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Department of Neurology

Telehealth in Neurology

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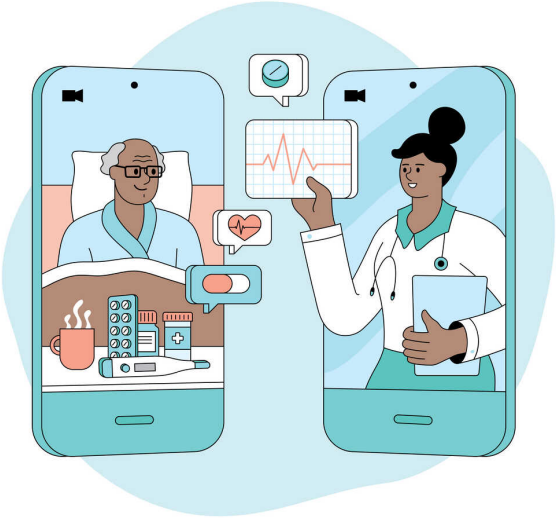
October 14, 2022

Disclosures

- Dr. Busis has received personal compensation for serving as CPT advisor for the American Academy of Neurology (AAN) and for AAN speaking engagements

Telehealth is Non-In-Person Care

- **Telehealth:** the use of electronic information and telecommunication technologies to provide health care when participants are not in the same place at the same time
- **Participants:** patients, family, and caregivers; and physicians and other members of the health care team
- **Technologies:** exchange and interpretation of text, data, images, audio or video either in real-time (synchronous) or via store and forward (asynchronous)
- **Choice of modality:** determined by the patient's needs, ability to access and use the technology, and the evidence base



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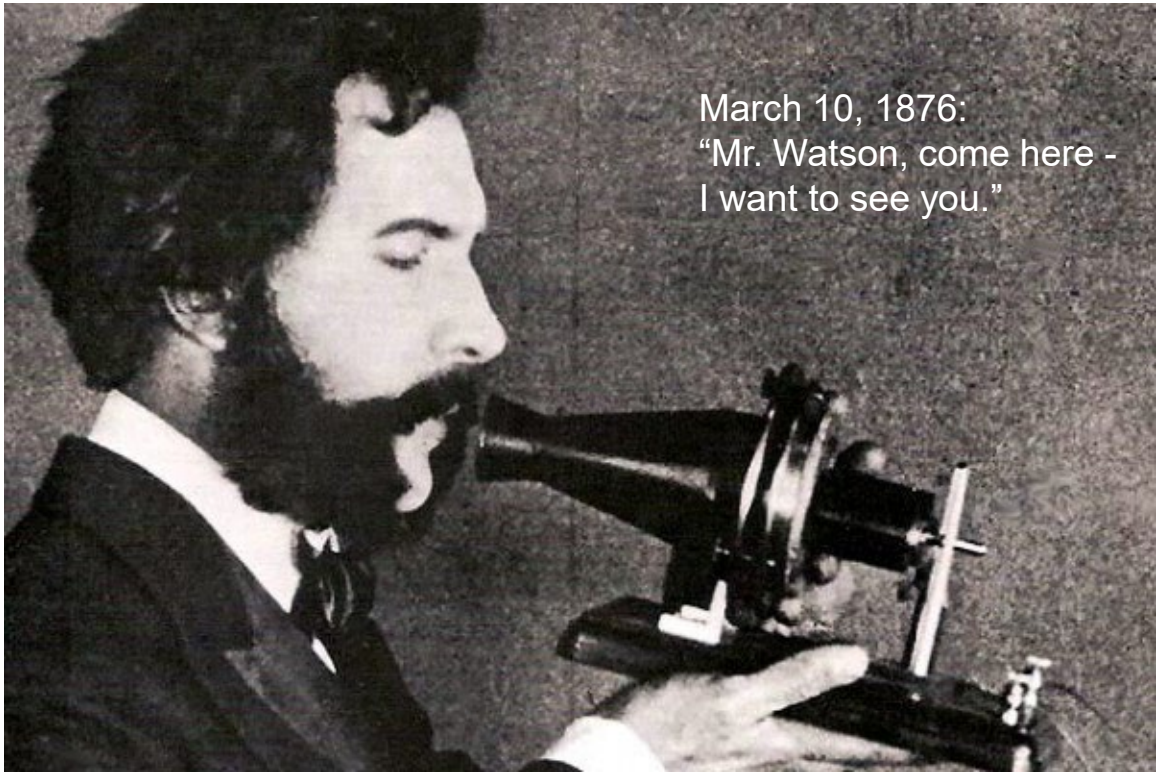
The First Telehealth Encounter?



