




# How has COVID-19 affected the treatment of osteoporosis? An IOF-NOF-ESCEO global survey

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Received: 3 November 2020 / Accepted: 9 December 2020 / Published online: 8 February 2021  
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## Abstract

**Summary** The effects of COVID-19 have the potential to impact on the management of chronic diseases including osteoporosis. A global survey has demonstrated that these impacts include an increase in telemedicine consultations, delays in DXA scanning, interruptions in the supply of medications and reductions in parenteral medication delivery.

**Introduction** The COVID-19 pandemic has had profound effects on the health of the global population both directly, via the sequelae of the infection, and indirectly, including the relative neglect of chronic disease management. Together the International Osteoporosis Foundation and National Osteoporosis Foundation sought to ascertain the impact on osteoporosis management.

**Methods** Questionnaires were electronically circulated to a sample of members of both learned bodies and included information regarding the location and specialty of respondents, current extent of face to face consultations, alterations in osteoporosis risk assessment, telemedicine experience, alterations to medication ascertainment and delivery and electronic health record (EHR) utilisation. Responses were collected, quantitative data analysed, and qualitative data assessed for recurring themes.

**Results** Responses were received from 209 healthcare workers from 53 countries, including 28% from Europe, 24% from North America, 19% from the Asia Pacific region, 17% from the Middle East and 12% from Latin America. Most respondents were physicians (85%) with physician assistants, physical therapists and nurses/nurse practitioners represented in the sample. The main three specialties represented included rheumatology (40%), endocrinology (22%) and orthopaedics (15%). In terms of the type of patient contact, 33% of respondents conducted telephone consultations and 21% video consultations. Bone mineral density assessment by dual-energy X-ray absorptiometry (DXA) usage was affected with only 29% able to obtain a scan as recommended. The majority of clinicians (60%) had systems in place to identify patients receiving parenteral medication, and 43% of clinicians reported difficulty in arranging appropriate osteoporosis medications during the COVID-19 crisis.

**Conclusions** To conclude through surveying a global sample of osteoporosis healthcare professionals, we have observed an increase in telemedicine consultations, delays in DXA scanning, interrupted supply of medications and reductions in parenteral medication delivery.

**Keywords** Coronavirus · COVID-19 · Fracture · Osteoporosis

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## Introduction

The COVID-19 pandemic has assaulted healthcare systems and brought crippling societal and financial changes which are becoming more apparent every day. The health impacts of COVID-19 are both direct, as a consequence of the infection itself, and indirect, due to interruption in routine and preventive health care services and in the management of chronic diseases. Lock-downs, self-isolation and shielding have necessitated a move away from face to face encounters toward alternative models of care, including telemedicine [1–3]. There have also been logistic challenges with ascertainment and delivery of goods (including medications [4]) and the necessary redeployment of staff to in-patient units has likely impacted out-patient services. The assessment and management of osteoporosis is largely performed in these out-patient settings and, combined with the prescribing and delivery of anti-osteoporosis medications, is likely to have been hampered by the COVID-19 pandemic. Indeed, access to the online FRAX® fracture risk assessment tool was almost 60% lower in April compared to February 2020 suggesting that osteoporosis assessment may have been neglected during the pandemic [5].

The International Osteoporosis Foundation (IOF) and National Osteoporosis Foundation (NOF) aimed to characterise the specific impact of COVID-19 on the care, assessment and management of osteoporosis patients through a survey put to a sample of the IOF and NOF membership.

## Methods

Surveys for the management and treatment of osteoporosis during the COVID-19 crisis were composed by CG, AM, AP and AS from the NOF and shared with members of the IOF including CC, NCH and JYR for use by IOF and their associated membership. The surveys covered the location and specialty of respondents, current extent of face to face consultations, alterations in osteoporosis risk assessment, telemedicine experience, alterations to medication ascertainment and delivery and electronic health record (EHR) utilisation.

