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REVIEW ARTICLE

Global Perspective on the Impact of the COVID-19 Pandemic on Rheumatology and Health Equity

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Although the public health emergency associated with the COVID-19 pandemic has ended, challenges remain, especially for individuals with rheumatic diseases. We aimed to assess the historical and ongoing effects of COVID-19 on individuals with rheumatic diseases and rheumatology practices globally, with specific attention to vulnerable communities and lessons learned. We reviewed literature from several countries and regions, including Africa, Australia and New Zealand, China, Europe, Latin America, and the US. In this review, we summarize literature that not only examines the impact of the pandemic on individuals with rheumatic diseases, but also research that reports the lasting changes to rheumatology patient care and practice, and health service use. Across countries, challenges faced by individuals with rheumatic diseases during the pandemic included disruptions in health care and medication supply shortages. These challenges were associated with worse disease and mental health outcomes in some studies, particularly among those who had social vulnerabilities defined by socioeconomic, race, or rurality. Moreover, rheumatology practice was impacted in all regions, with the uptake of telemedicine and changes in health care utilization. While many regions developed rapid guidelines to disseminate scientific information, misinformation and disinformation remained widespread. Finally, vaccine uptake among individuals with rheumatic diseases has been uneven across the world. As the acute phase of the pandemic wanes, ongoing efforts are needed to improve health care access, stabilize rheumatology drug supplies, improve public health communication, and implement evidence-based vaccination practices to reduce COVID-19 morbidity and mortality among individuals with rheumatic diseases.

INTRODUCTION

The COVID-19 pandemic created significant challenges for individuals with rheumatic diseases, particularly those who were members of vulnerable populations. Challenges included maldistribution of testing and vaccines, unequal access to health care, and more severe outcomes of infection, all of which have disproportionately affected individuals with low socioeconomic status. The pandemic has also exposed disparities in health and health care that already existed in many countries, highlighting the need for both local and global responses to address differential outcomes in populations at higher risk of severe COVID-19.

Three years into the pandemic, it is important to reflect on the impact of COVID-19 on both individuals with rheumatic disease and on rheumatology practice. In this review, a global team of rheumatologists reviewed the literature on the impacts of COVID-19 in rheumatology in several countries and regions, including Africa, Australia/New Zealand, China, Europe, Latin America, and the US. Where possible, we focused our literature review specifically on people from socioeconomic, racial, or ethnic groups with historically fewer resources and access to care, indigenous populations, and rural populations. In this review, we summarize literature that not only examines the impact of the pandemic on these populations, but also research that reports the

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lasting changes to rheumatology patient care and practice, and on health service use. By providing this synthesis of the literature, we aim to identify lessons learned that the global rheumatology community can apply to improve care for individuals with rheumatic diseases.

Africa

The earlier forecasts of COVID-19 pandemic impact from public health experts projected a bleak image for Africa (1). Health systems in the continent were described as having varied and less preparedness compared to other parts of the world, hence the region was anticipated to suffer a disproportionate burden of disease and death. Fortunately, these predictions did not pan out, as fewer deaths than expected have been reported on the continent. The pandemic nevertheless had dire consequences on the socioeconomic and political landscape and health systems of Africa (2,3).

Impact on patients in Africa. The impact of the pandemic on individuals with rheumatic disease has been profound, including disruptions in access to care, shortages of drugs, and a rise in self-reported mental health issues. Several African studies have sought to quantify some of the associated burden. In a regional study to determine the impact of COVID-19 on individuals with chronic rheumatic diseases, the pandemic negatively impacted rheumatology visits (82% of cases), availability of hydroxychloroquine (HCQ) (47%), and mental health (73%) (4).

The African League of Associations for Rheumatology reported an acute shortage of HCQ, noted by 7 of 10 rheumatologists, and 1 of 5 had to lower the amounts they prescribed to patients to make the supply last (5). A retrospective study of 342 South Africans patients receiving care at an academic rheumatology center reported that 80% of patients had interruptions in chloroquine access and 69 patients experienced a physician-determined disease flare (6).

