n (%)	Never n (%)
Patient education	47 (61)	20 (26)	7 (9.1)	3 (3.9)	0 (0)
Exercises	39 (50.6)	24 (31.1)	12 (15.6)	2 (2.6)	0 (0)
Progression/Regression	27 (35.1)	38 (49.4)	6 (7.8)	4 (5.2)	2 (2.6)
Goal setting, exercise planning	18 (23.4)	22 (28.6)	24 (31.2)	11 (14.3)	2 (2.6)
Exercise diary	9 (11.7)	13 (16.9)	22 (28.6)	18 (23.4)	15 (19.5)
Discharge advice	40 (52)	20 (26)	13 (16.9)	1 (1.3)	3 (3.9)
Continuing exercises long term	43 (55.8)	19 (24.7)	9 (11.7)	3 (3.9)	3 (3.9)

SARAH: Strengthening and Stretching for Rheumatoid Arthritis of the Hand.

tested, easy to follow and improved their hand function. Therapists said patients felt empowered to manage their hand arthritis symptoms and were motivated to adhere to the programme.

Fifty per cent of implementers described aspects that were unhelpful. Some felt it was time-consuming (including too much paperwork), that the number of recommended review sessions was not always feasible for them or patients and they had difficulty providing exercise equipment. Around 20% of therapists had not encountered any barriers to implementation.

Non-implementers reported the main barriers to implementation were lack of appropriate patients and time. Staff shortages, changes in current work role, difficulties in arranging follow-up sessions and using another hand exercise programme were also reported. These barriers were similar to those reported in the post-training questionnaire. The only difference between implementers and non-implementers was that implementers treated more patients with RA than the non-implementers.

## Stage 2

Between December 2017 and March 2019, 15 NHS trusts in England and 1 from Wales participated. One hundred and eighteen patients were enrolled from 15 trusts. Therapists returned 108 patient booklets to the SARAH implementation team. Data were available for 90% of patients at baseline (106/118) and 65.3% (77/118) at discharge. Approximately 85% (100/118) of patients returned the follow-up postal questionnaire or completed the follow-up over the telephone.

Of the 108 booklets, six patients had baseline data only. Five patients withdrew from the study (one prior to the treatment, three during treatment and one after treatment). A total of 97 patients with baseline and discharge or follow-up data were included in the analyses.

The majority of the patients were British (73/97, 75%) and female (78/97, 80%). Their mean age was

61.6 (SD 13.6) years. The median duration since their RA diagnosis was six (inter-quartile range (IQR), 1–17.1) years. Around 47% of patients were retired; 37% were employed full-time or part-time or self-employed, and 15.5% were not working. 88.7% of the patients were right-handed.

**SARAH programme delivery.** The median number of therapy sessions was 4 (IQR 2–5), but 48% of patients received less than the four recommended sessions. A small proportion (8/97, 8%) received a single session, 29% (28/97) received two sessions, 14% (14/97) received three sessions, 21% (20/97) received four sessions and 27% (26/97) received five or six sessions.

The median duration between baseline and discharge sessions was 108 (90–141) days. Fifteen out of 97 patients (15.5%) attended the therapy sessions over a longer time frame than anticipated (more than 12 weeks' duration).

**Content of sessions.** Nearly 75% of patients received joint protection education during their first therapy session. Ninety-seven per cent of patients were taught the exercises in the first session, and exercise progression/regression was carried out in over 80% of the review sessions. Many patients were taught goal setting and exercise planning strategies during the initial sessions (70% during session 1), but this was done less in later sessions. Reviewing progress using the exercise diary was reported in 70% of sessions. More than 80% of the patients received discharge advice, and 98% were advised on continuing the SARAH programme on a long-term basis. See Supplementary Table 2 for details.

**Clinical outcomes.** The median duration between baseline and postal/telephone follow-up was 147 days. Improvements in hand function were significant ( $p < 0.05$ ) at both discharge and at follow-up (Table 4). At discharge, we observed a medium effect size (Cohen's  $d = 0.7$  (95% CI 0.45–0.91)). At four months, the effect size had reduced but was still

Table 4. Stage 2 clinical outcomes.

