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Osteoporosis (K Saag, Section Editor)

Remote Management of Osteoporosis

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Abstract

Purpose of Review Osteoporosis management has evolved significantly over the past decade, with telehealth emerging as an effective tool to manage bone health in a growing patient population. This review explores the advantages and disadvantages of telehealth use for osteoporosis management while highlighting recent studies of clinical importance.
Recent Findings A wide variety of telehealth approaches are used today, from phone or video telemedicine appointments with physicians and advanced practice providers, to electronic systems for triage and consultation with osteoporosis specialists. Contemporary studies show that telehealth can facilitate health care access to underserved communities and enhance physician–patient communication, as well as provide patient education. However, barriers such as inexperience or lack of access to technology, suboptimal patient-clinician relationship building process, and difficulties with follow-up have limited the use of telehealth to certain situations.
Summary Telehealth has proven to be an effective resource for managing and treating osteoporosis patients. As its use continues to grow, important limitations must be accounted for to avoid lapses in care. Further research should keep these factors in mind as the use of this technology progresses.

Introduction

Osteoporosis affects more than 14 million Americans 50 years of age and older [1]. Osteoporosis is characterized by compromised skeletal integrity due to a decrease in bone mineral density that leads to a substantial high risk of fracture. Osteoporosis results from an imbalance between bone formation and bone resorption due to factors such as estrogen deficiency, extended glucocorticoid use, or systemic inflammatory diseases [2]. Post-menopausal estrogen deprivation is one of the most common causes seen in the general population, as the loss of estrogen stimulates bone resorption and remodeling, leading to a state of weakened bone composition [2]. As a result, women are disproportionately affected by osteoporosis, with the CDC estimating that 19.6% of women compared to 4.4% of men over the age of 50 years suffer from osteoporosis [1]. The age-adjusted prevalence of osteoporosis has been increasing over the last decade and 1 in 5 individuals over age 65 years had osteoporosis in 2017 [1]. In addition, since the segment of population aged 65 and older is expanding, the number of adults affected by osteoporosis is expected to substantially increase resulting in a greater need for osteoporosis management services.

Osteoporosis is often a silent disease, as many patients are first diagnosed following a fragility fracture, which typically involves the hip, spine, wrist, or humerus [3]. Prior to a fracture, diagnosis of osteoporosis is typically made via the measurement of bone mineral density (BMD) using dual x-ray absorptiometry (DXA) and novel methods of examining bone microarchitecture such as the trabecular bone score that are emerging for evaluation of bone strength [4]. Following diagnosis, osteoporosis requires longitudinal monitoring and treatment to decrease the risk of fracture and preserve quality of life [5–7]. Proven measures include strengthening and weight-bearing exercise, limiting caffeine and alcohol use, smoking cessation, optimizing calcium and vitamin D intake through diet sources and supplements, fall prevention interventions, and bone-specific pharmacologic therapy to improve long-term outcomes [5–7]. While long-term management of osteoporosis is complex and requires periodic BMD and laboratory testing, with the growing availability and expansion of telehealth, much of osteoporosis patient follow-up can now be feasibly accomplished remotely, outside usual face to face visits, in a telehealth setting [8].

Telehealth services can include a variety of approaches including video consultation and follow up visits (i.e., telemedicine), remote patient monitoring using electronic applications, patient education incorporating distance learning to increase self-efficacy and encourage self-management, and virtual physician-physician consultations (i.e., eConsults). Although the use of telehealth in the general population has been facilitated by increasingly ubiquitous access to technology, uptake of telehealth services has been slower for some groups, including those 65 years of age and older, due to issues such as lower digital literacy [9]. However, prompted by the COVID-19 pandemic, telehealth for chronic disease management including for osteoporosis care has gained substantial momentum and has been advocated as a way to prevent COVID-19 spread and to ensure safety of this vulnerable population [8]. During the COVID-19 pandemic, guidance from professional societies recommended postponing DXA and routine laboratory testing in otherwise stable, low-risk patients with osteoporosis and continuing outpatient administration of parenteral therapies if the local context allowed [8]. Relevant to osteoporosis management, care innovation spurred by the pandemic resulted in the implementation of drive-thru administration of injectable bone-specific therapeutics like denosumab at some hospital systems to prevent interruptions in treatment. Furthermore, to promote appropriate care for those hospitalized with fragility fractures and mitigate the risk of losing communication during follow-up, bone health experts recommended the initiation of pharmacologic therapy during the hospitalization [8]. Although implementing telemedicine for osteoporosis follow-up care may be challenging, some measurable success exists, and a thorough understanding of the advantages and disadvantages of remote osteoporosis care is critical.