Aronson SH. The Lancet on the telephone 1876-1975. Med Hist. 1977 Jan;21(1):69-87.

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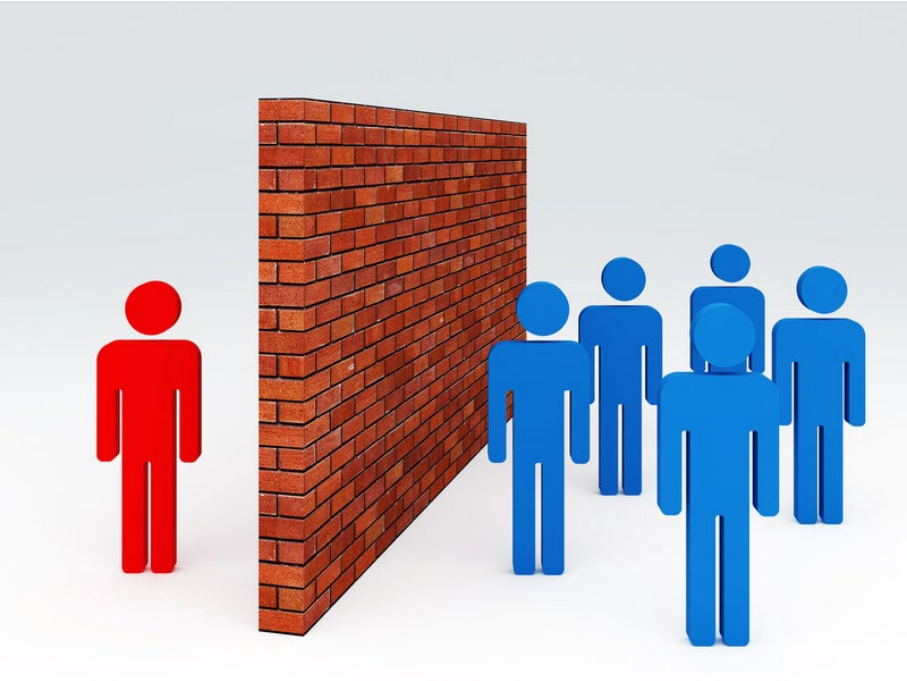
Telehealth is Used to Increase Access and Safety



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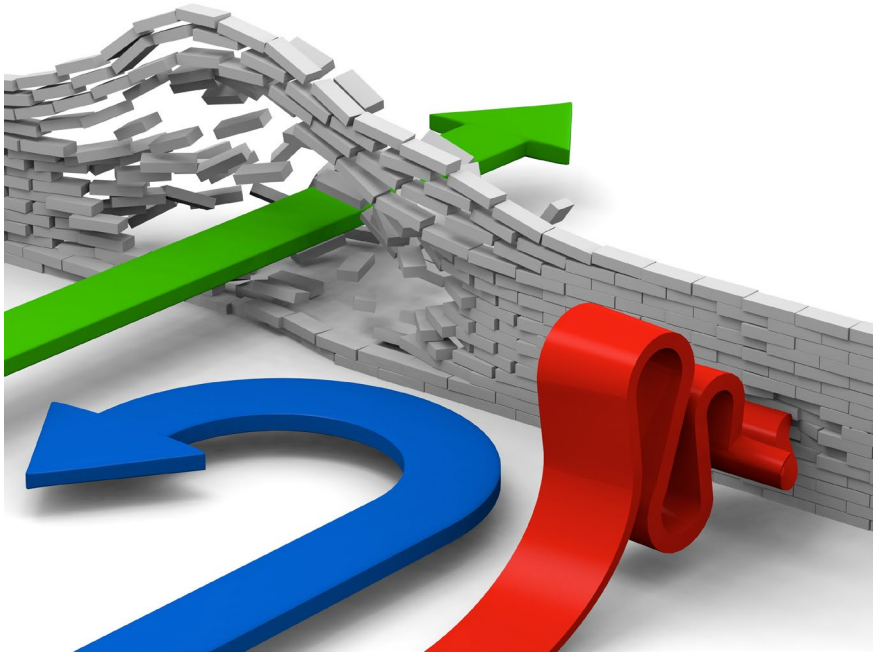
But Decreased Access or Quality for Some Patients?



