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The Use Of Telemedicine By Physicians: Still The Exception Rather Than The Rule

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ABSTRACT Using data from the American Medical Association's 2016 Physician Practice Benchmark Survey, we provide the first nationally representative estimates of physicians' use of telemedicine. In 2016, 15.4 percent of physicians worked in practices that used telemedicine for a wide spectrum of patient interactions, including e-visits as well as diagnoses made by radiologists who used telemedicine to store and forward data. In the same year, 11.2 percent of physicians worked in practices that used telemedicine for interactions between physicians and health care professionals. We found that in addition to specialty, larger practice size was an important correlate of telemedicine use. This suggests that despite regulatory and legislative changes to encourage the use of telemedicine, the financial burden of implementing it may be a continuing barrier for small practices.

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Telemedicine has the potential to increase access to care, improve the quality of the care provided, and reduce health care costs. Although recent regulatory and legislative changes to the Medicare program^{1,2} and an increase in state telemedicine parity laws³ could increase its prevalence, there are few estimates of its use. This information gap makes it difficult to assess the potential cost savings from telemedicine as well as its impact on access to and quality of care.

Research based on Medicare claims data indicates that in 2014 only 0.2 percent of Medicare Part B fee-for-service beneficiaries accessed services using telehealth. In contrast, 12 percent of beneficiaries covered by the Department of Veterans Affairs (VA) receive some form of telehealth each year.⁴ Estimates are lacking for the privately insured population and for physicians. We don't know how many physicians use telemedicine, or what functions it serves in their practices. One rigorous but narrowly focused survey estimated that 15 percent of family practice physicians used telemedicine in 2014.⁵ Sur-

vey data on hospitals indicated that by 2012, 42 percent had adopted telemedicine.⁶

Better information on where and how telemedicine is being used can inform strategies to encourage its appropriate use. Using data from the 2016 Physician Practice Benchmark Survey of the American Medical Association (AMA, with which both authors are affiliated), we estimated the percentage of physicians who use telemedicine for interactions with patients and with health care professionals. In addition, we provide utilization rates for three telemedicine modalities (videoconferencing, remote patient monitoring, and store and forward of data), and we explore the correlates of telemedicine to better understand the factors that inhibit or encourage its use. This is the first set of nationally representative estimates of the use of telemedicine by physicians.

Study Data And Methods

The Physician Practice Benchmark Survey is a nationally representative survey of physicians who provide at least twenty hours of patient care

per week, have completed residency, are not federal government employees, and practice in one of the fifty states or the District of Columbia. The survey has been conducted in 2012, 2014, and 2016. The 2016 survey was the first of the series to include questions on telemedicine.

The 2016 sample was drawn from the M3 Global Research physician panel. M3 licenses data from the AMA's Physician Masterfile, a repository of information on all physicians licensed to practice medicine in the US, and appends the data to its panel. The sample was selected from the panel on the basis of Masterfile variables indicating that the physician had completed residency, practiced in the US, was not retired, and had patient care as their professional activity. Physicians were screened at the start of the survey to ensure that they met the sample criteria and, in particular, to exclude those working part time or for the federal government—information not available from the Masterfile. The final data set included 3,500 physicians, with a response rate of 36 percent. Survey weights were constructed by NORC at the University of Chicago to reflect the probability of selection from the M3 panel into the sample and to adjust for nonresolution of eligibility status, differences between respondents and nonrespondents, and differences between the distributions of the sample respondents and the population (eligible physicians in the Masterfile). Weights took into account specialty, age, sex, AMA membership status, present employment (a “practice setting” variable), and census region.^{7,8} All descriptive statistics presented here were weighted.

TELEMEDICINE USE Because the Medicare program statutorily defines *telehealth* to include only two-way, audiovisual, real-time interactions,⁹ we used the term *telemedicine* rather than *telehealth* in the Benchmark Survey. Surveyed physicians were instructed that telemedicine was “the use of technology as a substitute for an in-person encounter with a health care professional” and asked whether telemedicine was used in their practice. The use of telemedicine was not tied to any particular payer or whether reimbursement was received for its use. Physicians in practices that used telemedicine were asked whether it was used for any of five functions. Three of these functions were patient interactions (diagnosing or treating patients, following up with patients, and managing patients with chronic disease), and two were interactions with health care professionals (having a specialty consultation and getting a second opinion). The physicians were also asked about their practice's use of three telemedicine modalities (videoconferencing, remote patient monitoring, and store and forward of data). Physicians could select more

than one function or modality, and the reported use of each modality was not linked back to any particular function.

