

Factors Associated With Use of Telemedicine for Follow-up of SLE in the COVID-19 Outbreak

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Abstract

Background Telemedicine has become an essential tool to manage patients with chronic disease during the COVID-19 pandemic in many parts of the world, and its widespread use will likely go beyond the outbreak. However, there is no study examining the factors associated with telemedicine use for follow-up of patients with SLE.

Methods Consecutive patients followed up at the lupus nephritis clinic were contacted for their preference in changing the coming consultation to telemedicine in the form of videoconferencing. The demographic, socioeconomic and disease data of the first 140 patients opted for telemedicine and 140 control patients preferred to continue standard in-person follow-up were compared.

Results The mean age of the 280 recruited patients was 45.6 ± 11.8 years. The mean disease duration was 15.0 ± 9.2 years. The majority of them had lupus nephritis class III, IV or V (88.2%) and were on prednisolone (90%). Three quarters of the patients (67.1%) were on immunosuppressants. The mean SLEDAI-2k was 4.06 ± 2.54 , physician global assessment (PGA) was 0.46 ± 0.62 and SLICC/ACR damage index was 1.11 ± 1.36 . A significant proportion of the patients (72.1%) had one or more comorbidities. It was found that patients with higher mean PGA (telemedicine: 0.54 ± 0.63 vs control: 0.38 ± 0.59 , $p=0.025$) and family monthly income > USD3,800 (telemedicine: 51/140, 36.4% vs control: 33/140, 23.6%; $p=0.028$) preferred telemedicine, while full-time employees (telemedicine: 56/140, 40.0% vs control: 71/140, 50.7%; $p=0.041$) preferred in-person follow-up. These predictors remained significant after controlling for age in the multivariate analysis. PGA was positively correlated with the perception that TM could reduce and routine visit could increase the risk of COVID-19 during the outbreak. No other clinical factors were found to be associated with the preference of telemedicine follow-up.

Conclusions When choosing the mode of care delivery between telemedicine and physical clinic visit for patients with SLE, the subjective disease activity as well as patient's employment and economic status appeared to be important.

Background

Since coronavirus disease 2019 (COVID-19) was declared a pandemic, the rapidly increasing number of cases and deaths overwhelmed the health care system worldwide. Community lockdowns, social distancing and quarantine restrictions have been implemented to curb the spread of the infection. Systemic lupus erythematosus (SLE) is a chronic remitting-relapsing disease that affects multiple organ systems (1). Patients with SLE are at heightened risk of infection due to the underlying disease and the use of immunosuppressive therapies (2). The increased prevalence of comorbidities, such as hypertension and cardiovascular diseases, have been reported to be poor prognostic factors of COVID-19 (3, 4).

During this extraordinary time, vulnerable patients such as those with lupus nephritis who are likely to be with multiple comorbidities and on immunosuppressants (IS) will face the difficult choice between risking

iatrogenic COVID-19 exposure during a clinician visit and postponing needed care. Indeed, the attendance of our lupus nephritis clinic dropped by 14.4% after the outbreak compared with the same time last year (5). Lupus patients typically require regular follow-up visits to ensure early detection of flares and to monitor the toxicity of immunosuppressive therapy. The unattended patients are at risk of sub-optimal disease control which will lead to damage accrual and high costs (6, 7). As care could be interrupted for a prolonged period, an alternative option would be to adopt telemedicine (TM) or telehealth, the use of telecommunication technologies to provide medical information and services. In fact, the use of TM to reduce potential exposure to severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) has been recommended by international rheumatology societies (8, 9).

So far, the use of TM in rheumatology has been very limited with few experiences reported. According to a systematic review in 2017, there is no good evidence in supporting the use of TM for the management of rheumatic diseases (10). In a subsequent randomized controlled trial, it was concluded that in rheumatoid arthritis patients with low disease activity or remission, a TM follow-up could achieve similar disease control as conventional care (11). Two studies done during the COVID-19 outbreak reported moderate acceptance of TM as the mode of care in patients with connective tissue diseases (5, 12). However, there is no data on the clinical factors associated with the use of TM in patients with SLE. We hypothesized the patient's decision of choosing TM as the mode of follow-up could be influenced by their clinical condition on top of the socio-economic profile.