Other data suggest negative impacts on disease control and quality of life in patients in Africa. A study of patients with rheumatoid arthritis (RA) from a single center in Benin reported the mean ± SD Disease Activity Score in 28 joints scores increasing from 3.4 ± 1.5 pre-pandemic to 4.7 ± 2.04 in May 2020. Quality of life also decreased, with the physical component summary score and mental component summary scores of the Medical Outcome Study Short Form 36 measured as a mean ± SD 71.1 ± 20.3 and 67.1 ± 16.02 pre-pandemic compared to 38.1 ± 4.96 and 36.8 ± 3.8, respectively (7). Among an Egyptian rheumatic disease group, patients were found to be more vulnerable to mental health disorders and psychological distress, with 49%, 29%, and 1% of patients having experienced moderate, severe, and extremely severe anxiety, respectively, as a result of COVID-19 (8).

Impact on health care providers and practice in Africa. The pandemic has pushed many rheumatology clinics across Africa to adopt more virtual consultations (telemedicine), with significant reductions in daily hospital activities, such as infusions and other outpatient activities; these changes have also corresponded to significant negative impacts on mental health being reported by rheumatologists (9,10).

One of the most remarkable efforts to respond to challenges and uncertainties created by COVID-19 in rheumatology practice in Africa was the formation of a special task force that aimed to develop recommendations for the management of rheumatic disease during the pandemic (11). A pan-African survey on experiences of rheumatologists provided comprehensive insight into the rheumatology service organization and the extent of service disruption caused by the COVID-19 pandemic (5,12).

Vaccination has presented another major challenge in Africa. There has been a high level of skepticism and hesitancy towards vaccination (13). These data show a reluctance across the whole population toward receiving COVID-19 vaccines, though this improved over time.

Some governments in Africa prioritized patients with rheumatic diseases for COVID-19 vaccination. In South Africa, patients with comorbidities, including RA, were included in the second phase of the national vaccination program (14). In Nigeria, individuals with underlying medical conditions, including rheumatic diseases, were in the priority group for vaccination (15). Unlike other parts of the world, not much has been done to look at antibody response in rheumatic patients. In Egypt and Morocco, it was found that there was lower antibody responses to the Sinopharm vaccine and Sinovac vaccines among the general population and health workers (16,17).

Lessons learned in Africa. In Africa, priorities include patient and population education regarding vaccination and mental health support. The health system could benefit from ongoing medical education for doctors, advocacy for rheumatology, access to drugs (biologic treatments and HCQ), an accessible telemedicine platform, more organized rheumatology units, and adequate supplies of personal protective equipment (PPE); these are among the top-cited unmet needs to deal with rheumatic diseases in Africa in the wake of the COVID-19 pandemic.

China

As the first country heavily struck by the COVID-19 outbreak, China adopted a series of policies to contain virus spread including lockdown, a strict zero-COVID policy, mobilization of resources, vaccination, and drug development. These policies, which were in place through December 2022, were intended to spare no efforts to reduce mortality rates and protect vulnerable populations such as the elderly and patients with chronic diseases including rheumatic diseases and were largely successful from the perspective of mitigating COVID-19–related outcomes.

Impact on patients in China. In China, the impact of COVID-19 on individuals with rheumatic diseases has been multifaceted, including less access to routine health care, increased risk of infection and severe disease, and concerns about vaccination. Several studies have evaluated how COVID-19 has influenced clinical outcomes (e.g., frequency of infections or flares), health-related concerns and behaviors (e.g., vaccination-related concerns and uptake), and changes in access to care for patients with rheumatic diseases since the emergence of the pandemic. For example, a number of retrospective studies in Wuhan—the capital of Hubei province, and the first city in China impacted by the COVID-19 pandemic in early 2020—reported outcomes in patients with rheumatic diseases (18–21).

Similar to findings from other regions, patients with rheumatic diseases in China were found to be more susceptible to COVID-19 infection compared to the general population (21). Rheumatic diseases were also shown to aggravate the course of infection (18) and increase the risk of respiratory failure (19). However, additional data including data from studies outside of Wuhan found that with adequate medical intervention in China, COVID-19 was not necessarily associated with increased likelihood of critical outcomes such as intensive care unit occupancy (22), mechanical ventilation (21), and death (18). Based on these findings, national rheumatology associations in China and Asia Pacific League of Associations for Rheumatology have published recommendations to improve the outcomes of COVID-19 in patients with rheumatic diseases (23).