The NOF survey was conducted between April 15 and 24, 2020, using the SurveyMonkey platform. The survey was sent to 400 healthcare providers in NOF's Professional Partner Network membership programme with one reminder circulated during this period. The IOF survey was conducted between May 18 and June 8, 2020, using the SurveyMonkey platform. The survey was sent to 526 healthcare providers from the IOF Committee of Scientific Advisors and the Committee of National Societies with four reminders circulated during this period.

Data were collected, merged where appropriate and depicted graphically using bar charts, and free text responses were assessed for recurring themes.

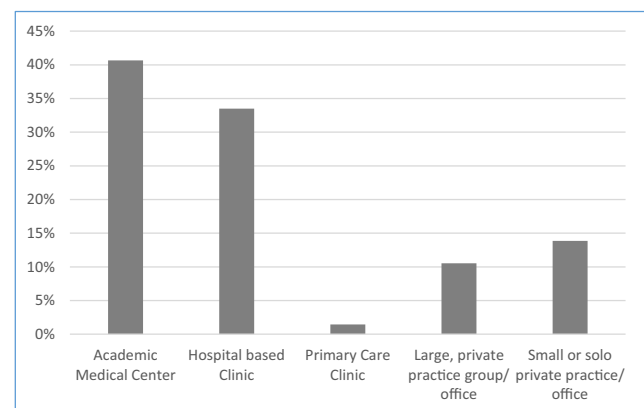
## Results

There were 209 respondents from a total of 53 countries, including 28% from Europe, 24% from North America, 19% from the Asia Pacific region, 17% from the Middle East and 12% from Latin America. The majority of respondents were physicians (85%) with 7% physician assistants, 2% physical therapists, 3% nurses/nurse practitioners and 3% other (in management). Respondents represented the specialties of rheumatology (40%), endocrinology (22%), orthopaedics (15%), general internal medicine (11%), radiology (3%), obstetrics and gynaecology (2%), physical medicine (1%), nephrology (0.5%) and other (4% including osteology, bone metabolism, geriatric medicine and management), and were primarily affiliated with academic medical centres or hospital-based clinics (Fig. 1).

Regarding office, clinic or hospital closures, 21% of institutions were open to patients for face to face or telemedicine consultations for emergencies only, 23% for non-acute or routine visits, 57% for both emergency and routine appointments and 7% were closed to all visit types.

In terms of the mode of patient contact, 33% of respondents performed telephone consultations, 21% video consultations, 26% face to face appointments, 18% urgent 'in person' visits, and 3% used other modalities, including instant messaging or attendance for parenteral therapies.

Regarding which patients were considered suitable for 'virtual' appointments, 28% of the providers conducted telemedicine appointments for established patients requiring diagnostic services, 40% conducted telemedicine appointments for established patients requiring treatment decisions, 19% assessed new patients via telemedicine, 2% assessed 'other



**Fig. 1** Clinical settings represented by respondents to surveys (% of total responses)

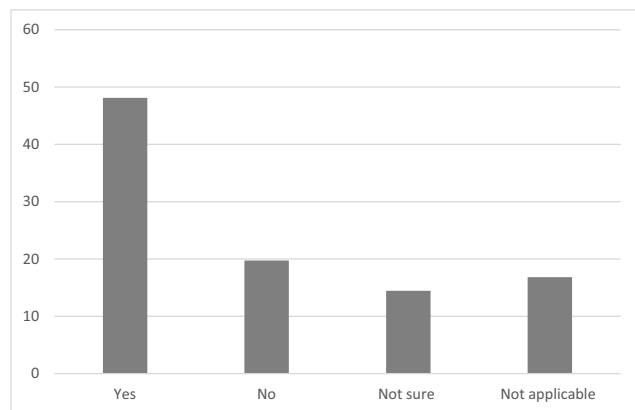
patients’ (including those affected by COVID-19 or those undergoing quarantine who required repeat prescription of medication) and 10% did not conduct any telemedicine appointments.