SPECIALTY AND PRACTICE CHARACTERISTICS From the Masterfile, the survey data included physicians' primary specialty, which reflected medical training in one of over 250 detailed specialties. We mapped primary specialties to nine broad categories. The three broad categories of primary care, internal medicine subspecialties, and surgery were also broken down into more detailed specialties. Information about practice size (the number of physicians across all practice sites and locations), type, and ownership structure was gathered during the survey. We collapsed practice type and ownership to form a single variable with seven categories: solo practice; single specialty, physician owned; single specialty, other; multispecialty, physician owned; multispecialty, other; hospital employee (that is, a physician employed directly by, rather than a practice owned by, a hospital); and other. Because physicians employed by a hospital were not asked about practice size, we included them in the largest practice-size category.

MARKET CHARACTERISTICS We examined differences in telemedicine use by practice location (metropolitan versus nonmetropolitan) and the presence of a state telemedicine private-payer parity law. Metropolitan location was defined as practicing in a metropolitan core-based statistical area, as designated by the Office of Management and Budget.

Many states have telemedicine private-payer parity laws that require commercial insurers to provide coverage and reimbursement for telemedicine services as they would for in-person services. We used data compiled by the American Telemedicine Association to determine whether such a law existed in each state as of 2015.¹⁰ As of that year, a parity law had been enacted by the District of Columbia and twenty-four states (which had increased to thirty-one states by January 2017).³ While these laws require coverage of telemedicine services, they generally do not mandate that reimbursement for telemedicine services be equal to that for in-person services.¹¹ Furthermore, some laws are restricted to particular modalities, patient settings, or types of services and thus may differ in the extent to which they facilitate the use of telemedicine. Online appendix table 1 lists the states classified as having a parity law in 2015.¹²

ANALYSES We calculated the percentages of physicians whose practices used telemedicine for interactions between physicians and patients and those whose practices used it for interactions between physicians and health care professionals, as well as those whose practices used

each of the three modalities in 2016. We present those estimates by specialty, practice characteristics, and market characteristics. We used an ordinary least squares regression model to assess whether each of these variables was independently associated with our five measures of telemedicine use.

LIMITATIONS This study had several limitations. First, our data did not provide estimates of the percentage of interactions that were through telemedicine. As a result, variations in this “intensity” of use would be masked in our data.

Second, physicians were asked to report at the practice level, which may differ from their personal experience with telemedicine. Thus, the percentage of physicians who personally used telemedicine might be less than what we estimate.

Third, while some physicians were unaware of telemedicine use in their practice, we found this to be the rarity rather than the norm: Only 2.2 percent of physicians did not know whether telemedicine was used.

Finally, we could not estimate the frequency with which any of the three telemedicine modalities was used specifically for any one of the functions physicians reported in their practices. For example, we could not disentangle how often videoconferencing was used for patient interactions rather than interactions with health care professionals. Even in primary care and internal medicine subspecialties, many physicians who reported videoconferencing reported both types of interactions.

Study Results

SAMPLE CHARACTERISTICS We compared survey respondents to the population of physicians they represented—physicians in the AMA Masterfile who met the same criteria used to select M3 panel members for the survey. Survey respondents were broadly representative of the US physician workforce (appendix table 2).¹² Women accounted for 33.2 percent of respondents, nearly identical to their 33.6 percent of the physician population. The shares of physicians in states with parity laws (56.1 percent in the survey and 56.6 percent in the population) were also not significantly different from one another. The distributions of physicians by specialty, census division, and present employment were also similar, with significant differences in only two of the nine categories for the first two variables and no differences for the last variable. Compared to physicians in the population, slightly fewer physicians in the sample were in nonmetropolitan locations. The small differences in the age

distribution were partially driven by the survey screener questions that excluded physicians on the basis of information that either was not available in the Masterfile or might have changed since a physician’s Masterfile profile was last updated.

