

BRIEF REPORT

Adaptation of American College of Rheumatology Rheumatoid Arthritis Disease Activity and Functional Status Measures for Telehealth Visits

Bryant R. England,¹ Claire E. H. Barber,² Martin Bergman,³ Veena K. Ranganath,⁴ Lisa G. Suter,⁵ and Kaleb Michaud⁶

Objective. To provide guidance on the implementation of recommended American College of Rheumatology (ACR) rheumatoid arthritis (RA) disease activity and functional status assessment measures in telehealth settings.

Methods. An expert panel was assembled from the recently convened ACR RA disease activity and functional status measures working groups to summarize strategies for implementation of ACR-recommended RA disease activity (the Clinical Disease Activity Index [CDAI], Disease Activity Score in 28 joints using the erythrocyte sedimentation rate or the C-reactive protein level [DAS28-ESR/CRP], Patient Activity Scale II [PAS-II], Simplified Disease Activity Index [SDAI], and Routine Assessment of Patient Index Data 3 [RAPID3]) and functional status (the Health Assessment Questionnaire II [HAQ-II], Multidimensional Health Assessment Questionnaire [MDHAQ], and PROMIS physical function 10-item short form [PROMIS PF-10]) measures in telehealth settings.

Results. Measures composed of patient-reported items (disease activity: PAS-II, RAPID3; functional status: HAQ-II, MDHAQ, PROMIS PF-10) require minimal modification for use in telehealth settings. Measures requiring formal joint counts (the CDAI, DAS28-ESR/CRP, and SDAI) can be calculated using patient-reported swollen and tender joint counts. When the feasibility of laboratory testing is limited, the CDAI can be used in place of the SDAI, and scoring modifications of the DAS28-ESR/CRP without the acute-phase reactant are available. Assessment of the validity of these modifications is limited. Implementation of these measures can be facilitated by electronic health record collection, mobile applications, and provider/staff administration during telehealth visits.

Conclusion. The ACR-recommended RA disease activity and functional status measures can be adapted for use in telehealth settings to support high-quality clinical care. Research is needed to better understand how telehealth settings may impact the validity of these measures.

INTRODUCTION

The COVID-19 pandemic has increased the number of telehealth visits in rheumatology through telephone or videoconferencing in a synchronous or asynchronous manner. Many logistical challenges accompany the use of telehealth, including the regular assessment of rheumatoid arthritis (RA) disease activity and functional status that are central to RA management. The American College of Rheumatology (ACR) recently provided updated

recommendations on RA disease activity measures and initial recommendations on functional status measures to support high-quality clinical care for routine clinical settings (1,2). This guidance has been used to inform quality measures on periodic assessment of disease activity and functional status assessment for providers who report through the Merit-Based Incentive Payment System (MIPS). To support the assessment of RA disease activity and functional status in telehealth settings, the ACR convened a working group to provide strategies for adopting the recommended

¹Bryant R. England, MD, PhD: University of Nebraska Medical Center and VA Nebraska–Western Iowa Health Care System, Omaha, Nebraska; ²Claire E. H. Barber, MD, PhD: University of Calgary, Calgary, Alberta, Canada, and Arthritis Research Canada, Vancouver, British Columbia, Canada; ³Martin Bergman, MD: Drexel University College of Medicine, Philadelphia, Pennsylvania; ⁴Veena K. Ranganath, MD, MS: University of California, Los Angeles; ⁵Lisa G. Suter, MD: Yale University School of Medicine, Yale-New Haven Health System Center for Outcome Research and Evaluation, and Veterans Affairs Connecticut Health System, New Haven, Connecticut; ⁶Kaleb

Michaud, PhD: University of Nebraska Medical Center and VA Nebraska–Western Iowa Health Care System, Omaha, Nebraska, and FORWARD, The National Databank for Rheumatic Diseases, Wichita, Kansas.

No potential conflicts of interest relevant to this article were reported.

Address correspondence to Kaleb Michaud, PhD, 986270 Nebraska Medical Center, Omaha, NE 68198. Email: kmichaud@unmc.edu.