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Spectrum of Telehealth Services in Neurology

Non-in-person health care: when participants are not in the same place at the same time

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Key Takeaways from 2021 AMA Telehealth Survey

- 98% of neurologists used telehealth
- Per week, neurologists saw 36% of their patients via telehealth
- Telehealth enabled neurologists to provide high-quality care for many services
- Most use cases were follow-up care, improving access, and medication management
- 75% or more of telehealth visits were with established patients
- Telehealth visits were mostly conducted from clinic or home
- Most neurologists used live audio-visual technology
- 6 in 10 could access their telehealth platforms via the EHR
- 66% of respondents agreed/strongly agreed telehealth has increased their professional satisfaction
- Practices planned to offer a variety of telehealth services in the future

https://www.ama-assn.org/system/files/telehealth-survey-report.pdf

Migration of Virtual Care to Home

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Comparing Teleneurology to In-Person Encounters

History

Exam

Medical Decision Making

"Just listen to your patient, [s]he is telling you the diagnosis."

Most of the Neurological Exam Can Be Done Virtually

1. **General appearance of patient (Yes)**
2. Vital signs (Possible)
3. **Cardiovascular (No)**
4. **Attention span and concentration (Yes)**
5. **Orientation to person, place, time (Yes)**
6. **Language (Yes)**
7. **Fund of knowledge (Yes)**
8. **Recent and remote memory (Yes)**
9. 2nd cranial nerve (Possible)
10. **Ophthalmoscopic examination (No)**
11. **3rd, 4th and 6th cranial nerves (Yes)**
12. **5th cranial nerve (Yes)**
13. **7th cranial nerve (Yes)**
14. **8th cranial nerve (Yes)**
15. 9th cranial nerve (Possible)
16. **11th cranial nerve (Yes)**
17. **12th cranial nerve (Yes)**
18. **Muscle strength (Yes)**
19. **Muscle tone with atrophy or abnormal movements (Yes)**
20. **Coordination (Yes)**
21. Deep tendon reflexes with pathological reflexes (Possible)
22. **Sensation (Yes)**
23. **Gait and station (Yes)**

Grossman SN, et al. Rapid implementation of virtual neurology in response to the COVID-19 pandemic. Neurology. 2020 Jun 16;94(24):1077-1087.

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The Most Useful Elements of the Virtual Neuro Exam

1. General appearance of patient (Yes)
2. Vital signs (Possible)
3. Cardiovascular (No)
4. **Attention span and concentration (Yes)**
5. **Orientation to person, place, time (Yes)**
6. **Language (Yes)**
7. **Fund of knowledge (Yes)**
8. **Recent and remote memory (Yes)**
9. 2nd cranial nerve (Possible)
10. Ophthalmoscopic examination (No)
11. **3rd, 4th and 6th cranial nerves (Yes)**
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17. **12th cranial nerve (Yes)**
18. **Muscle strength (Yes)**
19. Muscle tone with atrophy or abnormal movements (Yes)
20. **Coordination (Yes)**
21. Deep tendon reflexes with pathological reflexes (Possible)
22. **Sensation (Yes)**
23. **Gait and station (Yes)**

Thawani SP, et al. Neurologists' Evaluations of Experience and Effectiveness of Teleneurology Encounters. Telemed J E Health. 2022 Jul 14. doi: 10.1089/tmj.2021.0551. Online ahead of print.