Advantages to using telehealth for osteoporosis care

Many patients with osteoporosis or a history of fragility fractures experience a significant impact to their quality of life, including the ability to complete physical activities and perform daily tasks [10, 11]. Moreover, the US rural population has the largest percentage of adults older than 65 and since many rural communities lack osteoporosis specialists, face to face appointments can be challenging and require substantial resources such as travel time and expense [12]. Thus, targeted outreach for those at risk for osteoporosis and fragility fracture is a possible avenue to close this gap in care. A telehealth outreach approach used an algorithm implemented in the electronic medical record to screen veterans residing in rural areas for risk factors for osteoporosis [13••]. The outreach strategy involved mailing of a letter informing the veterans of their risk together with an invitation to contact a bone health clinical team if they were interested in using their service. This light-touch algorithm-based intervention resulted in 36% of individuals responding to the invitation to participate, 24% of at-risk individuals completing DXA testing, 15% receiving a diagnosis of osteoporosis, and 91% initiating bone specific pharmacotherapy when this was indicated [13••].

Given the challenges in attending face-to-face appointments due to transportation, cost, and other barriers, it is not surprising that patients value the convenience of telemedicine appointments for routine follow-up osteoporosis care, particularly since physical examination is not a feasible tool for defining the severity and progression of osteoporosis [3]. A recent study found that among patients with osteoporosis who received virtual care, a majority of respondents said that the quality of care they received from the osteoporosis specialist was the same as the one delivered in person [14•].

The convenience of telehealth extends beyond face-to-face appointments with physicians. Virtual reminders and educational counseling are straightforward, effective methods to promote follow-up and enhance physician–patient communication in already established relationships. Telehealth-related interventions in post-fracture patients are more likely to foster a conversation about bone health between physicians and patients and increase the likelihood for direct action in osteoporosis management [15•]. For example, nurse-based telephonic counseling and patient specific reminders to their respective physicians significantly increased the number of patients that began bisphosphonate treatment [16]. Another study using a physiotherapist to provide counseling by phone showed a significant improvement in self-reported osteoporosis management, BMD testing rate, and physician–patient conversations about osteoporosis [17].

Aside from direct patient access to osteoporosis specialists in underserved areas and enhanced communication with existing physicians, telehealth approaches can be applied to improve patient self-efficacy about osteoporosis and influence modifiable risk factors. These programs come in many forms, from informational articles to interactive online learning modules and synchronous counseling sessions with health professionals including nurses, dieticians, and pharmacists. One study surveyed new patients referred

by family physicians to a multidisciplinary osteoporosis telemedicine program about their perceptions about the program. After participating in this program, 90% of respondents rated their knowledge about osteoporosis as good or excellent [18]. Similarly, participation in an 8-week online theory-based bone health program that included learning modules and participant discussion boards significantly increased knowledge about osteoporosis and positively affected risk factors like calcium intake and exercise frequency [19]. A direct-to-patient multimodal educational intervention that involved women aged 45 and older with past fractures improved participant's readiness for behavior change and altered perceptions of barriers to osteoporosis treatment [20, 21]. However, remote patient education interventions did not result in statistically significant improvement in initiating or adhering to an osteoporosis medication regimen, self-reported fractures, self-reported falls, or general health [20]. Beyond education about osteoporosis diagnosis and treatment, tele-pharmacist consultations for people with multiple chronic conditions, including osteoporosis, are an effective way to monitor medication regimens, and in one study, primary care providers accepted a third of pharmacist recommendations [22]. This data highlights that telehealth approaches are a convenient way to easily contact patients to assess adherence to therapy and discuss medication side effects or other concerns patients may have.