Submitted for publication June 8, 2020; accepted in revised form August 13, 2020.

SIGNIFICANCE & INNOVATIONS

- Due to the COVID-19 pandemic, telehealth has been widely adopted as a method to provide ongoing disease management for patients with rheumatoid arthritis (RA).
- The American College of Rheumatology recently provided an update on recommended RA disease activity and functional status for regular use to guide clinical care, with an emphasis on in-clinic visits. This report provides guidance for adapting these recommended measures for telehealth use.

RA disease activity and functional status measures for telehealth settings.

PATIENTS AND METHODS

The ACR convened an expert panel from the prior RA disease activity and functional status measures working groups (1,2). The recommended RA disease activity measures were the Clinical Disease Activity Index (CDAI), Disease Activity Score in 28 joints using the erythrocyte sedimentation rate or the C-reactive protein level (DAS28-ESR/CRP), Patient Activity Scale II (PAS-II), Simplified Disease Activity Index (SDAI), and Routine Assessment of Patient Index Data 3 (RAPID3), while the recommended functional status assessment measures were the Health Assessment Questionnaire II (HAQ-II), Multidimensional Health Assessment Questionnaire (MDHAQ), and PROMIS physical function 10-item short form (PROMIS PF-10). We evaluated the feasibility of implementation of the recommended functional status and disease activity measures and provided strategies for modification (if required) and use in telehealth settings to support patient care.

RESULTS

Modifying measures for telehealth settings. A summary of modifications needed for RA disease activity and functional status measures for telehealth use is provided in Table 1. The measures are recommended to be incorporated in routine practice with the same measures being utilized over time for a given patient and collection occurring at most visits. Minimal standards for reporting on disease activity and functional status are described in the ACR-endorsed performance measures used in the MIPS program (Table 1 footnote).

The 2019 ACR recommendations for disease activity and functional status included several entirely patient-reported measures that do not require substitution or modification of any components, thus retaining their original psychometric properties as summarized in the initial reports (1,2). These measures include the PAS-II and RAPID3 for RA disease activity and all recommended

functional status assessment measures including the HAQ-II, MDHAQ, and PROMIS PF-10.

Measures requiring clinician assessments for tender and swollen joint counts and/or physician global scores are not feasible in their original operationalization in a telehealth setting but can be modified for use. The CDAI, DAS28-ESR/CRP, and SDAI all traditionally require provider-assessed swollen and tender joint counts. In place of provider joint counts, patient-reported joint counts may be substituted. While several studies have found moderate-to-strong correlations between patient and provider joint counts and patient and provider-derived composite disease activity scores (3–6), there are important caveats to the use of patient joint counts. First, most studies have incorporated baseline in-person training for conducting patient joint counts and found training to improve agreement with provider joint counts (6). Second, there is less agreement between patients and providers in the assessment of swollen joints compared to tender joint counts and for the assessment of smaller joints compared to larger joints (4–6). Finally, while group differences in RA disease activity scores using patient versus provider joint counts are typically small, there may be larger variability at the individual patient level. This individual variability may be related to disease activity level, RA disease duration, pain, disability, education level, health literacy, and language barriers (3–6). Provider global assessments included in the CDAI and SDAI may be collected as usual, although the authors recognize that the validity of the provider global assessment may be impacted by the use of telehealth.

Laboratory testing for the measurement of the ESR or CRP level is required for the DAS28-ESR/CRP and the SDAI. The feasibility of obtaining laboratory testing in conjunction with telehealth varies and may be problematic. Many patients are receiving disease-modifying antirheumatic drugs that require regular laboratory monitoring, and obtaining the ESR or CRP with this testing may be feasible. For others not receiving regular laboratory testing, those lacking access to a laboratory, or for those who consider the risk of SARS-CoV-2 exposure too great to obtain laboratory testing, the CDAI (calculated using patient-reported tender and swollen joint counts) could be used in place of the SDAI, and the DAS28-ESR/CRP may be scored without the acute-phase reactant but with an added patient pain visual analog scale (7). The DAS28 without acute-phase reactants has not undergone the same validation as the DAS28-ESR/CRP, and whether alternative disease activity state thresholds may improve agreement with the DAS28-ESR/CRP, such as those proposed for the DAS28-CRP, is unknown.