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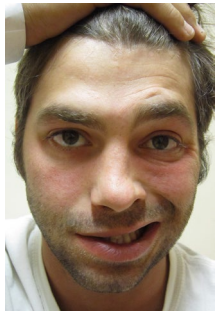
Components of the Virtual Motor Exam



Inspection

Self or Assisted Exam

Functional

Objects

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MRC Strength Grading Scale

5. Normal power
4. Active movement against gravity and resistance
3. Active movement against gravity
2. Active movement only with gravity eliminated
1. Trace contraction (flicker)
0. No contraction

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Modalities of Sensory Testing

- Touch
- Sharp
- Cold
- Position (with assistant)
- Vibration (with assistant and tuning fork)

- May draw area of sensory alteration and photograph it for future reference

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Testing Finger Abduction and Digit 5 Sensation

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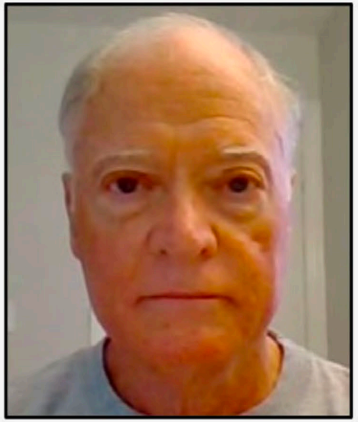
Assessing Fatigable Weakness

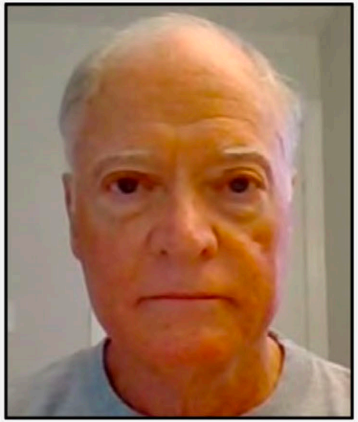
- **Instructions**

"While relaxing your eyebrows, look straight ahead at the camera. Relax your eyebrows."



"Now, keep your head still and raise your eyes to look at the ceiling. Hold your gaze there for 61s."

"Look back down at the camera and relax your eyebrows."



- **Observations**
  - ✓ Ptosis?
  - ✓ Unilateral/bilateral?
  - ✓ Severity?

61 sec

- **Observations**
  - ✓ Fatigable Ptosis?
  - ✓ Unilateral/bilateral?
  - ✓ Severity?

Guidon AC, et al. Telemedicine visits in myasthenia gravis: Expert guidance and the Myasthenia Gravis Core Exam (MG-CE). Muscle Nerve. 2021 Sep;64(3):270-276

Remote Peripheral Neuropathy Assessment Tool

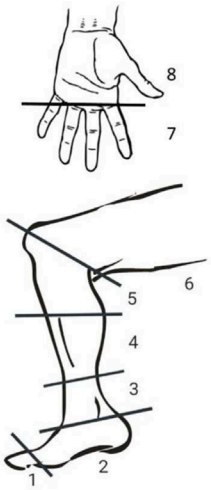
The VA Neuropathy Scale

Romberg
0=normal
1=step off

Casual Gait	Heel Walk	Tandem Walk
0=normal	0=normal	0=normal
1=abnormal	1=abnormal	1=abnormal

Left Knee Reflex 0=normal or brisk 1=absent or depressed	Right Knee Reflex 0=normal or brisk 1=absent or depressed
Left Foot Inspection 0=normal 2=ulcers, skin fissures	Right Foot Inspection 0=normal 2=ulcers, skin fissures
Left Toe Vibration 0=normal 1=decreased 2=absent	Right Toe Vibration 0=normal 1=decreased 2=absent
Left Knee Vibration 0=normal 1=decreased 2=absent	Right Knee Vibration 0=normal 1=decreased 2=absent

Segments for pin sensation reporting



	Left pinprick 0=normal 1=reduced 2=absent	Right pinprick 0=normal 1=reduced 2=absent
Region8		
Region7		
Region6		
Region5		
Region4		
Region3		
Region2		
Region1		

TOTAL SCORE_____

Wilson AM, et al. The Veterans Affairs Neuropathy Scale: A Reliable, Remote Polyneuropathy Exam. Front Neurol. 2019 Nov 1;10:1050.