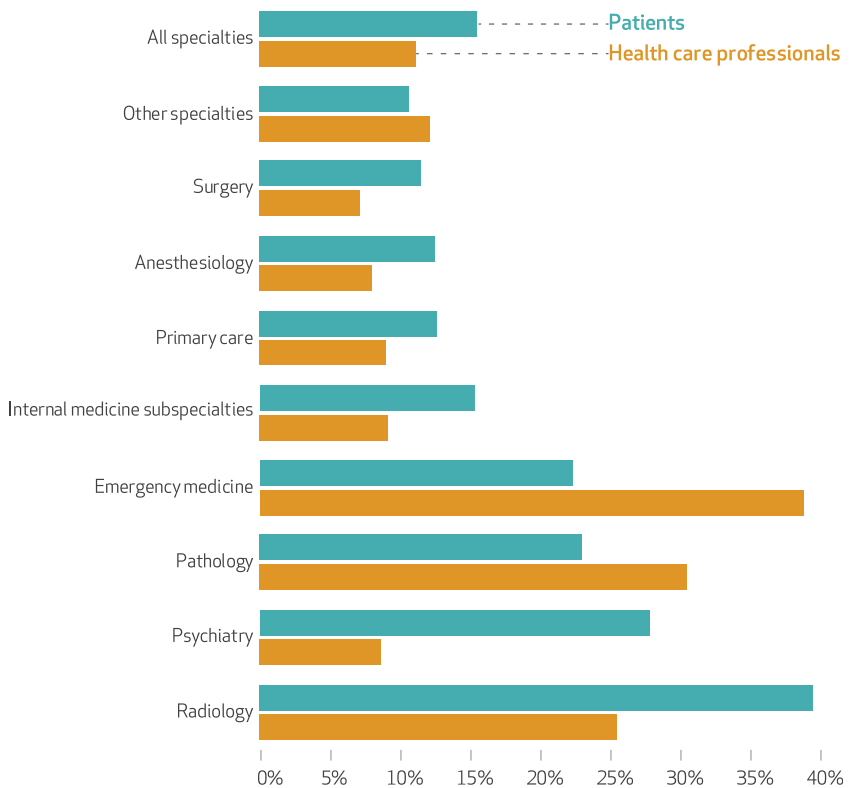
OVERALL USE OF TELEMEDICINE In 2016, 15.4 percent of physicians worked in practices that used telemedicine for patient interactions and 11.2 percent in practices that used it for interactions with health care professionals (exhibit 1). Utilization rates for the five functions ranged from 6.5 percent (getting a second opinion) to 11.2 percent (diagnosing or treating patients) (appendix table 3).¹²

Of the three telemedicine modalities captured in the data, videoconferencing was reported most often: 12.6 percent of physicians said it was used in their practice (exhibit 2). Remote patient monitoring was reported by 7.3 percent of physicians, and store and forward of data by 9.4 percent.

TELEMEDICINE USE BY SPECIALTY The use of telemedicine varied greatly across specialty.

EXHIBIT 1

Physicians in practices that used telemedicine in 2016, by type of interaction and specialty



SOURCE Authors’ analysis of data from the American Medical Association’s 2016 Physician Practice Benchmark Survey. **NOTES** A mapping from primary specialty to each of the specialty categories is available from the authors upon request. For both types of interactions (with patients and with health care professionals), differences across specialties were significant ($p < 0.01$).