Impact on health care providers and practice in China. The COVID-19 pandemic had a substantial impact on the long-term follow-up of patients with rheumatic disease in China. Early and intensive measures were adopted to contain COVID-19 with strict mask mandates, social distancing and routine testing requirements, and swift lockdowns coupled with contact tracing when cases were identified. While these measures disrupted in-person care for many patients with rheumatic disease, they were also viewed as an effective means to protect vulnerable populations from COVID-19 (24). In response, the use of telemedicine in rheumatology care was rapidly and significantly expanded in China (25,26).

Despite the availability of vaccines, COVID-19 vaccination rates in Asian countries, including China, remain low (27). Other than the messenger RNA and adenovirus vector vaccines used in western countries, inactivated COVID-19 vaccines were widely used in China. The efficacy and safety of these vaccines have been confirmed (28). Although more research is needed, some data suggest that patients may experience disease flare after vaccination (28). A nationwide, multicenter survey conducted to investigate vaccination-related concerns in Chinese patients with rheumatic diseases found that concerns regarding adverse effects and disease flare were the main factors affecting vaccination willingness (29). Recommendations have been published in China to address vaccine hesitancy (30).

Lessons learned in China. There are some key lessons learned from the management of patients with rheumatic diseases during the COVID-19 pandemic. First, policies for early intensive methods against the spread of infection play an important role in the protection of vulnerable populations who are at higher risk of infection and severe outcomes. Second, patients with chronic disease may have less access to routine health care due to restriction of traveling to avoid infection, which may further result in poor monitoring, delayed adjustment of treatment regimens, and excessive risk of flare. Thus, the expansion of telemedicine has been a welcome innovation. Third, better understanding of the concerns of patients and more individualized education are required to improve vaccination rates among these vulnerable populations. Proper guidance for patients (31) is not only the duty of rheumatologists, but also requires collaborative efforts from social media and the government.

Australia and New Zealand

Both Australia and Aotearoa New Zealand adopted "zero-COVID" suppression/elimination strategies. In March 2020 these island states, along with most in Oceania, established strict border control with quarantine after entry. Both countries had comprehensive testing and case isolation systems and implemented social distancing measures with lockdowns when community transmission occurred. National COVID-19 vaccination programs began in 2021, obtaining high levels of vaccination by late 2021. New Zealand avoided widespread community transmission of COVID-19 until 2022 and can report the overall best mortality protection outcomes among countries in the Organization for Economic Co-operation and Development (OECD), and performed better compared to the OECD average economically (32). Australia controlled a significant outbreak in Melbourne in late 2020 that particularly impacted older adults in aged residential care, then continued with a zero-COVID strategy until mid-2021 (33). These approaches have been successful but with some areas for improvement (34).

Impact on patients in Australia and New Zealand. Given largely successful early COVID-19 containment strategies, individuals with rheumatic disease were able to reduce risk of exposure comparatively easily. There were also long periods in 2020 and 2021 when there was no COVID-19 transmission, and in-person health services were not disrupted. During periods of required physical distancing, most ambulatory rheumatology care was moved to virtual care, often via telephone (35). In Australia, individuals with rheumatic disease reported high confidence in accessing health care, with high acceptability for telemedicine-delivered care reported early in the pandemic (36,37). While there were short-lived restrictions on HCQ dispensing, supplies were not interrupted. Tocilizumab became unavailable for rheumatic disease indications in both countries, forcing changes to treatment for those relying on this medication. In New Zealand this resulted in the first government subsidization of JAK inhibitors in late 2021. Australia implemented rapid changes in funding authorization of advanced therapies to ensure continuity of care.

Overall, there were some changes and delays to patient care, but most were managed proactively.

While there is not yet published data on COVID-19 outcomes in individuals with rheumatic disease in Australasia, it seems likely that patterns will follow those seen in other high-income countries with high rates of vaccination. Population data shows older individuals and some ethnic groups experienced high rates of poor outcomes from COVID-19 (38) with Māori and Pacific peoples experiencing higher rates of COVID-19 infections, in part due to inequitable delivery of public health measures, such as contact tracing (39).

