



HHS Public Access

Author manuscript

Arthritis Care Res (Hoboken). Author manuscript; available in PMC 2021 October 01.

Published in final edited form as:

Arthritis Care Res (Hoboken). 2020 October ; 72(10): 1404–1409. doi:10.1002/acr.24049.

Factors associated with use of telemedicine for follow-up of rheumatoid arthritis

ED Ferucci¹, P Holck², GM Day³, TL Choromanski³, SL Freeman⁴

¹Community Health Services, Alaska Native Tribal Health Consortium, 4315 Diplomacy Drive ANC-HEP, 99508, Anchorage, Alaska, United States.

²Holck Consulting, Anchorage, Alaska, United States.

³Clinical and Research Services, Alaska Native Tribal Health Consortium, Anchorage, Alaska, United States.

⁴Telehealth, Alaska Native Tribal Health Consortium, Anchorage, Alaska, United States.

Abstract

Objective: Telemedicine is increasingly being offered to patients for rheumatology care, but few studies have examined factors associated with telemedicine use or outcomes of telemedicine in rheumatology. The objective of this analysis was to determine factors associated with the use of video telemedicine when offered as part of usual care for follow-up of rheumatoid arthritis (RA).

Methods: Individuals in the Alaska Tribal Health System with a diagnosis of rheumatoid arthritis were recruited when seeing a rheumatologist either in-person or by video telemedicine, both of which were offered as part of usual care. At the study visit, participants completed the RAPID3 and a telemedicine perception survey and agreed to medical record review for demographics and disease characteristics. Data from this visit were analyzed to determine factors associated with using telemedicine for RA, compared to being seen in-person only.

Results: Of 122 participants enrolled in the study, 56 (46%) had been seen by telemedicine at least once. Factors associated with telemedicine use in univariate analysis included higher RAPID3 score, higher number of rheumatologist visits in the preceding year, more positive perceptions of telemedicine, and seeing a physician who used telemedicine more often. On multivariate analysis, these four factors all remained significant. Demographic and other disease-related factors or comorbidities were not associated with telemedicine use.

Conclusion: When offered as an option for rheumatology care, video telemedicine was more likely to be used by RA patients with higher disease activity, more positive perceptions of telemedicine, and whose physicians used telemedicine more often.

In rheumatoid arthritis (RA), several studies have demonstrated that access to a rheumatologist is associated with improved quality of care.^{1–4} Timely access to a rheumatologist and treatment with disease-modifying anti-rheumatic drugs improve long-

Corresponding Author: Elizabeth D. Ferucci, MD, MPH, 4315 Diplomacy Drive, ANC-HEP, Anchorage, Alaska 99508, Telephone: 907-729-1560, Fax: 907-729-1570, edferucci@anthe.org.

Potential conflicts of interest: none.

term outcomes in RA.⁵ With the recommendations for use of a treat-to-target strategy in newer guidelines for RA, even more frequent visits to a rheumatologist will be required.⁶ In the United States, there is a shortage of rheumatologists which is projected to increase over time and disproportionately affects rural populations.^{7,8} Telemedicine has been proposed as a potential solution for specialist shortages and workforce maldistribution.⁹

Telemedicine is increasingly being adopted in rheumatology practice, but few studies have examined factors associated with telemedicine use or the outcomes of telemedicine in rheumatology.¹⁰ Since telemedicine is a broad term that encompasses many methodologies to deliver health care using technology, not all studies evaluate comparable technology or protocols for use. The Alaska Tribal Health System (ATHS) has had the capability to use asynchronous (store-and-forward) telemedicine for almost 20 years, but more recently has had improved connectivity to support live video teleconference visits (synchronous, or “VTC” visits) between patients and specialty clinic providers. Specialty care by telemedicine VTC has been available in rheumatology since 2015 and has been the preferred method of telemedicine in this specialty. In the ATHS, telemedicine is used for rheumatology follow-up visits for patients with an established diagnosis, most commonly RA. In routine clinical practice, individuals with RA are offered the option to be seen by telemedicine or in-person and can select the visit format they prefer.

This study was designed to evaluate the outcomes of and quality of care for RA in patients seen by telemedicine for follow-up compared to usual care only. Long-term follow-up for outcomes and quality assessment is ongoing. The objective of this analysis is to determine baseline factors associated with the use of telemedicine for RA in the Alaska Tribal Health System.