EXHIBIT 2

Physicians' use of telemedicine, by specialty, 2016

| | Type of interaction (%) | | Telemedicine modality (%) | | | No. of respondents |
|--|-------------------------|---------------------------------------|---------------------------|---------------------------|---------------------------|--------------------|
| | Physician to patient | Physician to health care professional | Video-conferencing | Remote patient monitoring | Store and forward of data | |
| All specialties | 15.4 | 11.2 | 12.6 | 7.3 | 9.4 | 3,500 |
| Radiology | 39.5 | 25.5 | 17.0 | 9.7 | 42.7 | 129 |
| Psychiatry | 27.8 | 8.6 | 25.8 | 9.3 | 3.9 | 199 |
| Pathology | 23.0 | 30.4 | 24.1 | 2.1 | 22.7 | 33 |
| Emergency medicine | 22.3 | 38.8 | 31.6 | 6.9 | 13.1 | 168 |
| Internal medicine subspecialties | 15.3 | 9.2 | 12.9 | 10.9 | 7.6 | 685 |
| Cardiology | 24.1 | 11.7 | 11.2 | 17.9 | 14.9 | 97 |
| Neurology | 17.2 | 14.3 | 19.5 | 12.8 | 7.9 | 85 |
| Endocrinology and diabetes | 15.2 | 8.0 | 17.0 | 11.4 | 12.8 | 71 |
| Nephrology | 15.9 | 13.0 | 15.0 | 15.4 | 5.6 | 59 |
| Rheumatology | 15.5 | 4.7 | 4.7 | 6.2 | 5.2 | 59 |
| Hematology/oncology | 14.9 | 8.0 | 14.9 | 11.7 | 6.3 | 60 |
| Gastroenterology | 7.9 | 7.0 | 10.8 | 5.1 | 0.0 | 83 |
| Allergy/immunology | 6.1 | 3.3 | 6.1 | 4.6 | 0.0 | 74 |
| Other internal medicine subspecialties | 17.3 | 9.5 | 14.0 | 11.0 | 11.1 | 97 |
| Primary care | 12.7 | 8.0 | 10.0 | 7.3 | 6.8 | 1,143 |
| General internal medicine | 14.2 | 9.6 | 11.3 | 9.1 | 6.7 | 390 |
| Family or general practice | 11.8 | 7.8 | 7.7 | 6.8 | 7.4 | 461 |
| Pediatrics | 11.8 | 10.0 | 12.0 | 5.1 | 6.0 | 292 |
| Anesthesiology | 12.4 | 8.0 | 9.4 | 8.6 | 11.7 | 247 |
| Surgery | 11.4 | 7.2 | 8.0 | 4.1 | 7.0 | 780 |
| Ophthalmology | 13.0 | 14.9 | 10.2 | 7.5 | 14.0 | 98 |
| Dermatology | 15.0 | 6.0 | 3.5 | 4.1 | 12.9 | 121 |
| General surgery | 9.7 | 5.0 | 7.9 | 0.0 | 4.8 | 101 |
| Otolaryngology | 10.8 | 9.7 | 11.4 | 4.6 | 2.6 | 63 |
| Orthopedic surgery | 11.1 | 3.9 | 8.3 | 2.1 | 3.8 | 102 |
| Urology | 11.7 | 9.9 | 9.9 | 5.9 | 4.0 | 51 |
| Obstetrics/gynecology | 9.3 | 4.8 | 5.1 | 5.1 | 4.8 | 184 |
| Other surgical subspecialties | 14.5 | 10.0 | 15.6 | 5.9 | 10.1 | 60 |
| Other specialties | 10.7 | 12.1 | 13.6 | 4.6 | 8.1 | 116 |

SOURCE Authors' analysis of data from the American Medical Association's 2016 Physician Practice Benchmark Survey. **NOTES** A mapping from primary specialty to each of the specialty categories is available from the authors upon request. For each of the five measures of telemedicine use, differences across the nine general specialty categories were significant ($p < 0.01$).

Some specialties reported relatively high use: 27.8 percent of psychiatrists and 24.1 percent of cardiologists worked in practices that used telemedicine for patient interactions (exhibit 2). In those specialties, the use of telemedicine for each of the three patient-focused interactions was high relative to the mean. For example, 19.0 percent of cardiologists said that their practices used telemedicine to manage patients with chronic disease (appendix table 3).¹²

Similarly, 39.5 percent of radiologists and 23.0 percent of pathologists reported that their practices used telemedicine for patient interactions (exhibit 2). Consistent with the care that these specialists provide, relatively few radiologists and pathologists (fewer than 5 percent) used telemedicine to follow up with patients or manage patients with chronic disease (appendix table 3).¹² In contrast, 37.4 percent and 20.9 per-

cent, respectively, said that their practices used telemedicine to diagnose or treat patients.

In other specialties, the use of telemedicine for patient interactions ranged from 6.1 percent for physicians in the internal medicine subspecialty of allergy/immunology to 22.3 percent for those in emergency medicine (exhibit 2).

The specialties most likely to use telemedicine for interactions with health care professionals were emergency medicine physicians (38.8 percent), pathologists (30.4 percent), and radiologists (25.5 percent). In other specialties utilization rates were under 15 percent—for many, well under 10 percent.

Videoconferencing use was highest among emergency medicine physicians (31.6 percent), followed by psychiatrists and pathologists (around 25 percent). Radiologists, a few internal medicine subspecialists (hematologists/oncolo-

gists, nephrologists, endocrinologists, and neurologists), and other surgical specialists also had relatively high use of this modality (15–19 percent).

Among radiologists, 42.7 percent worked in practices that used telemedicine to store and forward data—the highest share of any specialty. Pathologists came next, at 22.7 percent. With utilization rates of 13–15 percent, endocrinologists, dermatologists, emergency medicine physicians, ophthalmologists, and cardiologists also used this modality relatively often.