When considering how to incorporate DXA into osteoporosis risk assessment, 29% scheduled a DXA as soon as possible in order to inform treatment decisions (with appropriate precautions being taken), 11% assessed patients based on a clinical risk calculator (e.g. FRAX®) alone, 29% assessed patients based on a clinical risk calculator with a planned DXA at a later date and 33% arranged a DXA for when the risk of COVID-19 infection was likely to have lessened. A total of 5% responded that their DXA unit was currently closed or that they were referring to an osteoporotic fracture clinic service.

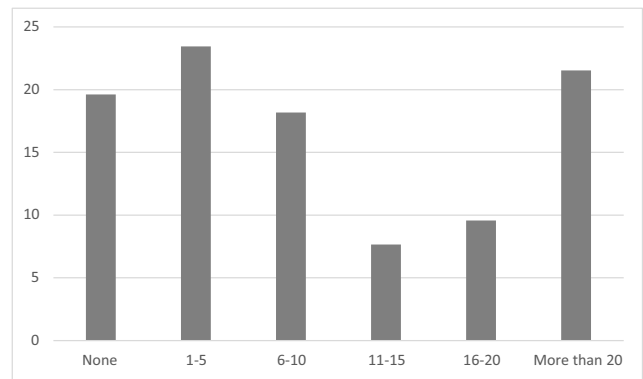
Reimbursement for telemedicine appointments was possible for 48% of respondents, but unavailable for 20% of respondents. A total of 14% of providers were unsure about reimbursement policies or status, and 17% stated that this was not applicable to their health care system or funding stream (Fig. 2). The number of weekly telemedicine appointments ranged from none to more than 20 (Fig. 3).

Almost half of clinicians, 43%, reported difficulty in arranging for appropriate osteoporosis medications during the COVID-19 crisis, whilst 57% reported no issues. Of those reporting problems, the overarching reasons included limited supply of or difficulty in acquiring medications, delay in administration of parenteral agents normally provided by a healthcare professional (both infusions and injections), reluctance on the part of patients to present for medication administration appointments even when opportunities existed and travel restrictions and self-isolation, resulting in patients being unable to attend office visits for administration of medications. Further details and specific comments from respondents are shown in Table 1.

During the COVID-19 pandemic, healthcare workers differed in their approach to medication prescriptions: 28%



**Fig. 2** Ability to request reimbursement for telemedicine appointments (% of total responses)



**Fig. 3** Number of telemedicine consultations per week (% of total respondents)

prescribed refills only, 3% made new prescriptions only, 63% prescribed both refills and new prescriptions and 4% did not prescribe any medication unless it was for an acute indication or illness.

For those patients requiring a ‘healthcare professional-administered treatment’ for osteoporosis (e.g. denosumab,

**Table 1** A sample of responses to the question ‘Please explain the issues you’re having with getting your patients their appropriate osteoporosis medication’

- I have decided to start second-line treatment with zoledronate, teriparatide or denosumab
- Irregular deliveries of medicine—denosumab in particular
- Routine infusions, e.g.: zoledronate paused and difficulties for denosumab for shielded patients
- Limited access to IV zoledronate
- Intravenous infusion of zoledronate due to a need to visit the infusion unit
- Intravenous medications might be difficult to receive, but the delay of 3–4 months is not a very big issue for zoledronic acid.
- Zoledronate infusions were suspended for 2 months but denosumab continues
- Bisphosphonates are sometimes lacking to logistic problems and embargo.
- Some primary care physicians are closed therefore some patients are having their denosumab delayed. I see these patients and give them the medication
- Medicines not available
- Some who need injectable medications avoid visiting clinic
- Patients in quarantine—prescriptions by email
- Patients were afraid to consult and preferred to postpone the consultation and medication
- Teriparatide injections (issue with cost of the drug and obtaining it)
- Difficulty in administering denosumab injections, zoledronate infusions. Many patients have skipped their injectable medications and follow up appointments
- They do not like or are afraid to come to the out-patient clinic as before, because of the COVID-19 pandemic. Some of them just no show.
- My overseas patients are unable to visit and those locally are unable to get their denosumab there as it is not registered in my country