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Case 1: Triage Based on History and Data Review

- 27 y/o woman with neuropathy to establish care after moving to New York
- Extensively worked up at another medical center for many medical problems
- Neurologic symptoms include:
  - Patchy numbness involving face, trunk, arms, legs, with sparing of feet
  - Constipation, reflux, dry eyes and mouth, sweating restricted to feet and belly
- Previous neuro exams showed patchy sensory loss in legs
- Multiple labs and imaging studies were nondiagnostic
- Autonomic testing showed mild dysfunction of sympathetic sudomotor fibers
- Tilt table suggested postural orthostatic tachycardia syndrome
- Skin biopsy of right distal leg consistent with severe far distal sensory and autonomic axonopathy
- Exam not possible since she was in a school building with limited privacy
- Dx: Patchy sensory/autonomic neuropathy
- Rx: Referred to internationally-known neuropathy expert

Case 2: History and Exam Tell the Story

- 41 y/o man with pain, weakness, and sensory alteration in the left upper extremity with a zoster rash
- Initially had pain in the left trapezius muscle
- Then developed a rash that looked like shingles in left arm
- Given a 7-day course of valacyclovir
- Hx ankylosing spondylitis and Crohn's disease, on adalimumab
- Wife is a physician and helped with exam
- 4/5 weakness in shoulder external and internal rotators, biceps, brachioradialis, finger extension, and finger abduction on assisted exam
- Reflexes symmetric using TV remote
- Sensory alteration in distal anterolateral left upper arm to touch
- Herpetic rash over the deltoid, anterolateral upper arm, and the lateral border of the left forearm
- Dx: Zoster radiculitis, left C5-6
- Rx: Ask ID about valacyclovir regimen

Case 3: Expected and Unexpected Exam Findings

- 37 y/o man with numbness of the left hand that awakens him from sleep
- It sometimes occurs during the day
- He sometimes has trouble gripping things with left hand
- Works at a computer, in finance
- Legs may fall asleep a bit more than other people's
- Weakness of right finger abduction and right flexor digitorum profundus 5 function but no other weakness in either upper extremity
- Dramatic Tinel's sign over the left median nerve at the carpal tunnel, slight Tinel's sign over the right median nerve at the carpal tunnel, and Tinel's sign over the right ulnar nerve at the elbow
- No clear-cut sensory loss
- Dx: Left carpal tunnel syndrome, asymptomatic right ulnar neuropathy at the elbow, possible right carpal tunnel syndrome
- Rx: Cock-up left wrist splint, right elbow pad, improve ergonomics of workstation
- Ask family members about liability to pressure palsies

Case 4: Home Monitoring is Key

- 56 y/o man with orthostatic dizziness
- Similar feeling in the past which was attributed to dehydration, resolved with rehydration
- Recurrent diarrhea
- Diabetes, alcohol and opiate use
- Patient's history did not match what was documented in the chart
- Neuro exam unremarkable

- Asked to do home blood pressure and pulse monitoring the next day
- Drop in BP and rise in pulse after standing (repeated x 3)
  - Lying down: BP 138/91, pulse 65
  - Standing up 10 mins: BP 104/40, pulse 92
- Orthostasis confirmed, not autonomic neuropathy since pulse rose
- Referred to internist
- Dx: Dehydration due to diarrhea

Bonus Case: Inpatient with Finger Drop

- 59 y/o man with history of histiocytoma with multiple nodules, subacute progressive finger drop
- Finger drop on exam involving right digits 5 > 4 > 3, no wrist weakness or sensory loss
- Imaging showed focal fusiform thickening measuring approximately 0.4-0.5 cm along the expected course of deep branch of radial nerve
- Dx: Histiocytoma involving deep branch of radial nerve

Limitations of the Teleneurology Exam

Ophthalmoscopic Exam

- Vestibular testing
- Detailed assessment of:
  - Strength or muscle tone
  - Reflexes
  - Sensation
- Must assist patients with problems affecting:
  - Cognition
  - Vision
  - Hearing
  - Use of the technology
- Rating scales may require on-site assistance

Minimize risks to patient safety during the examination!