Remote patient monitoring was used by fewer than 10 percent of physicians in every broad specialty group except internal medicine subspecialties (10.9 percent). Among internal medicine subspecialists, use of this modality was highest among cardiologists (17.9 percent) and nephrologists (15.4 percent). Neurologists, endocrinologists, and hematologists/oncologists had utilization rates around 12 percent. With the exception of hematologists/oncologists, these specialties had the highest reported rates of using telemedicine to manage patients with chronic disease (appendix table 3).¹²

TELEMEDICINE USE BY PRACTICE CHARACTERISTICS Physicians in larger practices were more likely than those in smaller practices to report

the use of telemedicine (exhibit 3). Use for patient interactions ranged from 8.2 percent among physicians in the smallest practice size category (one to four physicians) to 26.5 percent among physicians in the largest (at least fifty physicians). Use for interactions between physicians and health care professionals ranged from 3.6 percent to 22.8 percent. Patterns for use of videoconferencing and remote patient monitoring were similar, with physicians in the smallest practices using them the least and physicians in the largest practices using them the most.

Physicians in solo practice were less likely to use telemedicine for patient interactions (8.9 percent) than physicians in single or multispecialty group practices (for whom rates ranged from 10.2 percent to 21.2 percent) or who worked directly for hospitals (27.6 percent). A similar pattern was evident for the use of telemedicine for interactions between physicians and health care professionals. Among physicians in group practices, being in a physician-owned practice rather than one with some other ownership structure and being in a single specialty practice rather than a multispecialty practice appeared to be markers of lower use of telemedicine for both types of interactions.

We observed the same patterns across practice

EXHIBIT 3

Physicians' use of telemedicine, by practice and market characteristics, 2016

| Characteristic | Type of interaction (%) | | Telemedicine modality (%) | | | No. of respondents |
|--|-------------------------|---------------------------------------|---------------------------|---------------------------|---------------------------|--------------------|
| | Physician to patient | Physician to health care professional | Videoconferencing | Remote patient monitoring | Store and forward of data | |
| All | 15.4 | 11.2 | 12.6 | 7.3 | 9.4 | 3,500 |
| NUMBER OF PHYSICIANS IN PRACTICE | | | | | | |
| 1–4 | 8.2*** | 3.6*** | 6.0*** | 4.0*** | 4.4*** | 1,291 |
| 5–10 | 12.2 | 7.7 | 8.6 | 4.7 | 7.8 | 676 |
| 11–24 | 18.8 | 14.2 | 16.1 | 8.0 | 13.5 | 449 |
| 25–49 | 19.9 | 16.0 | 17.8 | 10.0 | 8.3 | 248 |
| 50 or more | 26.5 | 22.8 | 23.7 | 13.2 | 17.0 | 717 |
| PRACTICE TYPE AND OWNERSHIP STRUCTURE | | | | | | |
| Solo practice | 8.9*** | 3.1*** | 6.7*** | 4.1*** | 4.0*** | 600 |
| Single specialty, physician owned | 10.2 | 6.5 | 6.8 | 3.8 | 8.3 | 1,043 |
| Single specialty, other | 16.7 | 11.0 | 13.4 | 6.3 | 8.9 | 483 |
| Multispecialty, physician owned | 19.6 | 14.7 | 14.6 | 9.1 | 10.7 | 317 |
| Multispecialty, other | 21.2 | 19.4 | 20.3 | 12.9 | 11.4 | 620 |
| Hospital employee | 27.6 | 23.6 | 25.4 | 11.9 | 19.4 | 253 |
| Other practice type | 17.9 | 12.4 | 13.8 | 11.0 | 10.0 | 184 |
| LOCATION | | | | | | |
| Metropolitan | 15.5 | 10.9*** | 12.2*** | 7.3 | 9.3 | 3,292 |
| Nonmetropolitan | 15.0 | 16.8 | 18.8 | 7.3 | 10.0 | 208 |
| STATE HAD PRIVATE-PAYER PARITY LAW | | | | | | |
| Yes | 15.8 | 11.5 | 12.4 | 7.3 | 9.6 | 1,905 |
| No | 15.1 | 10.9 | 12.9 | 7.3 | 9.0 | 1,595 |

SOURCE Authors' analysis of data from the American Medical Association's 2016 Physician Practice Benchmark Survey. **NOTES** See the text for explanations of how practice and market characteristic variables were constructed. Tests for differences in use were performed for each subgroup. ***p < 0.01

types and ownership structures for videoconferencing and remote patient monitoring. However, ownership structure did not appear to be a factor in the use of telemedicine for store and forward of data.

TELEMEDICINE USE BY MARKET CHARACTERISTICS Compared to physicians in metropolitan locations, those in nonmetropolitan locations were more likely to report the use of telemedicine for interactions with health care professionals (16.8 percent versus 10.9 percent; exhibit 3). Videoconferencing was also used more often in nonmetropolitan practices (18.8 percent versus 12.2 percent). No significant differences in telemedicine use were observed between physicians in states with and without parity laws.