Collecting patient-reported measures and scoring via telehealth. While some measures, or components of measures, do not need modification, the processes for collecting the components of these measures, particularly patient-reported components, will change for many practices. The most significant factors for optimizing the collection of patient-reported measures

Table 1. Rheumatoid arthritis measures recommended by the American College of Rheumatology and telehealth modification summary*

	Abbreviated name	Components compatible with telehealth	Components needing modification for telehealth	Available modifications for telehealth
Disease activity†				
Clinical Disease Activity Index	CDAI	Patient global assessment; provider global assessment	Provider SJCs and TJCs	Replace provider SJCs and TJCs with patient-reported SJCs and TJCs
Disease Activity Score in 28 joints using the ESR or the CRP level	DAS28-ESR or DAS28-CRP	Patient global assessment	Provider SJCs and TJCs; laboratory testing‡	Replace provider SJCs and TJCs with patient-reported SJCs and TJCs; score DAS28 without acute-phase reactants§
Patient Activity Scale II	PAS-II	Patient global assessment; pain; HAQ-II	None	NA
Routine Assessment of Patient Index Data 3	RAPID3	Patient global assessment; pain; MDHAQ	None	NA
Simplified Disease Activity Index	SDAI	Patient global assessment; provider global assessment	Provider SJCs and TJCs; laboratory testing‡	Replace provider SJCs and TJCs with patient-reported SJCs and TJCs; use CDAI in place of SDAI
Functional status¶				
Health Assessment Questionnaire II	HAQ-II	Patient questionnaire	None	NA
Multidimensional Health Assessment Questionnaire	MDHAQ	Patient questionnaire	None	NA
PROMIS physical function 10-item short form	PROMIS PF10	Patient questionnaire	None	NA

* ACR = American College of Rheumatology; CRP = C-reactive protein; ESR = erythrocyte sedimentation rate; GA = global assessment; NA = not applicable; PROMIS = Patient-Reported Outcomes Measurement Information System; RA = rheumatoid arthritis; SJC = swollen joint count; TJC = tender joint count.

† Percentage of patients age ≥18 years with a diagnosis of RA who have an assessment of disease activity using an ACR-preferred RA disease activity assessment tool at ≥50% of encounters for RA for each patient during the measurement year (https://qpp.cms.gov/docs/QPP_quality_measure_specifications/CQM-Measures/2020_Measure_177_MIPSCQM.pdf).

‡ Laboratory testing may be feasible for some patients and practices.

§ DAS28 without acute-phase reactants: $0.53 \times \sqrt{(28TJC)} + 0.31 \times \sqrt{(28SJC)} + 0.25 \times \text{modified HAQ} + 0.001 \times \text{Pain} + 0.005 \times \text{Provider GA} + 0.014 \times \text{Patient GA} + 1.694$.

¶ Percentage of patients age ≥18 years with a diagnosis of RA for whom a functional status assessment was performed at least once within 12 months (https://qpp.cms.gov/docs/QPP_quality_measure_specifications/CQM-Measures/2020_Measure_178_MIPSCQM.pdf).

are the technical capabilities of the patients, providers, and electronic medical record (EMR) vendors. In place of paper forms, patient-reported items can be completed by patients prior to their telehealth visit directly within some EMRs through a patient portal. In these situations, patients are provided a notification via email prior to their appointment to complete these measures, which are then reviewed during their medical appointment with their provider. Advantages of EMR-based measure collection are having minimal process changes for telehealth encounters and the integration of the measures into the medical record with the ability to track and trend measures over time. Disadvantages may include challenges in completing surveys for individuals with lack of computer access, limited computer literacy, and language barriers; additional support staff may be required for administration as well (8).