PATIENTS AND METHODS:

Inclusion criteria:

Any individual age 18 and over with a diagnosis of RA who was seen by a rheumatologist at the Alaska Native Medical Center (ANMC), either in-person or by telemedicine, was eligible for inclusion in the study. Baseline enrollment occurred from August 2016 until March 2018. Patients meeting the inclusion criteria as described above were invited to participate and were enrolled if they agreed and provided informed consent, either written or oral, to participate in the study. The project was approved by the Alaska Area Institutional Review Board. Tribal approval was obtained from participating Tribal Health Organizations.

Clinical Use of Telemedicine:

During the time period of baseline enrollment in this study, telemedicine was available in rheumatology clinical care as synchronous video teleconference (VTC). All rheumatologists provided care using both telemedicine and standard in-person visits, but some rheumatologists had a higher proportion of visits by telemedicine than others. Brief training on how to use telemedicine equipment, basic principles of video etiquette, and telemedicine-specific workflows were provided to all rheumatologists before they started using VTC. This training was general and not specific to rheumatology care. Telemedicine was not used for

initial diagnosis. Although always used in the follow-up setting rather than for new patients and performed by VTC, telemedicine was available in two different scenarios. First, patients residing in rural areas could be seen by a rheumatologist at ANMC by VTC for follow-up, which was offered as an option to reduce travel burden. Second, one rheumatologist provided care to patients at ANMC from out-of-state for part of the time, and in this case, patients could be seen at ANMC in Anchorage, the largest city in Alaska, by the rheumatologist using VTC from out-of-state. This rheumatologist also saw patients in-person in Alaska part of the time, providing 23% of visits by telemedicine and accounting for 76% of the total number of telemedicine visits during the study period. All patients had an in-person visit prior to being seen by telemedicine and in most cases, telemedicine and in-person visits were used in combination for follow-up. During the time of this study, choosing to be seen by telemedicine would often decrease the wait time for a rheumatology visit. In practice, the preference was for patients to be seen by the same provider for all visits, but patients could see different providers based on preference or availability. In all cases, the patient was presented from a medical facility during the time of the VTC and none of the VTC visits were performed to the patient's home or smartphone. Multiple different presenters were used in different locations, so they were not trained to perform swollen or tender joint counts. As with in-person visits, telemedicine visits could be used to monitor existing treatment or to change treatment, according to the clinical judgement of the rheumatologist conducting the visit. For this study, all rheumatology telemedicine visits were considered in the telemedicine group.

Study visit and clinical data:

After informed consent was obtained, participants were seen for a study visit. This visit occurred at baseline, i.e. the time of study enrollment. As this study was observational and telemedicine had been available in practice prior to the study, some participants had been seen by telemedicine prior to the study visit and some had not. Data collected at the baseline study visit included a telemedicine perception survey to assess views on telemedicine and the Routine Assessment of Patient Index Data 3 (RAPID3) to assess RA disease activity. Participants consented to medical record abstraction at baseline and one year for demographics, disease characteristics, comorbidities, and measures of access to care and quality of care. A standardized data abstraction tool was used. Data collected using this tool included: age; sex; community of residence; smoking status; comorbidities; date of diagnosis of RA; classification criteria met for RA; laboratory test results (anti-cyclic citrullinated peptide (CCP), rheumatoid factor (RF), and inflammatory markers); presence of radiographic erosions; number of visits with a rheumatologist in preceding year; seen at least once using telemedicine in rheumatology or by another provider (non-rheumatology); and measures of quality of care. One measure of quality of care included whether a disease-modifying anti-rheumatic drug (DMARD) was prescribed in the past year. In addition, participants agreed to telephone contact at 6 and 12 months for outcome assessment, including RAPID3 at both time points and a repeat telemedicine perception survey at 12 months, and medical record abstraction at 12 months for quality of care measures. Only baseline measures are included in this analysis.

Statistical analysis:

Statistical analysis was performed using R version 3.5.1.¹¹ For data analysis, participants were categorized as being in the telemedicine group if they had had at least one telemedicine visit as of the baseline study visit with a rheumatologist and in the in-person group otherwise. Univariate analyses (and summary statistic calculations) were performed, and we used multivariable logistic models to adjust for potential confounders (e.g. age, sex), and to identify salient factors associated with telemedicine use. For all analyses, a two-sided p-value less than 0.05 was considered significant.