Telehealth has also enabled telerehabilitation for people with osteoporosis under the supervision of physical and occupational therapists, who can also monitor the recovery process after a fragility fracture. For example, through telehealth, virtual assessments for safety of environment and monitoring of home exercise regimens are possible. The majority of participants in telerehabilitation visits were very satisfied with the quality of communication and appreciated the convenience of the visit and comfort associated with their home environment [23••]. Another study found that compared to individuals who sustained a hip fracture and who participated in usual in-person physical therapy sessions, participants in an online rehabilitation program that included home exercises and videoconferences with occupational therapists displayed better physical performance [24•]. These findings likely reflect the benefit that the comfortable environment of one's own home can have on the recovery process after a fragility fracture.

Novel uses of telemedicine have the potential to streamline aspects of our health system. Electronic triaging for potential patients with osteoporosis may speed up bone health evaluation. For example, the implementation of an e-triage service in a busy osteoporosis practice resulted in over a quarter of referrals receiving direct assessment with DXA rather than waiting for initial face-to-face appointments and the new patient appointment waiting time halved during this period [25••]. Other methods to increase efficiency of the delivery of osteoporosis care include eConsults that enable specialists with bone expertise to provide remote consultative services to primary care providers. One study found that rheumatology eConsults improved access by significantly reducing wait times for rheumatology patients including those needing osteoporosis evaluation, and 2 out of 5 referrals were able to provide recommendations without the need of face-to-face visit [26]. For post-fragility fracture care in particular, implementation of an eConsult service resulted in significant increases in the rates of bisphosphonate and calcium/vitamin

D prescription for secondary fracture prevention [27]. Programs such as the VA Rural Osteoporosis Evaluation Service (ROPES) are using aspects of both electronic triage and electronic consultation to expand osteoporosis care, especially to those in rural communities. Since its implementation in 2012, VA medical centers participating in the ROPES program have seen an increase in the osteoporosis treatment and evaluation rates [28].

Disadvantages to using telehealth for osteoporosis care

The numerous advantages conferred by telehealth need to be balanced by the potential drawbacks to this technology, issues that also must be considered carefully. One of the critical aspects to consider is the limitations of the virtual interface itself. Virtual communication is inherently limited by technical difficulties, access to a stable internet connection, and patient knowledge of the communication medium (i.e., digital health literacy) [29]. These factors affect both patient and physician satisfaction and the quality of the telemedicine visit in general. One study found that physicians were more satisfied with telemedicine when the patients had sufficient technological skills to engage in virtual visits [30]. Another study pertaining to rheumatology patients over the age of 60 found high levels of satisfaction with both video and telephonic visits, yet over 50% of the survey population preferred an in-person visit for their next appointment [31].

Adequate access to technology is often taken for granted. Individuals older than 65 represent a demographic that consistently has lower rates of internet use and a lower level of digital literacy [9, 32]. One study examining digital literacy in low-income, older adults found that 53% of participants reported using the internet and only 49% of those patients had high eHealth literacy [33]. Other factors compounding this age barrier include a patient's level of education, socioeconomic status, and geographical residence. For example, one study revealed that users of a telehealth service were more likely to be college educated, employed, and live in urban areas [34]. In addition, adults with osteoporosis living in rural areas are more likely to be diagnosed later than those in urban centers [35]. Although the rural patients reported better outcomes, the delay in diagnosis could reflect a lack of access to osteoporosis specialists and virtual resources available in places with less infrastructure [35]. Most significantly, a large cross-sectional study found that 38% of adults over 65 years of age expressed some level of unreadiness or hesitation in participating in a telemedicine visit [36•]. Within this group of older adults who felt unready to attend a telemedicine visit, 74% reported less than high school education and 67% were in the lowest income quintile highlighting the influence of socioeconomic status on telemedicine adoption [36•]. Hesitation was due to several factors including hearing loss, visual impairment, possible dementia, problems speaking, device accessibility, and inexperience with technology [36•]. Thus, while access to and comfort with technology and socioeconomic factor are key to expanding the use of telemedicine, it is equally important to consider how hearing, visual, and cognitive impairments can affect adequate participation in a virtual visit. Solutions to these