In this study, we aimed to examine the demographic, socio-economic, psychological, disease and treatment factors predicting the patient's preference of use of TM for follow-up of SLE.

Methods

Study design and patients

This was a single-center prospective case-control study. The study was performed at the lupus nephritis clinic of a regional hospital in Hong Kong. From 1st May to 30th November 2020, all consecutive adult patients with a diagnosis of SLE according to the 2019 EULAR/ACR classification criteria were invited to participate in the study (13). Patients (or their carers) needed to possess the technology required to conduct a TM visit. Patients were excluded if they were incapable of answering a questionnaire. All patients who had given written informed consent were asked for their interest in changing the coming scheduled follow-up to TM-based in the form of a videoconference. The first 140 patients agreed to use TM care were recruited. Another 140 patients who preferred to continue standard follow-up were enrolled as controls. All participants were asked to complete a set of questionnaires including the LupusQoL, Health Assessment Questionnaire Disability Index (HAQ-DI), and Hospital Anxiety and Depression Scale (HADS). They also filled in an online questionnaire regarding their perceptions of TM follow-up (supplementary Fig. 1) (5). The responses were assigned a value of -2 to 2 (strongly disagree to strongly agree), with a higher score indicating that the respondent was more receptive to TM and a zero indicating a neutral response. The study was conducted according to the principles of the Declaration of Helsinki.

Assessments

The disease variables recorded included: disease duration, comorbidities, nephritis class, ever presence of rash/ joint pain, proteinuria, use of IS, SLE disease activity and Systemic Lupus International Collaborating Clinics/American College of Rheumatology (SLICC/ACR) Damage Index (SDI) (14). SLE disease activity was assessed by the Safety of Estrogens in Lupus Erythematosus National Assessment (SELENA) version of the Systemic Lupus Erythematosus Disease Activity Index 2000 (SLEDAI-2k) and physician global assessment (PGA) (14). SLE disease remission was defined as absence of clinical activity with no use of systemic glucocorticoids and IS; and lupus low disease activity state (LLDAS) as a SLEDAI 2k \leq 4, PGA \leq 1 with GC \leq 7.5 mg of prednisone and well tolerated IS agents (15). Recently, remission and LLDAS were agreed to be the meaningful targets for managing lupus patients in order to prevent damage accrual and improve quality of life (15). All the investigations and assessments were performed within one month before or after the patient was recruited. The clinical assessment of the control group was done face-to-face while that for the TM group was by a videoconference.

Statistical analysis

The overall demographic and clinical characteristics of the recruited patients were reported as mean values with standard deviations (SD) for continuous variables and as numbers and percentages for categorical variables. The patients in the TM and control groups were compared by chi-square test or fisher exact test and student t-test where appropriate. Binary logistic regression was conducted for the multivariate analysis of independent predictors with respect to preference over TM follow-up. Spearman correlation was used to investigate the association between SLE disease activity and patient's perception about TM follow-up. A 2-tailed probability value of $p < 0.05$ was considered statistically significant. Statistical analyses were performed using the Statistics Package for Social Sciences (IBM SPSS V.26.0, IBM Corporation, Armonk, NY, USA).

Results

The data of 280 patients (140 TM and 140 controls) with SLE were analyzed. The demographic and disease characteristics are presented in Table 1. The mean age of the recruited patients was 45.6 ± 11.8 years. There was a female predominance (91.4%). The mean disease duration was 15.8 ± 9.5 years. The majority of them (88.2%) had lupus nephritis class III, IV or V. The mean SLEDAI-2k was 3.39 ± 2.35 , mean PGA was 0.46 ± 0.62 and SDI was 0.97 ± 1.23 . Almost all of them (90%) were on prednisolone with a mean daily dose of 5.82 ± 6.10 mg. Three quarters of the patients (67.1%) were on IS with the commonest being mycophenolate mofetil followed by calcineurin inhibitors. While 70% of the patients were in LLDAS, only 5 (1.8%) had disease remission. A significant proportion of the patients (72.1%) had one or more comorbidities. The mean HAQ-DI of the patients was 0.20 ± 0.40 . Regarding the anxiety and depression scale, 32.9% and 29.6% of the patients had HADS anxiety score and depression score equals or larger than 8 respectively. The socio-economic profile of the patients is presented in Table 2.