Summary variables created for data analysis included “Mean Rheumatologist Telemedicine Rate” and “Telemedicine Survey Score.” Each rheumatologist has differing proportions of their overall visit-load that are telemedicine visits, and each patient has potentially multiple visits to multiple physicians. We defined the Mean Rheumatologist Telemedicine Rate as the weighted visit mean of these differing rheumatologist telemedicine proportions (range 2.7% - 23.0%). Thus, a value of 20% indicates that the patient saw rheumatologists who in total had about 20% of their encounters via telemedicine. The Telemedicine Survey Score is the average response to 12 questions with response values of -2 to 2 (strongly disagree to strongly agree), with a higher score indicating the respondent is more receptive to telemedicine and a zero indicating a neutral response.

RESULTS:

The baseline demographic and disease characteristics of the 122 study participants are presented in Table 1. Participants in the telemedicine group and in the in-person only group were similar with respect to age, sex, and disease duration, with mean disease duration of about 10 years in both groups. The majority of participants in both groups had positive autoantibodies (>85% positive for RF and for anti-CCP antibodies). There was no difference in the proportion with radiographic erosions, comorbidities, or current smoking by group. Almost all participants in both groups had been prescribed DMARDs in the past year. In both groups, the mean number of rheumatology visits in the past year was more than two, but the telemedicine group had more visits (mean 2.95, compared to 2.39, $p=0.011$). There was no statistical difference in distance to the rheumatology clinic or the proportion ever seen by telemedicine for other specialties by group. However, the telemedicine group had higher telemedicine survey scores (indicating more positive perceptions of telemedicine) and a higher mean rheumatologist telemedicine rate (indicating seeing a rheumatologist who performed telemedicine visits more frequently).

The results of multivariate analysis are presented in Table 2. Variables included in the final model included age (categorized as less than 50 years vs. 50 and above), sex, number of rheumatologist visits in the past year, RAPID3 score, telemedicine survey score, ever seen by telemedicine in the past by any provider (including non-rheumatologists), and the mean rheumatologist telemedicine rate. The strongest association with use of telemedicine was the mean rheumatologist telemedicine rate, with odds ratio of 4.14 (95% confidence interval (CI) 2.35–8.00). A strong association was also observed between telemedicine perception survey score and telemedicine use, with odds ratio of 2.76 (95% CI 1.32–6.18). The number

of rheumatologist visits in the past year and the RAPID3 score were also significant predictors of use of telemedicine in the multivariate model.

Perceptions of telemedicine were an important factor associated with the choice to be seen by telemedicine for RA follow-up, rather than in-person only. The results of the telemedicine perception survey are presented in detail in Figure 1. For most questions, individuals ever seen by telemedicine responded more favorably than those who had never been seen by telemedicine. Individuals seen by telemedicine still expressed a preference to be seen by the specialist in-person (61% of the telemedicine group, compared to 74% of the in-person only group), but those seen by telemedicine were more likely to feel that the care given in video visits was as good as in-person visits. Both groups felt that technical issues were a limitation, with just above 40% in both groups agreeing or strongly agreeing with the statement “I can always trust the equipment to work in a video visit.”

DISCUSSION:

In this study, we found that when video telemedicine was offered as part of usual care for RA, factors associated with telemedicine use included seeing a rheumatologist who used telemedicine more often, having more favorable opinions of telemedicine, having higher disease activity as measured by the RAPID3 score, and having more visits with a rheumatologist in the preceding year. Other demographic factors, comorbidities, or markers of more severe RA were not associated with telemedicine use.