barriers must be addressed in a personalized manner accounting for the specific needs and capabilities of each patient. For example, in the case of hearing loss, accommodations like closed captioning and remote interpreting services supported by the Americans with Disabilities Act for face-to-face visits can be made available on telehealth platforms [37].

The specifics of telemedicine visits need to be considered when providing remote osteoporosis care. In a survey involving VA rheumatology providers, two-thirds of rheumatologists thought a telemedicine model was appropriate for follow-up of patients with osteoporosis, but less than one-third felt comfortable conducting a new patient evaluation virtually [38]. This finding suggests that telemedicine may be more suitable for a follow-up visit for osteoporosis, rather than for initial consultation and speaks to the importance of the patient-clinician relationship building process in medicine and the challenges to emulating in-person rapport in a virtual setting. Moreover, while physical examination may not be as critical for follow-up osteoporosis care, during the initial osteoporosis evaluation, accurate height and weight measurement and appreciation of clinical characteristics such as kyphosis and endocrine stigmata remain of clinical importance [39].

Since in many cases in-person visits are associated with laboratory testing or BMD measurement, telemedicine visits alone are not sufficient for complete osteoporosis work-up. A telephone-based virtual fracture liaison service implemented during the COVID-19 pandemic was associated with high attendance rates and high patient satisfaction [40••]. Yet, these telephone encounters resulted in 54% of the patients being prescribed bisphosphonates and almost two-thirds of the participants still required in-person DXA scans for complete evaluation, which was completed by 80% of the patients [40••]. To ensure that these additional aspects of care are fulfilled, telemedicine visits need to be supported by adequate coordination to prevent fragmentation of care that negatively affects the quality. To this end, more patient reminders may be needed to ensure that ordered testing is scheduled and completed and that results are communicated to the ordering provider in a timely manner. One study found that respondents reported difficulties in having physical therapy follow-up, coordinating testing in their local communities, and difficulties communicating with their other physicians [14•].

Conclusion

In summary, given the growing incidence of osteoporosis in the USA, it is critical to ensure access to quality osteoporosis care. Telemedicine provides a promising avenue to deliver medical services for this growing patient base. The use of telehealth confers numerous advantages, including convenience and added access for rural populations, the mass distribution of educational materials, and expansion of team-based care expansion, which may improve the efficiency of the services provided. These benefits must be weighed against potential shortcomings, including the lack of access to technology, limited capacity to utilize telehealth services, strain on the physician–patient relationship, and possibility of increased fragmentation of care. Further studies

are needed to ensure that telemedicine advantages are harnessed, and disadvantages are mitigated, as the use of remote osteoporosis management will continue to grow.

Declarations

Conflict of interest
Jordan Saag declares no conflicts of interest. Maria I. Danila declares no conflicts of interest.

Human and animal rights and informed consent
All reported studies/experiments with human or animal subjects performed by the authors have been previously published and complied with all applicable ethical standards (including the Helsinki Declaration and its amendments, institutional/national research committee standards, and international/national/institutional guidelines).

References

Papers of particular interest, published recently, have been highlighted as:
• Of importance
•• Of major importance