REGRESSION RESULTS Many of the observed differences in the use of telemedicine were also present in our multivariate model (appendix table 4).¹² The specialties that had the highest use of each modality (exhibit 2) were also associated with the highest use in the regressions. Larger practice size was associated with a greater likelihood of using each measure of telemedicine, although not always in a strictly monotonic fashion. Compared to physicians in practices with fewer than five physicians, those in practices with fifty or more physicians were more likely to report that their practice used telemedicine for interactions with patients and health care professionals (by 15.1 percentage points and 11.4 percentage points, respectively). Practicing in a nonmetropolitan area was associated with a 5.1-percentage-point higher likelihood of the use of telemedicine for interactions with health care professionals and a 6.2-percentage-point higher likelihood of the use of videoconferencing, compared to practicing in a metropolitan area. Practicing in a state with a parity law was not correlated with any measure of telemedicine use.¹³

The regressions yielded results for practice type that were somewhat different than those we observed in the univariate results. Exhibit 3 shows that for each telemedicine measure, the utilization rates of hospital-employed physicians were higher than those of physicians in solo practice. In the regressions, hospital employees were more likely to use only videoconferencing, and then marginally so. In the regressions, the higher utilization rates of hospital-employed physicians observed in exhibit 3 are being picked up by the largest practice-size category.

Exhibit 3 also suggests that physicians in multispecialty practices had higher telemedicine utilization rates than physicians in single specialty practices. In contrast, joint tests in the regressions indicate that this practice attribute was a significant correlate of only one measure of telemedicine use: interactions with health care pro-

fessionals. Here, the univariate differences are being driven by the correlation between practice type and size: Multispecialty practices are larger than single-specialty practices.⁷ With regard to practice ownership, the regression results were consistent with those shown in exhibit 3. Joint tests suggest that practices owned by physicians were less likely to use telemedicine for interactions with patients and health care professionals and less likely to use videoconferencing, compared to other practices.

Discussion

We found that in 2016, 15.4 percent of physicians worked in practices that used telemedicine for interactions between physicians and patients. Although radiologists (39.5 percent), psychiatrists (27.8 percent), and cardiologists (24.1 percent) had the highest use of telemedicine for this type of interaction, these percentages reflect a wide spectrum across specialties in how telemedicine was used to interact with patients.

For example, radiologists' use of telemedicine for patient interactions is related to the use of store and forward of data: 42.7 percent of them said that their practice used this modality, and 37.4 percent said that their practice used telemedicine to diagnose and treat patients. A radiologist in an urban location may read and interpret the magnetic resonance imaging results of a patient in a rural location. This method of asynchronous communication also allows an off-site group of radiologists to review images from the emergency departments of multiple hospitals. While not having a patient encounter in the same sense that a primary care physician would have, radiologists are treating patients and using a form of telemedicine to do so. In contrast, psychiatrists' reports of patient-facing telemedicine reflect the use of videoconferencing for e-visits with patients: 25.8 percent of psychiatrists reported the use of videoconferencing in their practice. A key component of cardiologists' use of telemedicine is the use of remote monitoring of patients with chronic disease: 17.9 percent of cardiologists were in practices that used remote patient monitoring, and 19.0 percent used telemedicine to manage patients with chronic disease.

Overall, 11.2 percent of physicians worked in practices that used telemedicine for interactions with health care professionals. The specialties with the highest use of telemedicine for this function were emergency medicine (38.8 percent), pathology (30.4 percent), and radiology (25.5 percent). In addition to using telemedicine to store and forward data to diagnose and treat patients, pathologists and radiologists also use it

to share images with subspecialists. Each of these specialties may also use videoconferencing for this purpose.

Across the three telemedicine modalities, videoconferencing had the most widespread adoption among physicians (12.6 percent). Insurance coverage is likely a key reason for this finding. Videoconferencing is the modality most often referred to in defining telehealth in states' parity laws¹¹ and is the most commonly covered modality in states' fee-for-service Medicaid programs.¹⁴ As illustrated, it also can serve a variety of functions, including interactions with health care professionals as well as with patients, across a broad set of specialties.

Remote patient monitoring was used in the practices of 7.3 percent of physicians, and its use was reported most often by physicians in internal medicine subspecialties. The same types of remote patient monitoring used by cardiologists, who had the highest reported use of this modality, are also used in the treatment of cancer patients who are at increased risk for cardiovascular problems after chemotherapy and radiation therapy.¹⁵ The practices of 11.7 percent of hematologists/oncologists used remote patient monitoring.