Table 1

Disease data of the recruited patients and comparison between the telemedicine/standard follow-up groups

	Overall (n = 280)	Telemedicine group (n = 140)	Standard follow-up group (n = 140)	P-value
Age in years	45.6 ± 11.8	44.6 ± 11.4	46.6 ± 12.1	0.159
Gender: Female	256 (91.4)	127 (90.7)	129 (92.1)	0.669
Ever presence of:				
Rash	170 (60.8)	87 (62.1)	82 (58.6)	0.527
Joint pain	174 (62.1)	92 (65.7)	82 (58.6)	0.247
Disease duration in years	15.8 ± 9.5	15.0 ± 9.3	16.5 ± 9.6	0.176
Nephritis class III, IV or V	247 (88.2)	122 (87.1)	125 (89.3)	0.662
24 hour urine proteinuria in gram	0.45 ± 0.60	0.50 ± 0.63	0.40 ± 0.57	0.176
Current use of prednisolone	252 (90.0)	125 (85.7)	127 (90.7)	0.690
Daily prednisolone dose in mg	5.82 ± 6.10	5.28 ± 4.46	6.35 ± 7.37	0.143
Use of immunosuppressant	188 (67.1)	96 (68.6)	92 (65.7)	0.611
SLEDAI-2K	3.39 ± 2.35	3.51 ± 2.28	3.26 ± 2.41	0.366
PGA	0.46 ± 0.62	0.54 ± 0.63	0.38 ± 0.59	0.025
LLDAS	196 (70)	92 (65.7)	104 (74.3)	0.160
Remission	5 (1.8)	0 (0)	5 (3.6)	0.060
Presence of comorbidity	202 (72.1)	100 (71.4)	102 (72.9)	0.790
Number of comorbidity	1.46 ± 1.39	1.38 ± 1.35	1.55 ± 1.42	0.301
SDI	0.97 ± 1.23	0.95 ± 1.21	1.00 ± 1.26	0.732
HAQ-DI	0.20 ± 0.40	0.23 ± 0.45	0.18 ± 0.34	0.300

Data are reported as mean ± SD or number (%). SLEDAI-2k: Systemic Lupus Erythematosus Disease Activity Index 2000; PGA: physician global assessment; LLDAS: lupus low disease activity state; SDI: Systemic Lupus International Collaborating Clinics/American College of Rheumatology (SLICC/ACR) Damage Index; HAQ-DI: Health Assessment Questionnaire Disability Index; and HADS: Hospital Anxiety and Depression Scale.

	Overall (n = 280)	Telemedicine group (n = 140)	Standard follow-up group (n = 140)	P-value
HADS:				
Anxiety scale	5.93 ± 3.98	5.86 ± 4.06	6.00 ± 3.91	0.776
Depression scale	5.57 ± 3.91	5.56 ± 4.25	5.59 ± 3.54	0.954
LupusQoL score for:				
Physical health	80.5 ± 18.8	79.6 ± 20.2	81.5 ± 17.1	0.406
Pain	81.3 ± 18.8	82.1 ± 19.2	80.4 ± 18.4	0.456
Planning	83.8 ± 18.7	83.8 ± 18.7	83.8 ± 18.8	0.996
Intimate relationship	77.1 ± 24.9	74.7 ± 27.6	79.7 ± 21.3	0.201
Burden to others	73.9 ± 23.2	75.4 ± 22.3	72.4 ± 24.1	0.295
Emotional health	81.2 ± 17.4	82.1 ± 17.5	80.2 ± 17.3	0.383
Body image	78.8 ± 22.1	78.4 ± 23.2	79.1 ± 21.0	0.793
Fatigue	74.2 ± 20.6	75.6 ± 19.9	72.7 ± 21.3	0.247
Data are reported as mean ± SD or number (%). SLEDAI-2k: Systemic Lupus Erythematosus Disease Activity Index 2000; PGA: physician global assessment; LLDAS: lupus low disease activity state; SDI: Systemic Lupus International Collaborating Clinics/American College of Rheumatology (SLICC/ACR) Damage Index; HAQ-DI: Health Assessment Questionnaire Disability Index; and HADS: Hospital Anxiety and Depression Scale.				