zoledronate or romosozumab), 46% felt they had sufficient safeguards in place to minimise patient risk for in person medication administration visits, 3% had moved these treatments to an alternate clinical location, 21% suggested delaying treatment until COVID-19 risk had abated, 13% recommended a switch to an oral medication and 8% considered arranging in-home administration of treatment. In the 9% of ‘other’ responses, clinicians stated that the decision was made on a patient-by-patient basis, denosumab was self-administered by the patient at home, and they felt that zoledronate administration could be delayed but denosumab should be continued on schedule (Fig. 4).

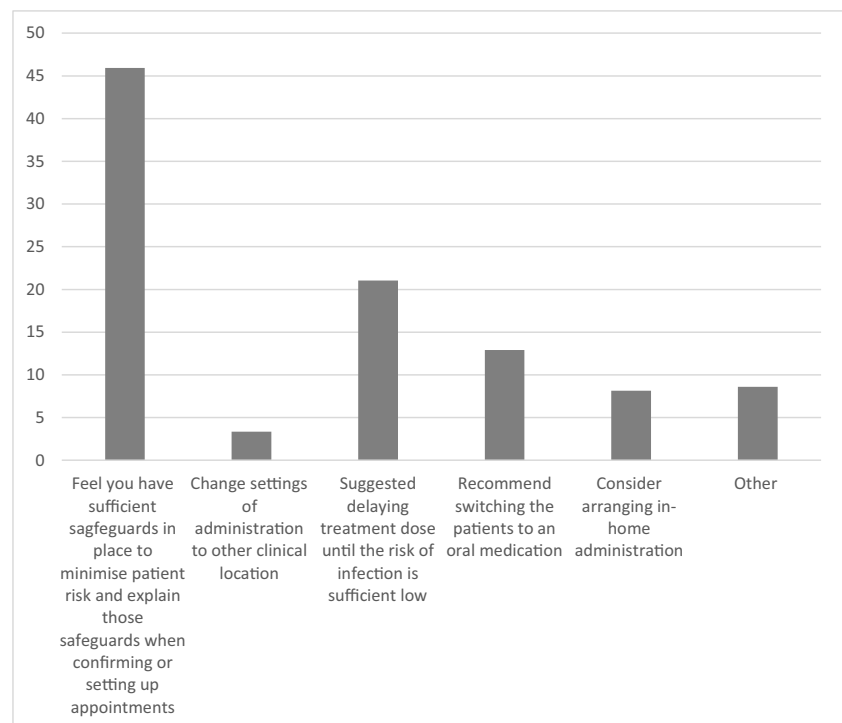
The majority of clinicians (60%) had systems in place to identify patients receiving subcutaneous or intravenous medication, so that plans of care could be proactively discussed with them. According to responders, primary care physicians were responsible for prescription of oral bisphosphonates in 49% of responses, raloxifene in 12%, denosumab in 15%, zoledronate in 8%, menopausal hormone therapy (MHT) in 7% and other medications in 9% of responses (see Fig. 5).

Regarding the amount of time required for electronic health record (EHR) charting or input during the COVID-19 pandemic, the majority of providers (93%) reported that it took as much or more time than that allotted prior to the pandemic (supplementary Fig. 1). Of those reporting changes in time for EHR documentation and overall care, the reasons included communication and documentation issues (e.g. more time taken to document, provide adequate reassurance and explanations to patients, difficulty contacting patients), technical