Outcomes	Baseline (participants providing discharge data)				Discharge		Baseline (participants providing follow-up data)				Follow-up	
	Baseline		Mean [SD] or median (IQR)		N	Mean [SD] or median (IQR)	Mean or median change 95% CI		Mean [SD] or median (IQR)	N	Mean [SD] or median (IQR)	Mean or median change 95% CI
	Mean [SD] or median (IQR)	N	Mean [SD] or median (IQR)	Mean [SD] or median (IQR)			95% CI					
Hand function [0–100]	54.3 [19]	96	55.4 [18.4]	75	65.4 [18.1]	10 [6.5–13.6]	93	61.6 [19.5]	7 [3.8–10.2]			
Hand/wrist pain [0–5]	3 (2–3)	97	3 (2–4)	73	3 (2–3)	0 (–1 to 0)	94	3 (2–3)	0 (–1 to 0)			
Grip strength – left hand (kg)	14.3 [9.8]	88	14.3 [9.2]	67	17.8 [11.2]	3.4 (1.1–5.8)						
Grip strength – right hand (kg)	13.9 [8.7]	88	13.9 [8.7]	68	18.2 [10.9]	4.3 (2.2–6.3)						

CI: confidence interval; IQR: inter-quartile range; SD: standard deviation.

approaching a medium effect size (Cohen's  $d$  was 0.45 (95% CI 0.32–0.58)). Pain was stable over time. There were statistically significant improvements in grip strength at discharge. The left- and right-hand strength improved by 24.5 and 31%, respectively.

The majority of patients (85%) rated themselves as improved (slightly improved or much improved) at discharge with 74% rating themselves as improved at four-month follow-up (Figure 1). Most patients were satisfied with the programme (99%) and found it useful (99%). Ninety per cent reported that they were continuing to exercise at four-month follow-up. Around 33% had continued their exercises daily while about 32 and 30% were exercising 1–2 times and 3–4 times/ per week, respectively. No adverse events relating to the exercises were reported.

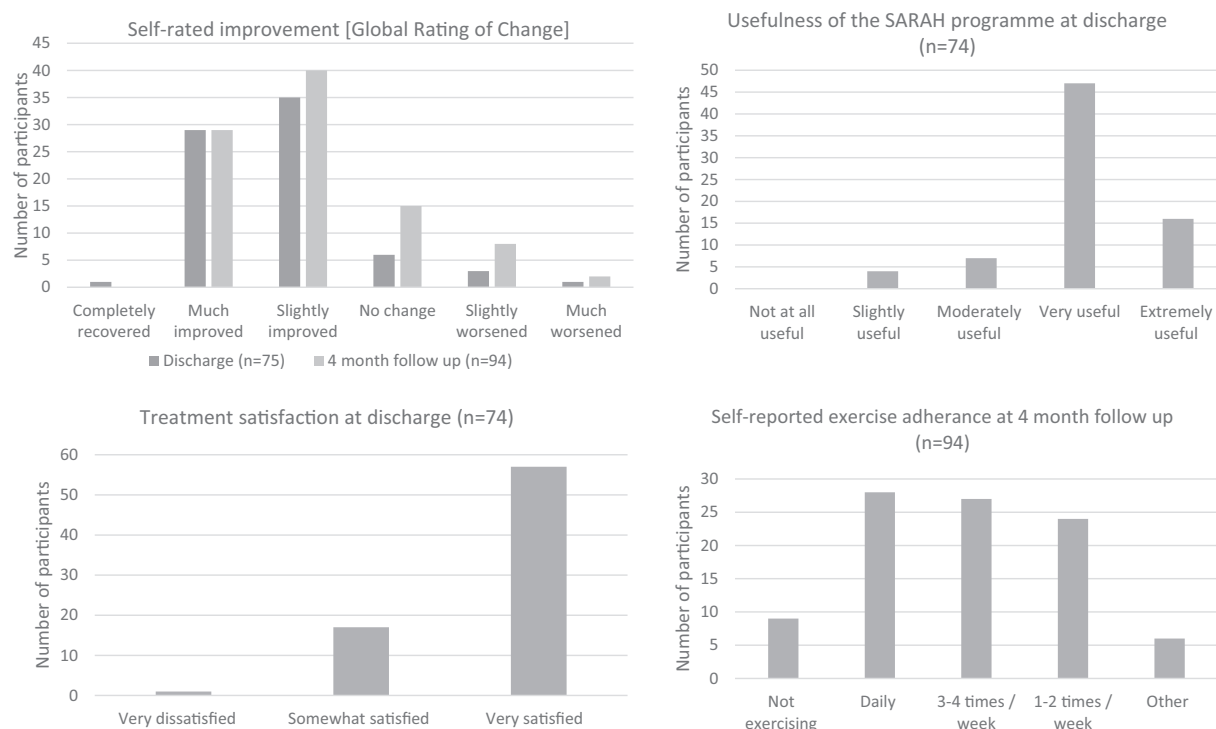
**Comparison with the SARAH clinical trial.** Patients in the current study were similar in regards to age, sex and baseline hand function to participants in the SARAH trial (Supplementary Table 3). However, SARAH trial participants reported having RA for longer (median duration 10 versus 6 years) and higher baseline hand-grip strength. The patient-reported outcomes in this study were similar or better than those reported for the participants allocated to the SARAH programme in the SARAH trial. Improvements in hand function were similar in both studies, but we observed greater improvements in grip strength in this study. Pain remained stable both in the current study and the SARAH trial.