1. Osteoporosis or low bone mass in older adults : United States, 2017–2018. In: National Center for Health S, editor. Hyattsville, MD: https://doi.org/10.15620/cdc:103477; 2021.
2. Armas LA, Recker RR. Pathophysiology of osteoporosis: new mechanistic insights. Endocrinol Metab Clin North Am. 2012;41(3):475–86. https://doi.org/10.1016/j.ecl.2012.04.006.
3. Siris ES, Adler R, Bilezikian J, Bolognese M, Dawson-Hughes B, Favus MJ, et al. The clinical diagnosis of osteoporosis: a position statement from the National Bone Health Alliance Working Group. Osteoporos Int. 2014;25(5):1439–43. https://doi.org/10.1007/s00198-014-2655-z.
4. Silva BC, Leslie WD, Resch H, Lamy O, Lesnyak O, Binkley N, et al. Trabecular bone score: a noninvasive analytical method based upon the DXA image. J Bone Miner Res. 2014;29(3):518–30. https://doi.org/10.1002/jbmr.2176.
5. Kanis JA, Cooper C, Rizzoli R, Reginster JY. European guidance for the diagnosis and management of osteoporosis in postmenopausal women. Osteoporos Int. 2019;30(1):3–44. https://doi.org/10.1007/s00198-018-4704-5.
6. Camacho PM, Petak SM, Binkley N, Diab DL, Eldeiry LS, Farooki A, et al. American Association of Clinical Endocrinologists/American College of Endocrinology clinical practice guidelines for the diagnosis and treatment of postmenopausal osteoporosis- 2020 update executive summary. Endocr Pract. 2020;26(5):564–70. https://doi.org/10.4158/gl-2020-0524.
7. Cosman F, de Beur SJ, LeBoff MS, Lewiecki EM, Tanner B, Randall S, et al. Clinician's guide to prevention and treatment of osteoporosis. Osteoporos Int. 2014;25(10):2359–81. https://doi.org/10.1007/s00198-014-2794-2.
8. Yu EW, Tsourdi E, Clarke BL, Bauer DC, Drake MT. Osteoporosis management in the era of COVID-19. J Bone Miner Res. 2020;35(6):1009–13. https://doi.org/10.1002/jbmr.4049.
9. Mann DM, Chen J, Chunara R, Testa PA, Nov O. COVID-19 transforms health care through telemedicine: evidence from the field. J Am Med Inform