For health systems/clinics without patient portals capable of electronically capturing patient-reported measures from patients directly, providers or clinic staff may administer the surveys during the telehealth visit. The advantage of provider/staff administration during the visit is greater support for those with lower literacy in completion of the forms and likely higher provider

understanding of the disease impact on patients through discussion of responses. The main disadvantages are the added time requirements to encounters for providers and/or added administrative/staff burden.

Last, measures can be obtained by mailings or electronic capture outside of the EMR. Mailed paper forms can be pre-filled by the patient and recorded during the telehealth visit or mailed back to the provider. While this may lower the burden of provider/staff time during an encounter, this increases the possibility of lower response rates and requires administrative support for mailing and processing the measures. Smartphone and web-based apps can be used by the patient and/or the provider to collect these measures electronically during the telehealth visit or at regular intervals and summarized during the telehealth visit (8). Integration of mobile apps into health records is an active area of study (9). Scoring of RA disease activity and functional status measures can be facilitated by the ACR Clinical Practice Guidelines and Criteria App as well as on the ACR website (<https://www.rheumatology.org/Practice-Quality/Clinical-Support/Quality-Measurement/Disease-Activity-Functional-Status-Assessments>) when not available within the EMR. A summary of strategies and potential barriers

Table 2. Strategies for telehealth implementation of rheumatoid arthritis (RA) disease activity and functional status measures by medium and potential barriers to implementation*

Medium	Collection strategies	Factors influencing feasibility and potential barriers†
EMR	Measures collected electronically by patient through patient portal before telehealth visit	Depends on EMR and EMR support on implementation and ability of patient to log on and complete
Smartphone or web-based application	Measures completed through smartphone or web-based application (e.g., ACR Clinical Practice Guidelines and Criteria App) and shared with provider	Depends on ability of patient to install and use app as well as transfer of data to clinical staff for recording in EMR
Video or telephone encounter	Provider collects measures from patient during synchronous telehealth encounter and records in EMR	Depends on the time available to providers/staff to collect these during the encounter and familiarity of patients with these measures
Mailed paper forms	Measures collected by patient at home on paper form and then mailed back or collected by clinical staff during telehealth visit	Depends on anticipated response rate, availability of administrative support staff to mail forms, and ability to complete the form in advance

* ACR = American College of Rheumatology; EMR = electronic medical record.

† For all collection strategies, patient health literacy and language should be considered. Time to collect, interpret, and report the results may vary depending on the medium used and clinic workflows.

for telehealth data collection is included in Table 2. While workflows vary between clinics and within clinics over time, successful collection of these measures can be facilitated by developing and assessing the performance of standard clinic workflows, educating staff and patients, and addressing patient health literacy and language barriers.

DISCUSSION

The current COVID-19 pandemic has heightened the need to care for patients with RA in an increasingly virtual environment. Following the announcement of the public health emergency, many rheumatology clinics were closed or had only limited face-to-face appointments due to social distancing restrictions and health system surge capacity planning. Therefore, it became necessary to deploy telehealth clinics using telephone or video-conference technology rapidly to ensure continuity of care. The routine collection and use of disease activity and functional status measures for high-quality RA care has been established as part of face-to-face encounters. While telehealth encounters have replaced face-to-face visits, the use of disease activity and functional status measures remain highly valuable for the management of RA during these uncertain times. Here, we have detailed approaches to facilitate the use of ACR-recommended RA disease activity and functional status measures in conjunction with telehealth encounters. All ACR-recommended RA disease activity (the CDAI, DAS28-ESR/CRP, PAS-II, RAPID-3, and SDAI) and functional status measures (the HAQ-II, MDHAQ, and PROMIS PF-10) can be adapted for use in telehealth settings using the provided modifications (Table 1).