The proportion of patients who rated themselves improved at follow-up was higher in this study than the SARAH trial (current study = 74%; SARAH trial = 52%). Ninety-nine per cent of patients reported they were satisfied with the SARAH programme compared to 81.5% of the SARAH programme participants in the trial. A similar proportion of patients to participants in the SARAH trial reported that they were still exercising at four months. However, fewer patients in this study reported doing their home exercises daily compared to the trial participants (33% versus 44%).

## Discussion

We have demonstrated that the online training is an accessible, acceptable and effective way to train therapists to deliver the SARAH programme. The iSARAH training had a good reach into the NHS. Therapists from 188 NHS organizations across the UK registered for the training, and at least one therapist from 162 NHS organizations completed all the training modules. Non-completion is common for online courses,<sup>11</sup> and although a proportion of therapists did not choose to complete the training evaluation, most (74%)





**Figure 1.** Patient perceived improvement, usefulness, treatment satisfaction and home exercise adherence at discharge and follow-up. SARAH: Strengthening and Stretching for Rheumatoid Arthritis of the Hand.

registrants in our study completed all the training modules. On completion of the training, the majority of therapists were confident they could deliver the programme and intended to do so. We were interested to see whether these intentions translated into adoption. Around two-thirds of iSARAH trained therapists responding to follow-up implemented the SARAH programme in their daily practice and were very positive about the programme. The clinical outcomes collected in stage 2 suggest that patients selected to receive the SARAH intervention by their therapist achieved similar outcomes to participants in the SARAH trial.

We collected information about the treatments delivered in both stages to measure fidelity of the intervention being implemented. The behavioural strategies (goal setting, exercise planning and exercise diary) were not always used. The strategies are an integral part of the SARAH programme to facilitate adherence to the exercises. From the SARAH trial, we know that behavioural support from the therapist was a key factor in the participant's long-term adherence to the exercise programme.<sup>18</sup> In future iterations of the iSARAH online training, we plan to strengthen this element of the training as it is the aspect of the intervention that may be unfamiliar to therapists and require greater emphasis.

Translating intervention developed in clinical trials into routine practice is challenging.<sup>19,20</sup> We identified

facilitators related to the SARAH implementation at four levels: intervention, patient, therapist and organization.<sup>20,21</sup> For example, the structured and comprehensive format and face-validity of SARAH exercises (intervention level) and perceived treatment benefits by both patients and therapists (patient and therapist level) facilitated the application of SARAH programme. The most common barriers to implementation were associated with the capacity of therapy departments to deliver the programme (organizational level). This may not be easily addressed in the current NHS climate. A potential solution would be to use alternative methods to deliver some of the sessions including online, telephone/videocalls or in a group. In both stages, therapists reported delivering less sessions than in the trial. Some patients only received 1–2 sessions. We were unable to examine if clinical outcomes were similar regardless of the number of sessions provided due to the small sample size. However, in the SARAH trial, those who attended more sessions did have better clinical outcomes.<sup>6</sup>

### Strengths and limitations

The iSARAH training is a theory-based intervention providing an easily accessible training opportunity. During the 18-month study period, therapists did not report any technical issues with the online training.

We attribute these to our iterative usability testing of the website before its launch and working alongside clinical stakeholders throughout.<sup>8,22</sup> Therapists who registered and provided feedback represent a national-level sample from diverse demographic and geographic backgrounds.