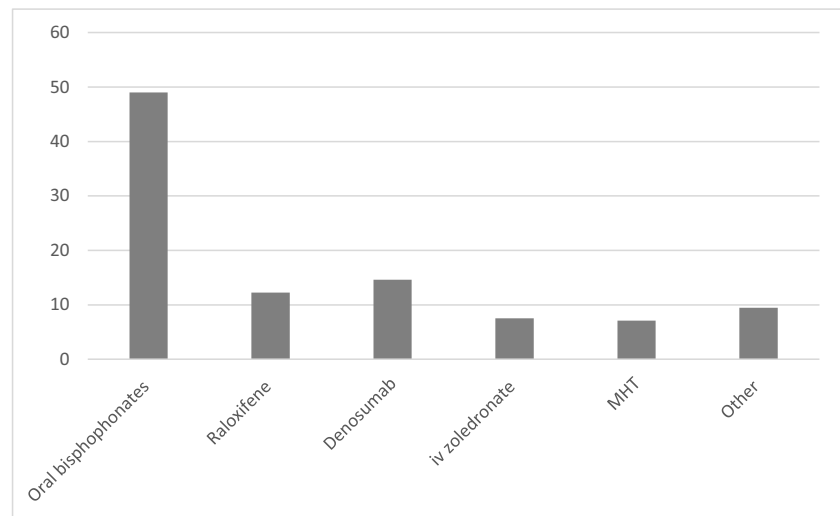
issues (e.g. poor internet connection, software problems, balancing multiple channels of communication, assisting the patient in the use of the video conferencing platform), workflow-related issues (e.g. difficulty acquiring prior patient notes/records due to closure of the hospital records section, greater complexity of work-flow, increased screening required for each patient to assess suitability for telemedicine appointment), treatment issues (e.g. inefficiencies in pharmacy operation during the pandemic, paucity of available treatments) and safety issues (e.g. additional time required for COVID-19 screening of patients prior to appointments, increased spacing of patient visits due to sanitising between appointments and social distancing between patients).

The time taken to follow-up patients was reported as greater in 39% of respondents, less in 9%, no change in 45% and 7% of respondents were unsure. Of those reporting greater time taken the reasons included communication with the patient (e.g. older persons being reticent to meet via telemedicine, more time required to provide explanations, responding to COVID-19 related concerns, clinicians providing laboratory results over the phone, clinicians calling to rearrange appointments), patient care (e.g. patients using specialist appointments to address all medical issues due to a paucity of medical availability elsewhere, extra time required for sanitisation, assessment of patient risk for COVID-19, complexity of EHR). In those reporting less time taken, the reasons included a greater time-efficiency of telephone consultations and spending more time with patients on video calls as fewer patients were seen during the pandemic.

**Fig. 4** Action for patients due to receive an HCP-administered osteoporosis treatment, who have conditions that would increase the risks associated with COVID-19 exposure (% of total responses)



**Fig. 5** Prescribed osteoporosis medications (% of total responses)



In the USA, 53% of the physicians were aware that Medicare allowed greater flexibility for therapies normally administered in a clinical setting and covered under Medicare part B to be administered at home; it should be noted that this often changed coverage to Medicare part D and increased out of pocket expenses for patients. Whilst 61% considered utilising this new Medicare arrangement, 27% were not sure and 12% would not consider using this option. The main reasons for not considering home administration were either that they were unaware, that this was not a substantial issue for them or they would rather use medications covered under Medicare part D (self-injection or oral medications), in order to ensure access to treatment and avoid the potential spread of COVID-19.

## Discussion

COVID-19 has had profound effects on global societies, finances and healthcare. We have captured some of the profound alterations in osteoporosis assessment and treatment from a broad cross-section of healthcare providers who have managed patients at risk of fragility fractures during the pandemic.

The way in which osteoporosis care is offered has profoundly changed with almost 1 in 3 healthcare providers performing telephone consultations and 1 in 5 performing video consultations. Over a fifth of respondents reported over 20 telemedicine appointments per week. It will be interesting to see whether this modality of patient contact continues to be widely accepted and used as lock-downs lift and we return to the ‘new normal’. The move toward telemedicine may be advantageous in the long term with previous studies demonstrating financial savings and increased efficiencies for healthcare systems [6], and increased convenience and

satisfaction for patients [7]. However, not all of the potential benefits may be observed in the short-term.