Assoc. 2020;27(7):1132–5. https://doi.org/10.1093/jamia/ocaa072.
10. Hopman WM, Berger C, Joseph L, Morin SN, Towheed T, Anastassiades T, et al. Longitudinal assessment of health-related quality of life in osteoporosis: data from the population-based Canadian Multicentre Osteoporosis Study. Osteoporos Int. 2019;30(8):1635–44. https://doi.org/10.1007/s00198-019-05000-y.
11. Ciubean AD, Ungur RA, Irsay L, Ciortea VM, Borda IM, Onac I, et al. Health-related quality of life in Romanian postmenopausal women with osteoporosis and fragility fractures. Clin Interv Aging. 2018;13:2465–72. https://doi.org/10.2147/cia.S190440.
12. Parker K, Horowitz J, Brown A, Fry R, Cohn D, Igielnik R. What unites and divides urban, suburban and rural communities. Pew Research Center2018.
13.•• Miller KL, Steffen MJ, McCoy KD, Cannon G, Seaman AT, Anderson ZL, et al. Delivering fracture prevention services to rural US veterans through telemedicine: a process evaluation. Arch Osteoporos. 2021;16(1):27. https://doi.org/10.1007/s11657-021-00882-0.
A telehealth outreach program screened rural patients in need of osteoporosis management. The effects on laboratory testing and initiation of pharmacotherapy were measured.
14.• Palcu P, Munce S, Jaglal SB, Allin S, Chishtie JA, Silverstein A, et al. Understanding patient experiences and challenges to osteoporosis care delivered virtually by telemedicine: a mixed methods study. Osteoporos Int. 2020;31(2):351–61. https://doi.org/10.1007/s00198-019-05182-5. A mixed-methods study that examined patient perspectives on osteoporosis care via telehealth. Results included both quantitative and qualitative outcomes using surveys and telephonic interviews.
15.• Yadav L, Haldar A, Jasper U, Taylor A, Visvanathan R, Chehade M, et al. Utilising digital health technology to support patient-healthcare provider communication in fragility fracture recovery: systematic review and meta-analysis. Int J Environ Res Public Health. 2019;16(20). https://doi.org/10.3390/ijerph16204047.
This meta-analysis reviewed studies concerning the effects of digital physician-patient communication on patients with fragility fractures. Outcomes included diagnosis and treatment of osteoporosis.
16. Majumdar SR, Johnson JA, McAlister FA, Bellerose D, Russell AS, Hanley DA, et al. Multifaceted intervention to improve diagnosis and treatment of osteoporosis in patients with recent wrist fracture: a randomized controlled trial. CMAJ. 2008;178(5):569–75. https://doi.org/10.1503/cmaj.070981.
17. Jaglal SB, Donescu OS, Bansod V, Laprade J, Thorpe K, Hawker G, et al. Impact of a centralized osteoporosis coordinator on post-fracture osteoporosis management: a cluster randomized trial. Osteoporos Int. 2012;23(1):87–95. https://doi.org/10.1007/s00198-011-1726-7.
18. Dickson L, Cameron C, Hawker G, Ratansi A, Radziunas I, Bansod V, et al. Development of a multidisciplinary osteoporosis telehealth program. Telemed J E Health. 2008;14(5):473–8. https://doi.org/10.1089/tmj.2007.0079.
19. Nahm E-S, Resnick B, Brown C, Zhu S, Magaziner J, Bellantoni M, et al. The effects of an online theory-based bone health program for older adults. J Appl Gerontol. 2017;36(9):1117–44. https://doi.org/10.1177/0733464815617284.
20. Danila MI, Outman RC, Rahn EJ, Mudano AS, Redden DT, Li P, et al. Evaluation of a multimodal, direct-to-patient educational intervention targeting barriers to osteoporosis care: a randomized clinical trial. J Bone Miner Res. 2018;33(5):763–72. https://doi.org/10.1002/jbmr.3395.
21. Danila MI, Outman RC, Rahn EJ, Mudano AS, Thomas TF, Redden DT, et al. A multi-modal intervention for Activating Patients at Risk for Osteoporosis (APROPOS): rationale, design, and uptake of online study intervention material. Contemp Clin Trials Commun. 2016;4:14–24. https://doi.org/10.1016/j.conctc.2016.06.010.
22. Taylor AM, Bingham J, Schussel K, Axon DR, Dickman DJ, Boesen K, et al. Integrating innovative telehealth solutions into an interprofessional team-delivered chronic care management pilot program. J Manag Care Spec Pharm. 2018;24(8):813–8. https://doi.org/10.18553/jmcp.2018.24.8.813.
23.•• Tenforde AS, Borgstrom H, Polich G, Steere H, Davis IS, Cotton K, et al. Outpatient physical, occupational, and speech therapy synchronous telemedicine: a survey study of patient satisfaction with virtual visits during the COVID-19 pandemic. Am J Phys Med Rehabil. 2020;99(11):977–81. https://doi.org/10.1097/phm.0000000000001571.
A survey regarding patient attitudes and satisfaction with a telerehabilitation program during the COVID-19 pandemic.
24. Ortiz-Piña M, Molina-Garcia P, Femia P, Ashe MC, Martín-Martín L, Salazar-Graván S, et al. Effects of tele-rehabilitation compared with home-based in-person rehabilitation for older adult's function after hip fracture. Int J Environ Res Public Health. 2021;18:10. https://doi.org/10.3390/ijerph18105493.
25.•• Lindsay JR, Lawrenson G, English S. A service evaluation of e-triage in the osteoporosis outpatient clinic-an effective tool to improve patient access? Arch Osteoporos. 2020;15(1):53. https://doi.org/10.1007/s11657-020-0703-1.
The effects of an e-triage system on osteoporosis management and consultation process in a busy outpatient practice were studied. Outcomes included measures of efficiency such as patient wait times and immediate intervention rates.
26. Rostom K, Smith CD, Liddy C, Afkham A, Keely E. Improving access to rheumatologists: use and benefits of an electronic consultation service. J