Table 2

Socio-economic data of the recruited patients and comparison between the telemedicine/standard follow-up groups

	Overall (n = 280)	Telemedicine group (n = 140)	Standard follow-up group (n = 140)	P-value
Sick leave due to SLE in the past year	91 (32.5)	44 (31.4)	47 (33.6)	0.929
Days of sick leave due to SLE in the past year	12.0 ± 19.0	11.2 ± 20.4	12.8 ± 17.9	0.702
Hospitalization due to SLE in the past year	64 (22.9)	36 (25.7)	28 (20.0)	0.313
Days of hospitalization due to SLE in the past year	20.9 ± 24.1	22.6 ± 26.7	18.7 ± 20.5	0.525
Currently married	148 (52.9)	81 (57.9)	67 (47.9)	0.134
Education level: tertiary or above	122 (43.6)	63 (45.0)	59 (42.1)	0.746
Education level: secondary or above	257 (91.8)	133 (95.0)	124 (88.6)	0.131
Fulltime employment	127 (45.4)	56 (40.0)	71 (50.7)	0.041
Occupation: professionals	36 (12.9)	22 (15.7)	14 (10.0)	0.181
housewives	42 (15.0)	22 (15.7)	20 (14.3)	0.816
students	11 (3.9)	7(5.0)	4 (2.9)	0.382
Housing: private	173 (61.8)	91 (65.0)	82 (58.6)	0.325
public	107 (38.2)	49 (35.0)	58 (41.4)	
Distance from home to hospital in KM	6.3 ± 6.0	6.3 ± 6.4	6.4 ± 5.5	0.951
Monthly family income > USD3,800	84 (30.0)	51 (36.4)	33 (23.6)	0.028
Data are reported as mean ± SD or number (%). SLE: systemic lupus erythematosus.				

Univariate analyses showed that higher PGA (TM: mean 0.54 ± 0.63 vs control: 0.38 ± 0.59, p = 0.025) and family monthly income > USD3,800 (TM: 51/140, 36.4% vs control: 33/140, 23.6%; p = 0.028) were associated with the preference of TM use, while fulltime employment (TM: 56/140, 40.0% vs control: 71/140, 50.7%; p = 0.041) was related to routine physical follow-up. There was no other statistically significant difference in all the demographic, socio-psychological, disease and treatment variables between the two groups of patients.

Binary logistic regression analysis revealed higher PGA, family monthly income > USD3,800 and non-fulltime employment status remained independent predictors of TM care (OR 1.05 95% CI 1.01–1.09, OR 1.90 95% CI 1.24–3.79, OR 1.89 95% CI 1.13–3.17 respectively) after adjustment for age. PGA was found to be positively correlated with the perceptions that TM follow-up could reduce ($r = 0.13$, $p = 0.036$) and routine visit could increase ($r = 0.12$, $p = 0.04$) the risk of infection during the COVID-19 outbreak (supplementary table 1).

Discussion

As we define the new normal for ambulatory care in the COVID era, we need a new approach to provide routine follow-up for our SLE patients and TM is an obvious option. Our study found that patients with higher physician-assessed disease activity were more willing to use TM instead of standard in-person follow-up. This could be due to the fear of infection exposure during the clinic visits as we also noted higher PGA was associated with the perception that TM follow-up would reduce the risk of infection while routine care would increase that risk. In fact it has been postulated that the more stringent behavioral measures adopted by patients due to the perceived risk could potentially explain the initial reports of paucity of SLE patients with COVID-19 (16). A survey distributed to 199 patients with lupus nephritis during the outbreak showed that their median fear of COVID-19 was 8 out of a maximum scale of 10 (17). However, in subsequent case series, SLE patients with quiescent disease did not seem to be protected from COVID-19 (18, 19). Comorbidities and glucocorticoid therapy were noted to be over-presented in these infected SLE patients which could explain the higher rate of severe COVID-19 compared to patients with other rheumatic diseases (18). However, no other disease specific factors including lupus manifestations, glucocorticoid therapy, comorbidities and IS use were found to be predictive of TM use in our study. Another possible explanation for the higher PGA in the TM group could be the perceived less stable disease when the patients were assessed virtually. The accuracy of disease activity assessment via TM warrants further investigations. Interestingly, in a study done before the COVID-19 outbreak, when offered as an option, video TM was also more likely to be used by rheumatoid arthritis patients with higher disease activity (20).