Impact of health care providers and practice in Australia and New Zealand. There were, however, negative impacts on patient care delivery at times during the pandemic. Data from 2 retrospective studies involving medical record review in single centers with telephone-based care during the initial lockdowns of 2020 reported no decrease in service volumes but lower frequency of change in rheumatic disease medications (40,41). Diagnosis was more often deferred, and high rates of earlier than expected follow-up appointments were also noted (10).

In 2023, both countries are moving toward managing COVID-19 as an endemic infection. Rheumatology care has largely returned to pre-pandemic patterns. Australian rheumatology practices had been early adopters of telemedicine to meet needs of a geographically dispersed rural population and to extend the reach of a limited rheumatology workforce (42). In Queensland, a state 7 times the size of Great Britain, 75% of rheumatologists had used telemedicine before the pandemic, mostly with a hub model of a health care provider located with the patient (43). During the pandemic, rheumatologists had low confidence in telephone-based rheumatology care delivery and anticipated ongoing barriers to telemedicine adoption including quality of care, efficiency, and reimbursement (43). Some practices have been more successful in incorporating virtual care into ongoing rheumatology practice (44).

Lessons learned in Australia and New Zealand. The bold public health approaches of the Australian and New Zealand governments have led to lower COVID-19 health burden and maintained economic activity. While data on health and other outcomes for individuals with rheumatic disease are awaited, we anticipate these to also be favorable. Underpinnings that enabled these outcomes included universal health care access and strong public trust in government processes.

Europe

The COVID-19 pandemic has transformed rheumatology health care delivery in Europe. The pandemic is likely to have had detrimental effects on patient management and quality of care, despite the efforts and teamwork displayed by the rheumatology community in its worldwide and integrated response.

Impact on patients in Europe. An online survey of 1,800 patients conducted at the start of the pandemic revealed that 58% had their rheumatology appointments canceled, and 46% were not given any information about how SARS–CoV-2 infection might affect their rheumatic disease and treatment. In addition, 46% of patients were unable to continue exercising regularly, 25% increased smoking, and 18% increased alcohol consumption. Based on scores on the Hospital Anxiety and Depression Scale, 46% of patients had depression, and 58% were at risk for anxiety. Half of the patients reported poor well-being (45).

Inequalities in COVID-19 mortality rates still exist. The Health Foundation, an independent charitable organization in the UK, reports mortality rates are 3–4 times higher in the poorest areas. However, compared to the first year of the pandemic, the overall number of COVID-19 deaths is now significantly lower. Vaccination programs have played a key role in reducing COVID-19 mortality rates, but for some populations, uptake is still low, particularly for individuals living in poorer areas and those from some minority ethnic groups (46).

Impact on health care providers and practice in Europe. A Europe-wide survey of 1,286 rheumatologists from 35 countries revealed that >80% canceled or postponed face-to-face visits with new patients, and 91% did the same for follow-up visits. Treatment choices were frequently delayed, and >70% of rheumatologists were hesitant to prescribe biological/targeted synthetic disease-modifying antirheumatic drugs (DMARDs) during the early stages of the pandemic, primarily due to patient anxiety, scarcity of screening tools, and decline in the availability of rheumatologic services. This is a missed opportunity for the best patient care (47). Variations were observed among countries due to the impact of the pandemic, response strategies, and telemedicine regulations (48).

From the perspective of training, in a survey of 302 rheumatology trainees (30% from Europe, 38% from the US, and 32% from other countries), a negative impact of the pandemic on learning opportunities during rheumatology training, including outpatient clinics (79%), inpatient consultations (59%), didactic teaching (55%), procedures (53%), teaching opportunities (52%), and ultrasonography (36%) was reported. Moreover, 39% of trainees reported that COVID-19 negatively affected their ability to continue their pre-pandemic research (49).