There are some limitations of this study. We used a strict definition of training completers, and only followed up those participants who fulfilled the criteria. Seventeen per cent of participants completed all the modules but did not complete the evaluation. Following up these participants as well would have provided more complete follow-up data. The follow-up response rate from therapists was low, which may limit the generalizability of the findings. We also relied on self-reports and did not include fidelity assessments to evaluate therapists' competence while delivering the SARAH programme. Therefore, it is unknown if the intervention was delivered to the same standard they were in the SARAH trial when fidelity assessments were undertaken.

We did not do a formal sample size calculation but based the patient recruitment target on what was potentially achievable during the study time frame. The relatively small sample size precluded us from doing subgroup analysis such as examining the impact of the number of treatment sessions. Therapists were able to select patients they felt were suitable for the SARAH programme. This may have resulted in a biased sample of patients more likely to do well with the SARAH programme and it is unknown how representative the study population is of patients with RA presenting to NHS therapy departments. However, this approach does reflect therapists' clinical decision making about treatment options for patients in a real world setting and is a valid evaluation of the SARAH programme. We have made comparisons with the SARAH trial to understand the clinical impact of delivering the programme in routine care. The results were similar suggesting successful translation from clinical trial to routine care. However, we acknowledge that the small sample size and lack of randomization in this study mean that this comparison should be interpreted cautiously. Finally, we did not measure sustainability of the programme over time so our study represents preliminary evidence of successful translation rather than long-term implementation.

## Conclusion

SARAH online training had good accessibility and reach and was an effective way to train therapists. Clinical outcomes were similar to the clinical trial providing preliminary evidence of successful translation of

the SARAH programme from clinical trial into routine care.

## Acknowledgements

We would like to thank Peter Heine for his assistance when developing the online training including taking part in the videos. We would like to thank the Patient and Public Representatives from the National Rheumatoid Arthritis Society who contributed to this work and The British Association of Hand Therapists who have been supportive of this work.

## Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

## Funding

The author(s) disclosed receipt of the following financial support for the research, authorship and/or publication of this article: This research was funded by the National Institute for Health Research (NIHR) Collaboration for Leadership in Applied Health Research and Care Oxford at Oxford Health NHS Foundation Trust. This work was supported by the NIHR Biomedical Research Centre, Oxford. The views expressed are those of the author(s) and not necessarily those of the NHS, the NIHR or the Department of Health.

## Ethical approval

Ethical approval was sought but the Clinical Trials and Research Governance team, University of Oxford, and NHS Research & Development office concluded that the evaluation of iSARAH training did not require formal ethical approval as it was a training evaluation (Ref: R5009/RE001/23 February 2017). The Oxford University Hospitals NHS Foundation Trust research board concluded that regulatory approval was not required as we were conducting a service evaluation of routine clinical care rather than a research study (dated 22 June 2017). Therapy department managers of the participating sites approved the service evaluation, and the project was registered with the clinical audit lead or governance team as per the local requirements of each NHS Trust before taking part.

## Informed consent

Therapists provided their consent to participate in the iSARAH evaluation when they registered for the online training. Written informed consent was obtained from patients before enrolment in the SARAH service evaluation.




## Guarantor

EW.

## Contributorship

SL and EW conceived and secured funding for the study. EW led the study team. SL was senior author. CS was responsible for the development of the online training, gaining the necessary approvals to conduct the study, hand therapist and patient recruitment, and data collection and analysis. LE provided programming and technical support for the online training. JT and ET assisted with the service evaluation data collection, data entry and analysis. JA was involved in protocol development and assisted in developing the online training. EW and CS drafted this manuscript. All authors reviewed and edited the manuscript, and approved the final version of the manuscript.

## ORCID iDs

Esther Williamson  <https://orcid.org/0000-0003-0638-0406>  
Cynthia Srikesavan  <https://orcid.org/0000-0002-3540-8052>  
Jo Adams  <https://orcid.org/0000-0003-1765-7060>

## Supplemental material

Supplemental material for this article is available online.