These recommendations on modification of RA disease activity and functional status measures for telehealth settings were focused on measures recently recommended by the ACR because these measures were selected as those with the best

validity and feasibility for routine use. Adapting these measures for telehealth clearly affects feasibility and, depending on the modifications needed to score these measures, may also affect the validity. Alterations to the validity of these measures is anticipated to be greatest for substituting patient-reported joint counts for provider joint counts (the CDAI, DAS28-ESR/CRP, and SDAI) and rescored the DAS28 without acute-phase reactants. At a population level, these modifications appear to have little influence on the validity of these measures (3–5), although individual variation can be expected. Despite the content of patient-reported measures remaining unchanged, the heightened stress and anxiety experienced during the COVID-19 pandemic may similarly influence their validity (10). It is possible that other measures not initially selected as recommended disease activity and functional status measures may have a greater role for monitoring RA status in telehealth settings as a result of a lesser impact of telehealth modifications on their validity or their improved feasibility with telehealth. Research into the performance of RA disease activity and functional status measures in telehealth settings will be essential for identifying the most valid and feasible measures.

Given substantial variation between practices (e.g., EMR vendors, information technology [IT], administrative support), we were unable to directly compare the feasibility of different RA disease activity and functional status measures in the telehealth setting. Rather, we have provided suggestions for collecting these measures via different mediums. If the EMR is compatible with the collection of patient-reported measures directly, this offers the best potential for routine use. However, this approach requires IT infrastructure/support and patient technological capabilities. The US Health Information National Trends Survey found only 31% of the general public utilized patient portals in 2018, with female patients, White patients, and those with higher education levels more likely to use patient portals (11). If the EMR is not compatible or IT infrastructure is not available, changing

vendors or building this infrastructure will take substantial time, effort, and monetary commitment initially and for continued IT maintenance. The other methods of measure collection will require additional provider and/or administrator/clinical staff time. This may be compounded if provider joint counts are replaced with patient joint counts at the same telehealth encounter, necessitating patient education for the proper completion of these joint counts. Although most studies evaluating patient joint counts have utilized in-person training, patient resources and optimal training processes have not been established. The development of patient resources describing the conduct of patient joint counts as well as the process and importance of regularly monitoring disease activity and physical function should be a priority to facilitate virtual care. Furthermore, when initiating telehealth encounters, providers may already spend a significant amount of time in IT support (personally or with the patient) rather than providing direct care. A limitation of this work is that we did not conduct a new literature search on telehealth tools for the collection of disease activity or functional status measures, which was beyond the scope of this work.

Beyond the pandemic, the use of telehealth for RA care may be already happening in some areas due to geography, climate, transportation availability, and workforce shortages (12). It is likely that post-pandemic telehealth use will increase and help address rheumatology workforce challenges facing many regions (13). For example, telehealth may support safe remote monitoring of stable RA patients, allowing a redistribution of rheumatology resources to support urgent cases and new consultations. The virtual delivery of patient-reported outcomes has also been used to support treat-to-target initiatives in RA care and has been shown to be noninferior to routine care in the setting of a randomized controlled trial (14). Furthermore, electronic collection of patient-reported outcomes using EMRs or custom platforms or smartphone apps may support quality improvement and research initiatives. Virtual care complimented by electronic collection of patient-reported outcomes may also be acceptable and even preferred by some patients due to social and work obligations. For example, qualitative studies have shown that telehealth follow-up is acceptable to many patients with RA, although strategies may need to be developed to better assist some individuals requiring additional supports to adapt (15). Challenges exist in this environment, such as supporting patients and families with lower computer literacy and those for whom English is a second language. Additionally, it remains uncertain what is the optimal balance between telehealth and face-to-face encounters for long-term RA management.

In conclusion, the challenges of the pandemic have accelerated changes in the way we deliver care and have invited many opportunities to provide more patient-centered and flexible care. To support high-quality telehealth care for patients with RA in this new environment, we have described strategies for the modification and use of RA disease activity and functional status measures.

Future research should continue to explore the validity of adapted disease activity and functional status measures for RA and develop strategies to support patients and physicians in virtual assessments of RA status.

ACKNOWLEDGMENTS

The authors recognize the following ACR staff who facilitated this project: Amy Turner, Rachel Myslinski, Regina Parker, Robin Lane, and Tracy Johansson.

AUTHOR CONTRIBUTIONS

All authors were involved in drafting the article or revising it critically for important intellectual content, and all authors approved the final version to be submitted for publication. Dr. Michaud had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

Study conception and design. England, Michaud.