In this study, we also found that higher monthly family income favored TM use. Cavagna et al reported the results of a survey on the propensity for adopting TM in 175 patients with connective tissue disease of whom 49 had SLE (12). It was found that a college degree and distance from the hospital were independent predictors for the acceptance of TM. It might seem conceivable that patients who are socio-economically more privileged would be more keen to use TM. The issue needs to be addressed before universal integration between TM and standard care in order not to exacerbate health care disparities. On the other hand, we found no association in the distance from hospital with the preference of TM. This could be related to the fact that most of our patients were residing close to the hospital. In another study on the perception of SLE patients with regard to choosing TM for follow-up, the privacy/security issue, the accuracy of assessment, as well as the infection risks were important factors considered by the patients (5). When deciding on the mode of care delivery, the patient's perception is also important.

Another intriguing finding of the study is the association of fulltime employment status with standard in-person visit. Border restrictions, quarantine, and social distancing were the anti-endemic measures adopted in Hong Kong. Complete society lock-down or prohibition of social mobility was not in place which meant patients with fulltime employment still had to go to work. As a result, the increased infection risk associated with attending the scheduled clinic follow-up might seem to be negligible. Another potential explanation could be that sick-leave certificates were not issued for TM care due to administrative reasons in the institution where the study was conducted.

There are several limitations in this study. First, the results should be interpreted in the context of the local outbreak status and mitigation measures implemented. They may not be generalizable to other parts of the world in different outbreak stages adopting different strategies. Second, SLE patients on intravenous cyclophosphamide were not included in the study as they received regular assessment by rheumatologists as day-patients. Lastly, there were logistic issues that might affect the patient's acceptance to TM. For example, under the current workflow, patient still had to come to the hospital for blood and urine tests. The home or working environment of the patients may also be important.

Conclusions

When offered as an option, we found SLE patients with higher physician-determined disease activity and family income who were not full-time employed, were more willing to use TM for follow-up. With the availability of vaccines and anticipated loosening of containment measures, the results could provide important information on the factors to consider when we choose the mode of care delivery during, and also after the COVID-19 outbreak. The subjective disease activity and socio-economic statuses but not treatments or comorbidities appeared to be the important determinants in patients with SLE.

Abbreviations

COVID-19: Coronavirus disease 2019

SLE: Systemic lupus erythematosus

IS: Immunosuppressants

TM: Telemedicine

SARS-CoV-2: Severe acute respiratory syndrome coronavirus 2

HAQ-DI: Health Assessment Questionnaire Disability Index

HADS: Hospital Anxiety and Depression Scale

SLICC/ACR: Systemic Lupus International Collaborating Clinics/American College of Rheumatology

SDI: Systemic Lupus International Collaborating Clinics/American College of Rheumatology () Damage Index

SELENA: Safety of Estrogens in Lupus Erythematosus National Assessment () version of the **SLEDAI-2k:** Systemic Lupus Erythematosus Disease Activity Index

PGA: Physician global assessment

LLDAS: Lupus low disease activity state

SD: Standard deviations

Declarations

Ethics approval and consent to participate

The study was approved by The Joint Chinese University of Hong Kong – New Territories East Cluster Clinical Research Ethics Committee (NTEC-2020-0254). Written informed consents to participate were obtained from all patients.

Competing interests

None declared.

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Consent for publication

Not applicable.

Availability of data and materials

Data can be shared upon request.

Authors' contributions

All authors critically revised the manuscript for important intellectual content. Specific roles included: study design (HS, CCS, LST), data collection (HS, EC, ITC, SLL, TKL), data analysis (HS, EC, ITC, SLL, TKL), drafting of manuscript (HS, LST).

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