There are few published studies on the use of telemedicine in rheumatology in general or in RA specifically. A systematic review of telemedicine in rheumatology published in 2016 identified only 20 studies, most of which were observational and had a high risk of bias.¹⁰ The majority of studies found that telemedicine was effective in the rheumatology setting. The most common condition studied was RA. Approximately 60% of studies evaluated telemedicine in the follow-up setting, and only 34% studied video telemedicine as the modality used. Since 2016, additional studies of telemedicine in rheumatology have been published, but few have focused on live video follow-up visits. A study of rural veterans with inflammatory arthritis seen for video telemedicine follow-up described similar baseline RAPID-3 scores in 25 patients receiving telemedicine care compared to 60 patients receiving usual care.¹² In this study of veterans, visit satisfaction was assessed, but factors associated with the choice to use telemedicine or telemedicine perceptions were not described.¹² Most other recent studies of telemedicine in rheumatology have evaluated asynchronous telemedicine or other modalities, such as telephone based patient-reported outcome collection. The use of live video telemedicine is continuing to increase in rheumatology practice, but there are still few published studies evaluating predictors of its use, outcomes, or costs.

This study has some limitations. First, this was an observational study conducted in the setting of usual care and investigators were not able to control any aspects of clinical care. Although telemedicine was available as an option for usual care, it is possible that it was not offered to every patient. There may be unmeasured staff or provider biases that contributed to the selection of telemedicine by certain patients over others. However, the findings reflect real world practice, which may make them more generalizable. Second, telemedicine was

provided for both rural and urban patients who have different barriers to rheumatologist access. In most clinical settings, this model is still applicable as patients are selecting telemedicine in both rural and urban areas. Third, the setting is unique, with more patients residing in rural areas and longer distances to travel to a rheumatologist than in other settings. This may make telemedicine more attractive than it might be elsewhere. However, the distance to the rheumatologist was not significantly different in those who chose telemedicine compared to those who did not, suggesting that travel distance may not have been the only factor driving the choice to use telemedicine. Fourth, the findings may not be generalizable to all states or countries because of other legal or financial barriers differentially impacting the uptake of telemedicine. Regulations are also expected to change, which may affect the generalizability over time. Finally, data on outcomes over time are still being collected and this represents a cross-sectional analysis of factors associated with telemedicine use at baseline. An analysis of changes in outcome over time should provide additional insight into the use of telemedicine in RA. Despite these limitations, it is likely that our findings about patient perceptions about telemedicine and higher provider use of telemedicine would be predictors of telemedicine use in other settings.

In summary, we found that more frequent provider use and more positive patient perceptions of telemedicine were the strongest associations with the choice to use telemedicine for follow-up of rheumatoid arthritis. A higher number of visits and higher RAPID3 score were associated with telemedicine use, suggesting that higher disease activity makes the benefits of telemedicine more likely to outweigh the limitations. In the setting of less active disease, it may be reasonable to wait longer for an in-person visit if it is preferred. Future studies will investigate disease activity over time and quality of care for RA in the setting of telemedicine compared to usual care and will help inform practice further.

Acknowledgments

Financial support: This project was supported by grant number R21HS024540 from the Agency for Healthcare Research and Quality. The content is solely the responsibility of the authors and does not necessarily represent the official views of the Agency for Healthcare Research and Quality.

REFERENCES:

1. MacLean CH, Louie R, Leake B, et al. Quality of care for patients with rheumatoid arthritis. *JAMA* 2000;284:984–92. [PubMed: 10944644]
2. Lacaillie D, Anis AH, Guh DP, Esdaile JM. Gaps in care for rheumatoid arthritis: a population study. *Arthritis Rheum* 2005;53:241–8. [PubMed: 15818655]
3. Ferucci ED, Donnithorne KJ, Koller KR, Swango-Wilson A, Pflaum J, Lanier AP. Performance on rheumatoid arthritis quality indicators in an Alaska Native healthcare system. *Qual Saf Health Care* 2010;19:387–91. [PubMed: 20657010]
4. Yazdany J, Tonner C, Schmajuk G, Lin GA, Trivedi AN. Receipt of glucocorticoid monotherapy among Medicare beneficiaries with rheumatoid arthritis. *Arthritis Care Res (Hoboken)* 2014;66:1447–55. [PubMed: 25244314]
5. Finckh A, Liang MH, van Herckenrode CM, de Pablo P. Long-term impact of early treatment on radiographic progression in rheumatoid arthritis: A meta-analysis. *Arthritis Rheum* 2006;55:864–72. [PubMed: 17139662]
6. Solomon DH, Bitton A, Katz JN, Radner H, Brown EM, Fraenkel L. Review: treat to target in rheumatoid arthritis: fact, fiction, or hypothesis? *Arthritis Rheumatol* 2014;66:775–82. [PubMed: 24757129]