Additional reports have suggested that COVID-19–related issues, such as prioritization of COVID-19 research, redeployment of research staff, and the requirement for social distancing, have had a negative impact on the recruitment of participants to non–COVID-19–related research (50). According to a survey of >1,000 individuals with rheumatic diseases, the willingness of patients to participate in research during the pandemic also decreased. Respondents were less likely to participate in observational or interventional research studies during COVID-19 compared to before the pandemic (86% versus 64%, and 61% versus 44%, respectively) (51).

The management of rheumatic diseases within the context of COVID-19 has been addressed by overarching European institutions, such as EULAR. EULAR monitored the published literature and provided recommendations on the risk and prognosis of SARS–CoV-2 infection as well as the safety and efficacy of vaccination against SARS–CoV-2 in patients with rheumatic diseases (52–55).

Lessons learned in Europe. Repercussions of COVID-19 were vast and are far from over, and we will need to continue addressing its long-term impacts. Omicron has become the most prominent variant, leading to less severe infections, and resulting in a decrease in COVID-19 public concern. However, the long-term sequelae of COVID-19, commonly referred to as Long COVID, continue to affect millions of people in Europe and worldwide (48). It remains unclear whether Long COVID is more frequent in individuals with rheumatic diseases, and further studies are warranted. New questions are now being raised since most individuals with rheumatic diseases have received at least 1 complete vaccination cycle and a booster. There appears to be significant individual variation in immunogenicity, and it is still unknown how frequently the general population, let alone those with rheumatic diseases and those receiving different immunosuppressive treatments, will need to be revaccinated (53). Therefore, there is a need to conduct well-designed longitudinal studies to better understand vaccine immunogenicity and to determine the best timing and dosing of COVID-19 vaccines in patients with rheumatic diseases.

Latin America

Latin America had some of the highest COVID-19 death rates in the world, resulting from a combination of factors including political instability, corruption, social unrest, fragile health systems, and inequality of income, health, and education. For example, 54% of all work carried out in Latin America is informal; such workers have little-to-no access to health care and often have to work when ill to earn a living. For these individuals, quarantine and social distancing measures were just not possible. Additionally, as the large majority of Latin American countries are lower-middle income, they are often overlooked in global health efforts targeting low-income countries (56). These disparities disproportionately affect individuals with chronic diseases, including those with autoimmune diseases who experience barriers within and outside the health care system.

Impact on patients in Latin America. Low socioeconomic status (SES) has been associated with poorer outcomes, including higher risk of infection, less access to health care, and a higher number of comorbidities (57). In Argentina, Mestizo populations and individuals cared for in the public health system were more likely to require hospitalization (58). Additionally, small cities lacked the necessary infrastructure for pandemic management (59). Informal work is much more common in populations with lower socioeconomic status, and social support for these groups was insufficient (60). Since this population had limited in-person and virtual health care access, their diagnosis was usually delayed, portending poorer outcomes (61). Moreover, social media networks were not helpful vehicles for educational outreach in these populations (62), creating barriers to disseminating COVID-19–related information and other information during the pandemic.

Furthermore, in the Pan American League of Associations for Rheumatology (PANLAR) patient survey study, 23.4% of participants reported discontinuing at least 1 antirheumatic drug. The main reasons included fear that the medication would increase the risk of infection, and economic or administrative issues (63). However, actual adherence levels may have been even lower, since those with less access to health care also had less access to the internet and were less likely to participate in the study. Likewise, another study of physicians reported a 50% reduction in patient adherence to medication (64).

It is important to point out that historically in Latin America there is a high rate of vaccination, particularly in children; this was not the case for COVID-19, where a large percentage of patients with autoimmune diseases said they would decline the vaccine (65). This lack of confidence could be related to the novelty of the vaccine, or misinformation in the media and/or from political authorities. However, it is important to point out that despite these misgivings, 70% of the Latin American population completed the initial COVID-19 vaccination protocol by May 2022, compared to 58% worldwide (66). Furthermore, in Latin America, individuals with autoimmune disease were prioritized, so they were vaccinated even earlier.