The practices of 9.4 percent of physicians used telemedicine to store and forward data. In addition to having a high rate of use by radiologists and pathologists, this modality was also used relatively often by dermatologists and ophthalmologists. The use of this modality in these specialties allows primary care physicians to share images of skin conditions and eye screenings for diabetic retinopathy for review.

The results of listening sessions held by the Centers for Medicare and Medicaid Services suggest that the financial burden of implementing telemedicine is a barrier to its use.¹⁶ Our research provides further evidence for this: Physicians in larger practices and practices not owned by physicians had higher use of telemedicine. These practices may be better able to make the investments necessary to support telemedicine. Even after specialty differences were controlled for, physicians in practices with fifty or more physicians were 15.1 percentage points more likely than physicians in practices with fewer than five physicians to report that their practice used telemedicine for patient interactions, and 11.4 percentage points more likely to report its use for interactions with health care professionals. Prior research has identified larger practice size as a correlate of the adoption of electronic health records.^{17,18} And prior research on hospitals has found that affiliation with a system was associated with an increased likelihood of telemedi-

cine use.⁶

We found that practicing in a nonmetropolitan location was associated with increased use of telemedicine for interactions with health care professionals and increased use of videoconferencing. This may indicate that even in areas that are not necessarily Health Professional Shortage Areas, videoconferencing is being used to increase access to relevant subspecialists.

Contrary to the results of several recent studies that focused on hospitals and Medicare beneficiaries,^{6,19-21} we did not find an association between telemedicine use and state parity laws. Some parity laws apply only to particular modalities, settings, or services. A more narrowly focused analysis among a subset of physicians to whom these laws better apply might indicate that there are differences in use by parity-law status. It is also possible that the intensity of telemedicine use (which we did not measure) is greater in states with parity laws than in states without them, even if the rate of any use is not.

Conclusion

We examined data from the 2016 Physician Practice Benchmark Survey to assess how often three telemedicine modalities were used by physicians and what functions they served. Fifteen percent of physicians worked in practices that used telemedicine for interactions with patients. This reflects a wide spectrum of how physicians interact with patients, including e-visits as well as diagnoses made by radiologists using store and forward of data. Eleven percent of physicians worked in practices that used telemedicine for interactions with health care professionals. Importantly, these should be regarded as upper-bound estimates. Not all physicians in practices with telemedicine use it, and those who do might use it for only a subset of patients.

Our work suggests that despite regulatory and legislative changes designed to encourage the use of telemedicine, the financial burden of implementing it may be a continuing barrier, especially for small practices. Even after we controlled for specialty differences, we found that physicians in larger practices and ones that were not physician owned were more likely to report that their practices used telemedicine for interactions with both patients and health care professionals. In addition, the higher use in nonmetropolitan locations of telemedicine for interactions with health care professionals suggests that even when not practicing in a Health Professional Shortage Area, physicians are using telemedicine to alleviate access issues when relevant subspecialists are not available. ■

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the American Medical Association.