Analysis and interpretation of data. England, Barber, Bergman, Ranganath, Suter, Michaud.

REFERENCES

1. Barber CE, Zell J, Yazdany J, Davis AM, Cappelli L, Ehrlich-Jones L, et al. 2019 American College of Rheumatology recommended patient-reported functional status assessment measures in rheumatoid arthritis. *Arthritis Care Res (Hoboken)* 2019;71:1531–9.
2. England BR, Tiong BK, Bergman MJ, Curtis JR, Kazi S, Mikuls TR, et al. 2019 update of the American College of Rheumatology recommended rheumatoid arthritis disease activity measures. *Arthritis Care Res (Hoboken)* 2019;71:1540–55.
3. Skougaard M, Bliddal H, Christensen R, Ellegaard K, Nielsen SM, Zavada J, et al. Patients with rheumatoid arthritis acquire sustainable skills for home monitoring: a prospective dual-country cohort study (ELECTOR clinical trial I). *J Rheumatol* 2020;47:658–67.
4. Riazoli J, Nilsson JA, Telemann A, Petersson IF, Rantapaa-Dahlqvist S, Jacobsson LT, et al. Patient-reported 28 swollen and tender joint counts accurately represent RA disease activity and can be used to assess therapy responses at the group level. *Rheumatology (Oxford)* 2010;49:2098–103.
5. Radner H, Grisar J, Smolen JS, Stamm T, Aletaha D. Value of self-performed joint counts in rheumatoid arthritis patients near remission. *Arthritis Res Ther* 2012;14:R61.
6. Barton JL, Criswell LA, Kaiser R, Chen YH, Schillinger D. Systematic review and metaanalysis of patient self-report versus trained assessor joint counts in rheumatoid arthritis. *J Rheumatol* 2009;36:2635–41.
7. Bentley MJ, Greenberg JD, Reed GW. A modified rheumatoid arthritis disease activity score without acute-phase reactants (mDAS28) for epidemiological research. *J Rheumatol* 2010;37:1607–14.
8. Mollard E, Michaud K. Mobile apps for rheumatoid arthritis: opportunities and challenges. *Rheum Dis Clin North Am* 2019;45:197–209.
9. Austin L, Sharp CA, van der Veer SN, Machin M, Humphreys J, Mellor P, et al. Providing ‘the bigger picture’: benefits and feasibility of integrating remote monitoring from smartphones into the electronic health record. *Rheumatology (Oxford)* 2020;59:367–78.
10. Michaud K, Wipfler K, Shaw Y, Simon TA, Cornish A, England BR, et al. Experiences of patients with rheumatic diseases in the United States during early days of the COVID-19 pandemic. *ACR Open Rheumatol* 2020;2:335–43.
11. Hong YA, Jiang S, Liu PL. Use of patient portals of electronic health records remains low from 2014 to 2018: results from a national survey and policy implications. *Am J Health Promot* 2020;34:677–80.

12. Ferucci ED, Holck P, Day GM, Choromanski TL, Freeman SL. Factors associated with use of telemedicine for follow-up of rheumatoid arthritis. *Arthritis Care Res (Hoboken)* 2020;72:1404–9.
13. Battafarano DF, Ditmyer M, Bolster MB, Fitzgerald JD, Deal C, Bass AR, et al. 2015 American College of Rheumatology Workforce Study: supply and demand projections of adult rheumatology workforce, 2015–2030. *Arthritis Care Res (Hoboken)* 2018;70:617–26.
14. De Thurah A, Stengaard-Pedersen K, Axelsen M, Fredberg U, Schougaard LM, Hjollund NH, et al. Tele-health followup strategy for tight control of disease activity in rheumatoid arthritis: results of a randomized controlled trial. *Arthritis Care Res (Hoboken)* 2018;70:353–60.
15. Knudsen LR, de Thurah A, Lomborg K. Experiences with telehealth followup in patients with rheumatoid arthritis: a qualitative interview study. *Arthritis Care Res (Hoboken)* 2018;70:1366–72.