When patients were seen, a third of healthcare workers reported that a DXA was arranged without delay, but approximately 2/3 reported delays in obtaining a DXA and 11% reported use of clinical risk assessment tools (such as FRAX®) alone without bone mineral density measurement. The limited or delayed access to DXA may change ‘usual practice’, as a previous IOF survey of DXA usage identified that 83% of Fracture Liaison Services (FLS) performed interval scanning to monitor patients, and 50% of new patients were assessed with DXA [8]. Data from our survey are concerning and suggest that the traditional gold standard assessment of osteoporosis patients was not performed in the majority of cases during the pandemic. Anticipating the disruption of the care of patients with fragility fractures, IOF and NOF encouraged FLS centres to adopt a simplified model of care including avoiding delays to assessment and treatment whilst waiting for a DXA scan.

The long-term impact the COVID-19 pandemic will have on chronic disease management and global health systems is difficult to predict. In the short-term, we see immediate challenges to maintaining appropriate levels of care, particularly for patients at greater risk for the COVID-19 virus.

In many countries, there appears to be a substantial impact on reimbursement due to the change in number and type of patient visits, which may have implications for the ability to sustain and offer various osteoporosis clinical services and tests such as DXA. This must be carefully monitored as such changes could lead to a reduction in resources, a decrease in the assessment and treatment of patients with osteoporosis and osteoporosis-related fracture, and could ultimately translate into increased fracture rates and burden in the future. In some countries, temporary adjustments made to telemedicine (phone and video) reimbursement rates during the public health crisis (PHE) are being evaluated for post-PHE

implications and opportunities. Reimbursement rates will vary by country, insurance carriers and/or provider.

Changes in EHR were considered to be less time-efficient than pre-pandemic systems for a third of respondents with a minority (4%) reporting time-saving with the introduction of new technologies and telemedicine platforms. Early EHR studies demonstrated similar findings, as seen in a 2005 systematic review of time-efficiency in the use of EHR [9]; however, in the intervening 15 years systems and platforms have improved with marked benefits and time-efficiency of EHR demonstrated in the management of COVID-19 in hospitals in New York [10].

As has been seen with medications for other diseases, the availability of osteoporosis medications has been affected due to delivery/logistic issues, patients being unable or reluctant to attend visits for subcutaneous injections or intravenous infusions, and some additional problems, including primary care closures removing ready access to denosumab injections in the community. A fifth of respondents reported delays in providing intravenous or subcutaneous medication, and 13% reported a policy of switching patients to oral formulations to allow therapy to continue in the absence of parenteral treatments. A third of respondents only prescribed refill (or repeat) medication and no new medications with potentially serious consequences for new patients or those who had sustained a new fracture. The NOF, IOF and the Capture the Fracture websites and recent webinars also provided guidance on osteoporosis treatment in the event of medication access issues and delays in administration.

Despite an understandable reticence of patients to attend in-person appointments, approximately half of healthcare providers believed that there were sufficient safeguards in place to mitigate risk and allow in-person visits.

These findings are, of course, limited to those who were sampled and responded, and therefore, most reflect the input of rheumatology and endocrine physicians working in an academic centre or hospital clinic. Many aspects of our findings are still relevant to a broader audience of health professionals. Despite the global reach of COVID-19, it should also be recognised that some countries were at different points in the course of the pandemic, which may also be reflected in the variability of responses received.

In conclusion, through surveying a global sample of osteoporosis healthcare professionals, we have observed an increase in telemedicine consultations, greater reliance on EHR (with perceived time-inefficiencies) and potential impacts on reimbursement, delays to DXA scanning and supply of medications, reductions in parenteral medication delivery and an understandable reticence of patients to attend clinic appointments face to face. These findings serve to highlight the detrimental effects the COVID-19 pandemic is having on

osteoporosis assessment and management. At worst, this will result in a rise in fracture rates and a huge increase in individual morbidity and societal burden.