NOTES

- 1 Centers for Medicare and Medicaid Services. Medicare Program; revisions to payment policies under the Physician Fee Schedule and other revisions to Part B for CY 2018; Medicare Shared Savings Program requirements; and Medicare Diabetes Prevention Program. Final rule. *Fed Regist*. 2017;82(219):52976–3371.
- 2 Fingold HI, Kim D, Lerman AF. CHRONIC Care Act, title III of the Bipartisan Budget Act of 2018, signals meaningful change for Medicare Advantage plans and telehealth coverage. *National Law Review* [serial on the Internet]. 2018 Feb 21 [cited 2018 Oct 16]. Available from: <https://www.natlawreview.com/article/chronic-care-act-title-iii-bipartisan-budget-act-2018-signals-meaningful-change>
- 3 Thomas L, Capistrant G. State telemedicine gaps analysis: coverage and reimbursement [Internet]. Arlington (VA): American Telemedicine Association; 2017 Feb [cited 2018 Sep 4]. Available for download (registration required) from: <https://www.americantelemed.org/policy-page/state-telemedicine-gaps-reports>
- 4 Government Accountability Office. Health care: telehealth and remote patient monitoring use in Medicare and selected federal programs [Internet]. Washington (DC): GAO; 2017 Apr [cited 2018 Oct 16]. (Report No. GAO-17-365). Available from: <https://www.gao.gov/assets/690/684115.pdf>
- 5 Moore MA, Coffman M, Jetty A, Petterson S, Bazemore A. Only 15% of FPs report using telehealth; training and lack of reimbursement are top barriers. *Am Fam Physician*. 2016;93(2):101.
- 6 Adler-Milstein J, Kvedar J, Bates DW. Telehealth among US hospitals: several factors, including state reimbursement and licensure policies, influence adoption. *Health Aff (Millwood)*. 2014;33(2):207–15.
- 7 Kane CK. Updated data on physician practice arrangements: physician ownership drops below 50 percent [Internet]. Chicago (IL): American Medical Association; c 2017 [cited 2018 Oct 16]. Available from: <https://www.ama-assn.org/sites/default/files/media-browser/public/health-policy/PRP-2016-physician-benchmark-survey.pdf>
- 8 Of the surveyed physicians, 5.5 percent were found to be ineligible. Federal employment was the main reason for ineligibility, followed by seeing patients for fewer than twenty hours per week.
- 9 Centers for Medicare and Medicaid Services. Telehealth services [Internet]. Baltimore (MD): CMS; 2018 Feb [cited 2018 Oct 17]. Available from: https://www.cms.gov/Outreach-and-Education/Medicare-Learning-Network-MLN/MLNProducts/downloads/telehealth_srvcfsctsh.pdf
- 10 Thomas L, Capistrant G. State telemedicine gaps analysis: coverage and reimbursement [Internet]. Arlington (VA): American Telemedicine Association; 2015 May [cited 2018 Sep 4]. Available for download (registration required) from: <https://www.americantelemed.org/policy-page/state-telemedicine-gaps-reports>
- 11 Center for Connected Health Policy. Telehealth private payer laws: impact and issues [Internet]. New York (NY): Milbank Memorial Fund; 2017 Aug [cited 2018 Oct 17]. Available from: <https://www.milbank.org/wp-content/uploads/2017/08/MMF-Telehealth-Report-FINAL.pdf>
- 12 To access the appendix, click on the Details tab of the article online.
- 13 In addition to using a binary indicator for whether a state had a private-payer parity law, we examined state rankings for private insurance and Medicaid parity that took into account the various limitations that can be placed on telemedicine coverage (see note 10). These parity grades, measured on a four-point scale, also had no clear pattern of association with physician use of telemedicine when other physician and practice characteristics were controlled for.
- 14 Center for Connected Health Policy. 50 state scan of telehealth reimbursement laws and Medicaid policies—factsheet [Internet]. Sacramento (CA): CCHP; 2018 [cited 2018 Oct 17]. Available from: <http://www.cchpca.org/sites/default/files/resources/50%20State%20Factsheet%20Spring%202018%20FINAL.pdf>
- 15 Seymour C. Remote monitoring of cardiovascular symptoms in patients with cancer. *Onclive* [serial on the Internet]. 2018 Feb 1 [cited 2018 Oct 17]. Available from: <https://www.onclive.com/web-exclusives/remote-monitoring-of-cardiovascular-symptoms-in-patients-with-cancer>
- 16 CMS.gov. CMS rural health strategy [Internet]. Baltimore (MD): Centers for Medicare and Medicaid Services; 2018 May 8 [cited 2018 Oct 17]. (Fact Sheet). Available from: <https://www.cms.gov/Newsroom/MediaReleaseDatabase/Fact-sheets/2018-Fact-sheets-items/2018-05-08.html>
- 17 Rao SR, Desroches CM, Donelan K, Campbell EG, Miralles PD, Jha AK. Electronic health records in small physician practices: availability, use, and perceived benefits. *J Am Med Inform Assoc*. 2011;18(3):271–5.
- 18 Decker SL, Jamoom EW, Sisk JE. Physicians in nonprimary care and small practices and those age 55 and older lag in adopting electronic health record systems. *Health Aff (Millwood)*. 2012;31(5):1108–14.
- 19 Neufeld JD, Doarn CR, Aly R. State policies influence Medicare telemedicine utilization. *Telemed J E Health*. 2016;22(1):70–4.
- 20 Mehrotra A, Jena AB, Busch AB, Souza J, Uscher-Pines L, Landon BE. Utilization of telemedicine among rural Medicare beneficiaries. *JAMA*. 2016;315(18):2015–6.
- 21 Mehrotra A, Huskamp HA, Souza J, Uscher-Pines L, Rose S, Landon BE, et al. Rapid growth in mental health telemedicine use among rural Medicare beneficiaries, wide variation across states. *Health Aff (Millwood)*. 2017;36(5):909–17.