Impact on health care providers/practice in Latin America. One of the main changes during the pandemic was the increased use of telehealth, to which access was unequal. For example, in the PANLAR patient survey, only 32.3% of respondents whose medical appointments were canceled had a telehealth consultation. Among these, 49.9% were completed by telephone calls, and 36.4% by video calls (63). PANLAR physicians reported the time of face-to-face activity was limited. Telehealth was adopted by 80.0% of rheumatologists, of whom 50.6% used video calls and 45.5% used phone calls (64). The scarcity of video calls impacted the ability of providers to make an accurate diagnosis and treatment plan. Nevertheless, one study demonstrated that in some Latin American settings, telehealth was useful for monitoring patients with stable RA (67). These findings suggested a mixed model could be an option for certain patients, in particular those who live in rural areas.

Lesson learned in Latin America. Much work is needed to reduce disparities in Latin America. Outcomes of autoimmune diseases during the pandemic were affected by poverty, health care access, and health literacy; therefore, reducing morbidity from these factors should be the subject of advocacy efforts by rheumatologists and other professionals. Collaborative work between health care professionals and patients within the region, and with other regions, should be strongly encouraged to reduce these disparities.

US

Individuals with rheumatic diseases faced numerous challenges during the COVID-19 pandemic in the US, ranging from disruptions in health care and medication access, mental health impacts, and in some cases, more severe outcomes from infection. Furthermore, many rheumatic diseases disproportionately affect individuals with lower SES (e.g., Black, Latino, and Native American individuals), populations in which striking disparities in COVID-19 health outcomes were well documented.

Impact on patients in the US. Several studies focused on the concerns of patients regarding COVID-19 itself or the relationship between COVID-19 and their underlying rheumatic disease, changes in health-related behaviors during the pandemic, and access to medications and care, including adjustment to telemedicine. COVID-19–related concerns tended to be higher among patients receiving biologic DMARDs (68) or JAK inhibitors (69), and were associated with increased social distancing behaviors (69). Disruptions in medication use and health care visits stemmed from both changes in health-related behaviors (e.g., taking medications as prescribed, going to appointments) and physical barriers to access (e.g., limited supply of medications such as HCQ, shelter-in-place orders), and were associated with increased disease activity and flares (70,71).

While discontinuation of medications was initially associated with concerns regarding vulnerability to COVID-19 or severe outcomes, these concerns improved over the course of 2020. However, a large nation-wide study showed that from December 2020 to May 2021, interruptions in DMARD use increased by 80%, and a minority of discontinuations were physician guided (71). Concurrently, patients adapted to telemedicine, but generally preferred in-person initial evaluations (72), and older patients were less enthusiastic about virtual appointments. As vaccines became increasingly available in 2021, a desire to return to normal routines promoted uptake; however, this was counterbalanced by fears about side effects (including flare of underlying rheumatic disease) or distrust of the vaccines (73).

As early as April 2020, disparities in access and outcomes between White individuals and patients from racial and ethnic minority groups, those with lower SES, or those living in rural areas were becoming alarmingly apparent. Among patients with rheumatic diseases, these disparities were pervasive across domains including clinical outcomes, access to care and telemedicine, vaccine uptake, and participation in research, in part due to structural barriers but also in part fueled by mistrust (e.g., misinformation about minorities being targeted as “guinea pigs”) (69,74). For example, 2 studies from the Global Rheumatology Alliance registry found that patients with rheumatic disease identifying as Black, Latino, or Asian had more severe COVID-19 outcomes than those who were White (75,76).

Impact on providers/practices in the US. Rheumatology care delivery during the pandemic became significantly more complex in the setting of competing demands (e.g., diversion of resources to COVID-19 care), social distancing, obstacles to effective risk communication, and challenges of transitioning rapidly and equitably to virtual care. The American College of Rheumatology (ACR) developed a series of guidance documents to assist rheumatologists in navigating the pandemic (77). In addition, 3 large national studies examined changes in rheumatology practice patterns during the early months of the pandemic (through the Veterans Administration [VA] [78], the ACR Rheumatology Informatics System for Effectiveness registry [79], and the American Arthritis and Rheumatology Associates network [74]).