**Supplementary Information** The online version contains supplementary material available at <https://doi.org/10.1007/s00198-020-05793-3>.

**Acknowledgements** This report has been endorsed by the IOF Committees of Scientific Advisors and National Societies, as well as the National Osteoporosis Foundation.

**Funding** The IOF receives unrestricted educational grants to support its educational and scientific activities from non-governmental organisations, not-for-profit organisations, non-commercial or corporate partners. The NOF receives support for its educational and scientific activities from unrestricted donations from individuals and unrestricted educational grants from corporate partners.

## Compliance with ethical standards

**Conflict of interest** CC reports lecture fees and honoraria from Amgen, Danone, Eli Lilly, GSK, Kyowa Kirin, Medtronic, Merck, Nestlé, Novartis, Pfizer, Roche, Servier, Shire, Takeda and UCB outside the submitted work.

NCH reports personal fees, consultancy, lecture fees and honoraria from Alliance for Better Bone Health, Amgen, MSD, Eli Lilly, Servier, Shire, UCB, Consilient Healthcare, Kyowa Kirin and Internis Pharma, outside the submitted work.

NRF reports travel bursaries from Pfizer and Eli Lilly, outside the submitted work.

JYR reports consulting fees or advisory boards for IBSA-Genevri, Mylan, Radius Health, Pierre Fabre, lecturing fees for IBSA-Genevri, Mylan, Cniel and Dairy Research Council (DRC) and grant support from IBSA-Genevri, Mylan, Cniel and Radius Health.

AS has received research and grant funding from Radius Health and UCB (paid to MedStar), fees for consulting and advisory boards from Agnovos, Amgen, Radius Health, and UCB, honoraria for speaking and teaching from Amgen and Radius Health.

AM, AP, ASM, DDP, PH, SG have no conflicts to declare.

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## References

1. Greenhalgh T, Wherton J, Shaw S, Morrison C (2020) Video consultations for covid-19. *Bmj* 368:m998

2. Paskins Z, Crawford-Manning F, Bullock L (2020) Identifying and managing osteoporosis before and after COVID-19: rise of the remote consultation? *Osteoporos Int* 1–4
3. Eccleston C, Blyth FM, Dear BF, Fisher EA, Keefe FJ, Lynch ME, Palermo TM, Reid MC, Williams ACC (2020) Managing patients with chronic pain during the COVID-19 outbreak: considerations for the rapid introduction of remotely supported (eHealth) pain management services. *Pain* 161: 889–893
4. Palomar-Fernández C, Álvarez-Díaz A (2020) Hospital pharmacy service: facing the logistics of medicines procurement. *Fam Hosp* 44:17–20
5. McCloskey E (2020 (in press)) Global impact of COVID-19 on non-communicable disease management: descriptive analysis of access to FRAX fracture online tool for prevention of osteoporotic fractures. *Osteoporos Int*
6. Elliott RA, Barber N, Clifford S, Home R, Hartley E (2008) The cost effectiveness of a telephone-based pharmacy advisory service to improve adherence to newly prescribed medicines. *Pharm World Sci* 30:17–23
7. Palcu P, Munce S, Jaglal SB, Allin S, Chishtie JA, Silverstein A, Kim S (2020) Understanding patient experiences and challenges to osteoporosis care delivered virtually by telemedicine: a mixed methods study. *Osteoporos Int* 31:351–361
8. Clynes MA et al (2020) Bone densitometry worldwide: a global survey by the ISCD and IOF. *Osteoporos Int* 31:1779–1786
9. Poissant L, Pereira J, Tamblyn R, Kawasumi Y (2005) The impact of electronic health records on time efficiency of physicians and nurses: a systematic review. *J Am Med Inform Assoc* 12:505–516
10. Salway RJ, Silvestri D, Wei E, Bouton M (2020) Using information technology to improve COVID-19 care at New York City Health + Hospitals. *Health Aff (Millwood)*, 101377hlthaff202000930

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