## References

1. Clynes MA, Jameson K, Prieto-Alhambra D, et al. Impact of rheumatoid arthritis and its management on falls, fracture and bone mineral density in UK Biobank. *Front Endocrinol* 2019; 10: 817.
2. Horsten NC, Ursum J, Roorda LD, et al. Prevalence of hand symptoms, impairments and activity limitations in rheumatoid arthritis in relation to disease duration. *J Rehabil Med* 2010; 42: 916–921.
3. Romero-Guzman AK, Menchaca-Tapia VM, Contreras-Yanez I, et al. Patient and physician perspectives of hand function in a cohort of rheumatoid arthritis patients: the impact of disease activity. *BMC Musculoskelet Disord* 2016; 17: 392.
4. Slatkowsky-Christensen B, Mowinckel P, Loge JH, et al. Health-related quality of life in women with symptomatic hand osteoarthritis: a comparison with rheumatoid arthritis patients, healthy controls, and normative data. *Arthritis Rheum* 2007; 57: 1404–1409.
5. Heine PJ, Williams MA, Williamson E, et al. Development and delivery of an exercise intervention for rheumatoid arthritis: strengthening and stretching for rheumatoid arthritis of the hand (SARAH) trial. *Physiotherapy* 2012; 98: 121–130.
6. Lamb SE, Williamson EM, Heine PJ, et al. Exercises to improve function of the rheumatoid hand (SARAH): a randomised controlled trial. *Lancet* 2015; 385: 421–429.
7. NICE. *Rheumatoid arthritis in adults: management*. London: National Institute for Health and Care Excellence, 2018.
8. Srikesavan CS, Williamson E, Eldridge L, et al. A web-based training resource for therapists to deliver an evidence-based exercise program for rheumatoid arthritis of the hand (iSARAH): design, development, and usability testing. *J Med Internet Res* 2017; 19: e411.
9. Liyanagunawardena TR and Williams SA. Massive open online courses on health and medicine: review. *J Med Internet Res* 2014; 16: e191.
10. Cooper Z, Bailey-Straebler S, Morgan KE, et al. Using the internet to train therapists: randomized comparison of two scalable methods. *J Med Internet Res* 2017; 19: e355.
11. Fairburn CG, Allen E, Bailey-Straebler S, et al. Scaling up psychological treatments: a countrywide test of the online training of therapists. *J Med Internet Res* 2017; 19: e214.
12. Levac D, Glegg SM, Camden C, et al. Best practice recommendations for the development, implementation, and evaluation of online knowledge translation resources in rehabilitation. *Phys Ther* 2015; 95: 648–662.
13. Implementation Guide. Department of Veterans Health Administration, Health Services Research & Development, Quality Enhancement Research Initiative. Updated 2013.
14. Williams GC and Deci EL. Internalization of biopsychosocial values by medical students: a test of self-determination theory. *J Pers Soc Psychol* 1996; 70: 767–779.
15. Proctor E, Silmere H, Raghavan R, et al. Outcomes for implementation research: conceptual distinctions, measurement challenges, and research agenda. *Adm Policy Ment Health* 2011; 38: 65–76.
16. Chung KC, Pillsbury MS, Walters MR, et al. Reliability and validity testing of the Michigan Hand Outcomes Questionnaire. *J Hand Surg Am* 1998; 23: 575–587.
17. Kadel R and Kip K (eds). A SAS macro to compute effect size (Cohen's) and its confidence interval from raw survey data. In: Annual southeast SAS users group conference, Durham, NC, USA, 2012.
18. Nichols VP, Williamson E, Toye F, Lamb SE. A longitudinal, qualitative study exploring sustained adherence to a hand exercise programme for rheumatoid arthritis evaluated in the SARAH trial. *Disability and rehabilitation*. 2017 Aug 28;39(18):1856-63.
19. Jones CA, Roop SC, Pohar SL, et al. Translating knowledge in rehabilitation: systematic review. *Phys Ther* 2015; 95: 663–677.
20. Berube ME, Poitras S, Bastien M, et al. Strategies to translate knowledge related to common musculoskeletal conditions into physiotherapy practice: a systematic review. *Physiotherapy* 2018; 104: 1–8.
21. Chaudoir SR, Dugan AG and Barr CH. Measuring factors affecting implementation of health innovations: a systematic review of structural, organizational, provider, patient, and innovation level measures. *Implement Sci* 2013; 8: 22.
22. Ballew P, Castro S, Claus J, et al. Developing web-based training for public health practitioners: what can we learn from a review of five disciplines? *Health Educ Res* 2013; 28: 276–287.