7. Deal CL, Hooker R, Harrington T, et al. The United States rheumatology workforce: supply and demand, 2005–2025. *Arthritis Rheum* 2007;56:722–9. [PubMed: 17328042]
8. Battafarano DF, Ditmyer M, Bolster MB, 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. [PubMed: 29400009]
9. Ward IM, Schmidt TW, Lappan C, Battafarano DF. How Critical is Tele-Medicine to the Rheumatology Workforce? *Arthritis Care Res (Hoboken)* 2016;68:1387–9. [PubMed: 26866514]
10. McDougall JA, Ferucci ED, Glover J, Fraenkel L. Telerheumatology: A Systematic Review. *Arthritis Care Res (Hoboken)* 2016.
11. R: A language and environment for statistical computing. R Foundation for Statistical Computing, 2018 at [www.R-project.org/.](http://www.R-project.org/)
12. Wood PR, Caplan L. Outcomes, Satisfaction, and Costs of a Rheumatology Telemedicine Program: A Longitudinal Evaluation. *J Clin Rheumatol* 2019;25:41–4. [PubMed: 30461466]

Significance and Innovation:

- This study provides information on the characteristics of RA patients choosing video telemedicine compared to in-person care only when both are offered as options for usual care.
- The factors most strongly associated with choice to use telemedicine included higher patient-reported disease activity score, more positive perceptions of telemedicine, and seeing a physician who used telemedicine more often.
- The findings of this study may be useful in planning telemedicine programs in rheumatology. Outcomes are currently being investigated.