Rheumatol. 2018;45(1):137–40. https://doi.org/10.3899/jrheum.161529.
27. Lee RH, Lyles KW, Pearson M, Barnard K, Colón-Emeric C. Osteoporosis screening and treatment among veterans with recent fracture after implementation of an electronic consult service. Calcif Tissue Int. 2014;94(6):659–64. https://doi.org/10.1007/s00223-014-9849-4.
28. Colon-Emeric C. Rural promising practice issue brief: Rural OsteoPorosis Evaluation Service (ROPES). U.S. Department of Veterans Affairs Office of Rural Health; 2017.
29. Smith B, Magnani JW. New technologies, new disparities: the intersection of electronic health and digital health literacy. Int J Cardiol. 2019;292:280–2. https://doi.org/10.1016/j.ijcard.2019.05.066.
30. Tornero-Molina J, Sánchez-Alonso F, Fernández-Prada M, Bris-Ochaita ML, Sifuentes-Giraldo A, Vidal-Fuentes J. Tele-rheumatology during the COVID-19 pandemic. Reumatol Clin (Engl Ed). 2021. https://doi.org/10.1016/j.reumae.2020.10.002.
31. Danila M, Sun D, Jackson L, Cutter G, Jackson E, Ford E, et al. A randomized trial showing no differences in patient satisfaction with telemedicine delivered by phone or video during COVID-19 in rheumatology and other medical Specialty Clinics [abstract]. Arthritis Rheumatology. 2021;73.
32. Internet/Broadband Fact Sheet. https://www.pewresearch.org/internet/fact-sheet/internet-broadband/ (2021). Accessed February 12, 2022.
33. Arcury TA, Sandberg JC, Melius KP, Quandt SA, Leng X, Latulipe C, et al. Older adult internet use and eHealth literacy. J Appl Gerontol. 2020;39(2):141–50. https://doi.org/10.1177/0733464818807468.
34. Liaw WR, Jetty A, Coffman M, Petterson S, Moore MA, Sridhar G, et al. Disconnected: a survey of users and nonusers of telehealth and their use of primary care. J Am Med Inform Assoc. 2019;26(5):420–8. https://doi.org/10.1093/jamia/ocy182.
35. Pagonis T, Givissis P, Pagonis A, Petsatodis G, Christodoulou A. Osteoporosis onset differences between rural and metropolitan populations: correlation to fracture type, severity, and treatment efficacy. J Bone Miner Metab. 2012;30(1):85–92. https://doi.org/10.1007/s00774-011-0286-4.
36.• Lam K, Lu AD, Shi Y, Covinsky KE. Assessing telemedicine unreadiness among older adults in the United States during the COVID-19 pandemic. JAMA Intern Med. 2020;180(10):1389–91. https://doi.org/10.1001/jamainternmed.2020.2671.
A large cross-sectional study examined the perceptions and barriers to telehealth utilization in adults over 65.
37. COVID-19: guidelines for health care providers – video-based telehealth accessibility for deaf and hard of hearing patients. (2020). Accessed January 29 2022.
38. Singh JA, Richards JS, Chang E, Joseph A, Ng B. Management of rheumatic diseases during the COVID-19 pandemic: a national veterans affairs survey of rheumatologists. Arthritis Care Res (Hoboken). 2021;73(7):998–1003. https://doi.org/10.1002/acr.24487.
39. Glaser DL, Kaplan FS. Osteoporosis. Definition and clinical presentation. Spine (Phila Pa 1976). 1997;22(24 Suppl):12s-6s. doi: https://doi.org/10.1097/00007632-199712151-00003.
40.•• English S, Coyle L, Bradley S, Wilton W, Cordner J, Dempster R, et al. Virtual fracture liaison clinics in the COVID era: an initiative to maintain fracture prevention services during the pandemic associated with positive patient experience. Osteoporos Int. 2021;32(6):1221–6. https://doi.org/10.1007/s00198-021-05882-x.
This study centered on a virtual fracture liasion service used during the recent pandemic, with the goal of measuring efficacy in delivering fracture risk assessment and clinical management. Patient satisfaction was incuded as an additional outcome.

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