Rheumatologists in the VA reported comfort managing stable patients using telemedicine, but not new patients or established patients requiring ongoing therapeutic changes. Providers also perceived potential increases in health care disparities in African American patients, Latino patients, those in low SES groups, and those living in rural areas (78). Li et al compared visit counts from March to August 2020 to the same period in 2019 and found an 11.5% decrease in visits in states with shelter-in-place orders compared to 5.3% in states without. The authors also noted a significant decrease in the proportion of RA patients with disease activity measures documented, which not only impacts patient care but also physician reimbursement (79). There is little data describing the longitudinal impact that this massive uptake in telemedicine has had on rheumatology practice, patient care-seeking behaviors, and long-term health outcomes.

Lessons learned in the US. The literature identified several “lessons learned” for rheumatology patients and practice in the US. First, early and sustained attention to equity is necessary to protect vulnerable patients during a national health emergency. Rather than reactive policies around drug shortages or unfolding health disparities, proactive measures to ensure access to health care, critical medications, and life-saving measures such as PPE and vaccinations would improve outcomes. Misinformation and disinformation presented challenges in the US and often spread to other countries via social media and other online content. Notably, misinformation disproportionately impacted vulnerable communities. Efforts to improve health education and public health communication are needed.

Conclusion

The COVID-19 pandemic has created significant challenges for individuals with rheumatic diseases, particularly vulnerable populations with historically less access to health care resources. Disparities in health and health care that already existed were augmented, highlighting the need for both local and global responses to address differential outcomes in populations at

Table 1. Global lessons learned from the impact of COVID-19 on individuals with rheumatic disease and on rheumatology practices

Setting	Major challenges	Lessons learned
Individuals with rheumatic disease	Increased risk of infection	Clear public health messaging about wearing masks, social distancing, maintaining or adjusting immunosuppressive medications, and vaccination can help protect vulnerable individuals with rheumatic diseases
	Mental health concerns	Resources to address social isolation, anxiety, and depression should be put into place as early as possible
	Health equity	Improve access to care and target outreach to patients with rheumatic disease from vulnerable communities regarding vaccination and other preventive strategies
Rheumatology practices	Disruptions in access to care	Telemedicine serves as a useful tool to improve access to care globally
	Medication supply interruptions	Collaborative efforts by rheumatologists, government agencies, pharmacies, and insurance companies are needed to ensure a stable drug supply for patients with rheumatic diseases
	Health communication	Rheumatologists play a crucial role in providing clear and culturally sensitive communication to ensure that patients know how to protect themselves
		Rheumatology professional society guidelines can serve as one tool to combat misinformation during public health emergencies
		Coordination of public health messaging to the rheumatic disease community across organizations is needed to increase the impact of public health messaging

higher risk of severe COVID-19. Patients across all regions faced disruptions in rheumatology care, drug shortages, and struggles with social isolation and worsening mental health during peak pandemic periods. For providers and health systems, telemedicine capacity and uptake expanded rapidly, and professional societies came together proactively to create guidelines for the management of patients with rheumatic disease during the pandemic, and guidelines regarding the efficacy and safety of SARS–CoV-2 vaccination.

Key lessons learned are shown in Table 1, and include: 1) early and authentic attention to disparities in clinical outcomes, health services, and research related to COVID-19 is paramount to ensure equity, even as the acute phase of the pandemic wanes; 2) effective health education and public health communication play critical roles in promoting health-related behaviors and are closely linked with public trust (in many settings, both misinformation and disinformation presented tangible challenges to informed patient decision-making during the pandemic and amplified public mistrust); 3) advocacy, in partnership with professional societies and community-based organizations, can help bring about timely and effective policies or regulatory changes to address gaps and inequities in resources (e.g., medication access, PPE) and infrastructure (e.g., telemedicine capacity); 4) well-designed prospective studies are needed to evaluate the long-term impact of the pandemic on health outcomes and health care delivery for patients with rheumatic diseases—particularly those who are most vulnerable; and 5) studies are needed to fill gaps in our understanding of SARS–CoV-2 vaccine immunogenicity (including ongoing vaccine booster doses) across different regions and vaccine types, and optimal timing and dosing of these COVID-19 vaccines in patients with rheumatic diseases.

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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. Drs. Hseih and Yazdany 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.

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Analysis and interpretation of data. Hsieh, Dey, Grainger, Li, Machado, Ugarte-Gil, Yazdany.

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