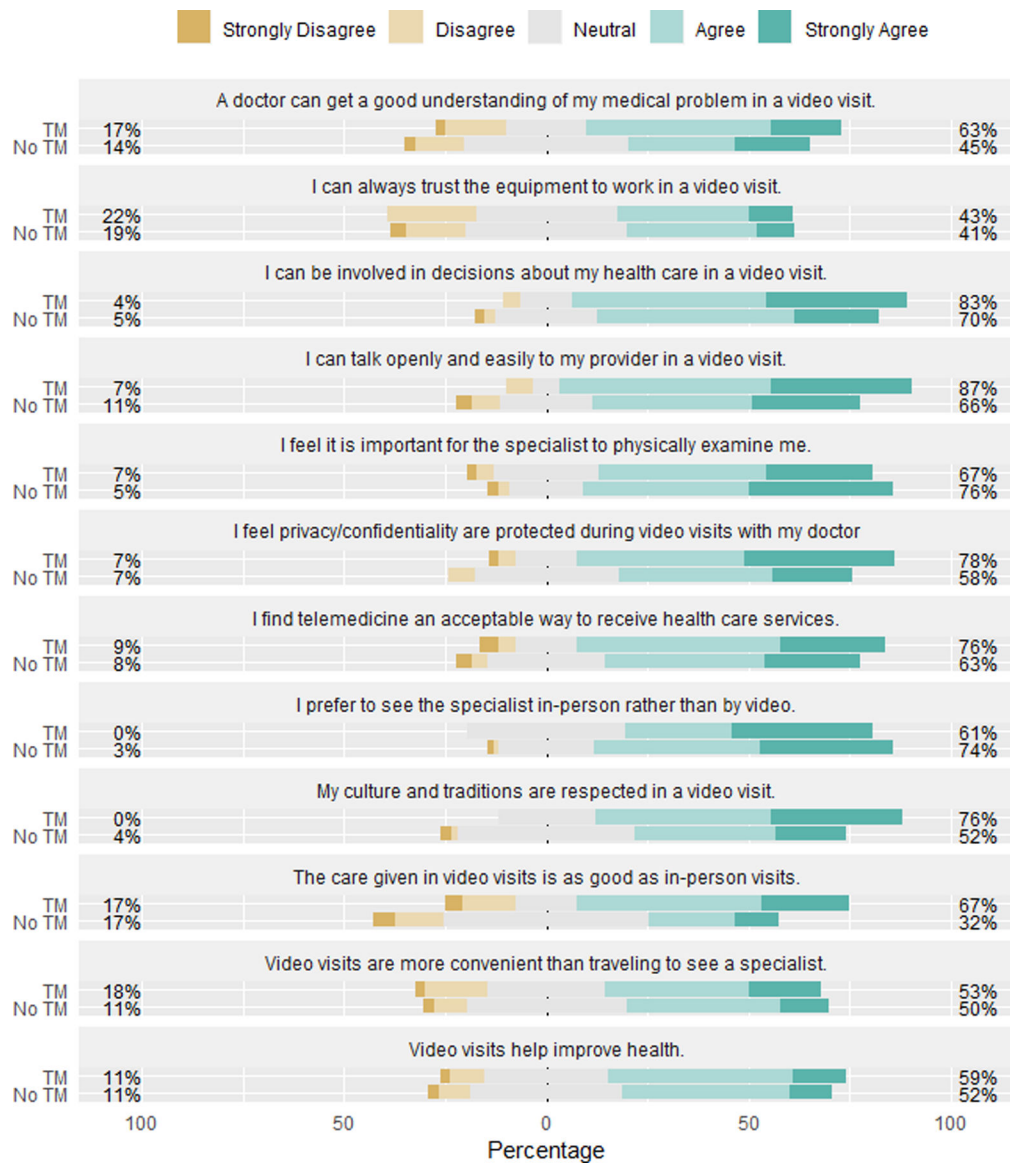


Figure 1: Perceptions of Telemedicine in Participants with RA Ever Seen by Telemedicine compared to In-Person Only

Twelve questions about perceptions of telemedicine were asked on a Likert scale, with the results summarized in this figure. Positive responses (agree or strongly agree) are presented in blue, with negative responses (disagree or strongly disagree) in beige. The percent with positive response is shown for each group on the right of the figure, with percent negative response on the left. The neutral category was removed when calculating percentages. The telemedicine group responses are presented on the top of each question (as “TM”) and the in-person only group on the bottom (as “no TM”).

Table 1:

Characteristics of Patients with RA seen by Telemedicine vs. In-Person Only

Characteristic	Telemedicine (n=56)	In-person only (n=66)	p-value
Age, year, mean (SD)	52.2 (12.2)	52.2 (13.9)	0.971
Female, n (%)	45 (80%)	57 (86%)	0.372
RA disease duration, years, mean (SD)	10.0 (8.8)	10.2 (10.9)	0.421
Anti-CCP antibody positive, n (%)	48 (87%)	61 (92%)	0.35
RF positive, n (%)	48 (87%)	59 (89%)	0.54
Erosions of hands or feet on plain films, n (%)	15 (30%)	15 (25%)	0.56
Current smoking, n (%)	28 (50%)	30 (45%)	0.46
Rheumatic disease comorbidity index, mean (SD)	1.1 (1.1)	0.73 (1.2)	0.06
RAPID3 score (0–30 scale), mean (SD)	12.63 (5.4)	10.43 (5.5)	0.037 *
Number of rheumatology visits in past year, mean (SD)	2.95 (1.35)	2.39 (1.32)	0.011 *
DMARD prescribed in the past year, n (%)	55 (98%)	64 (97%)	0.66
Distance to rheumatologist, miles, mean (SD)	130.2 (248.7)	169.7 (234.2)	0.116
Rheumatologist telemedicine rate, mean (SD)	0.196 (0.064)	0.115 (0.094)	<0.001 *
Telemedicine survey score (possible range –2 to +2), mean (SD)	0.547 (0.625)	0.238 (0.597)	0.001 *
Ever seen by telemedicine by another provider (non-rheumatology), n (%)	9 (16%)	4 (6%)	0.074

* p<0.05

Author Manuscript

Author Manuscript

Author Manuscript

Author Manuscript

Table 2:

Factors Associated with Telemedicine by Multivariate Logistic Regression in the Final Model

Characteristic	Odds ratio	95% Confidence Interval	p-value
Age less than 50	2.16	0.81, 6.14	0.13
Male sex	2.88	0.83, 10.80	0.10
Number of visits in past year	1.51	1.07, 2.16	0.02 *
RAPID3 score	1.16	1.05, 1.29	<0.01 *
Telemedicine survey score	2.76	1.32, 6.18	<0.01 *
Telemedicine visit ever by any provider	0.88	0.18, 4.61	0.87
Mean rheumatologist telemedicine rate	4.14	2.35, 8.00	<0.01 *

*p<0.05

Author Manuscript

Author Manuscript

Author Manuscript

Author Manuscript