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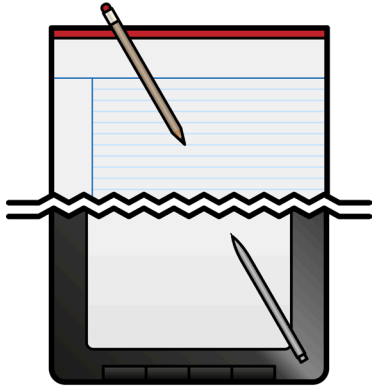
Telehealth Barriers

In addition to physical examination…

- Insurance coverage and payment
- Uncertainty/COVID rollbacks
- Technology literacy/digital divide
- Location/site of service
- Data/privacy concerns
- Workflows
- Education
- Telehealth evidence base



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Evidence for Teleneurology Before COVID

	Patient/physician satisfaction	Improved access to care[a]	Diagnostic accuracy	Improved outcomes	Cost savings (patient, health system use)[a]
Concussion/traumatic brain injury	+	+	++	++	+
Dementia	++	–	++	+	+
Epilepsy	+	+	–	++	+
Headache	++	–	++	++	+
Movement disorders	++	+	++	++	+
Multiple sclerosis	++	–	++	++	+
Neuromuscular	++	–	–	+	+
Inpatient general neurology	–	+	+	+	+

Abbreviations: + = small case series, indirect measurement; ++ = randomized controlled trial or inferiority trial, direct measure; – = no studies.
[a] While it is presumed that telemedicine improves access to care and provides cost savings, few studies have formally measured this.

Hatcher-Martin JM, et al. Telemedicine in neurology: Telemedicine Work Group of the American Academy of Neurology update. Neurology. 2020 Jan 7;94(1):30-38.

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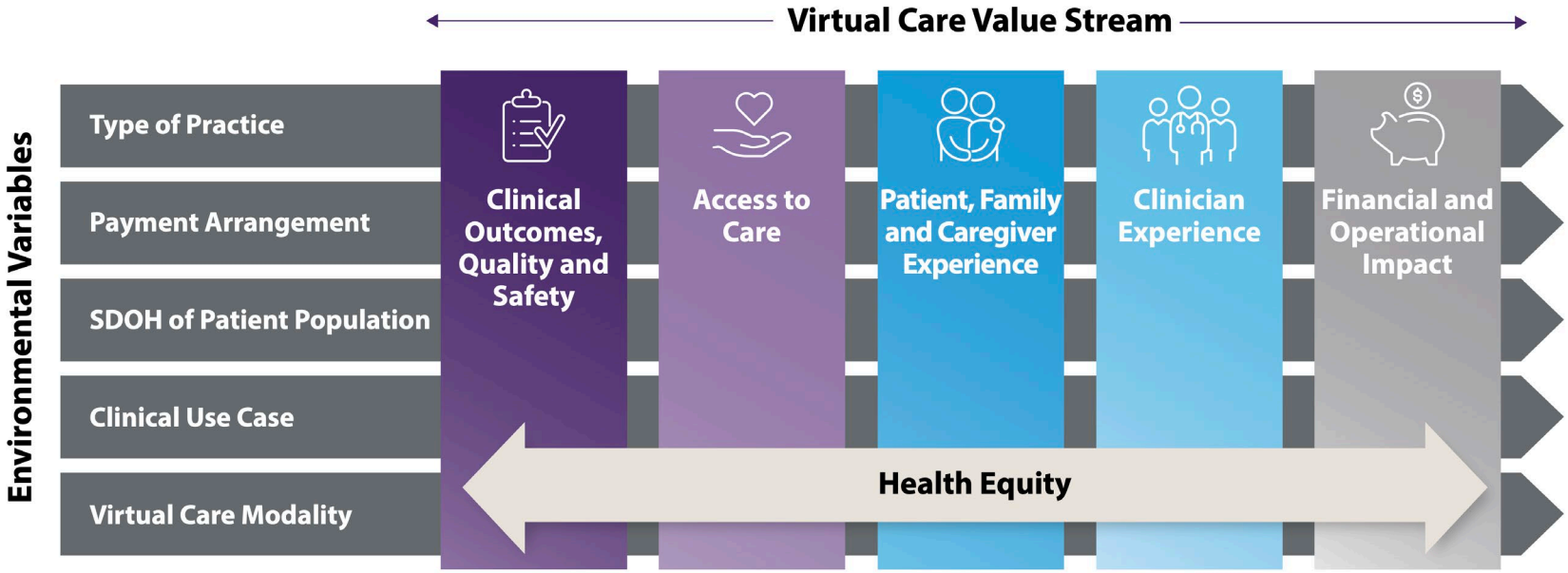
AMA Framework for Measuring the Value of Telehealth



https://www.ama-assn.org/practice-management/digital/amas-return-health-telehealth-framework-practices

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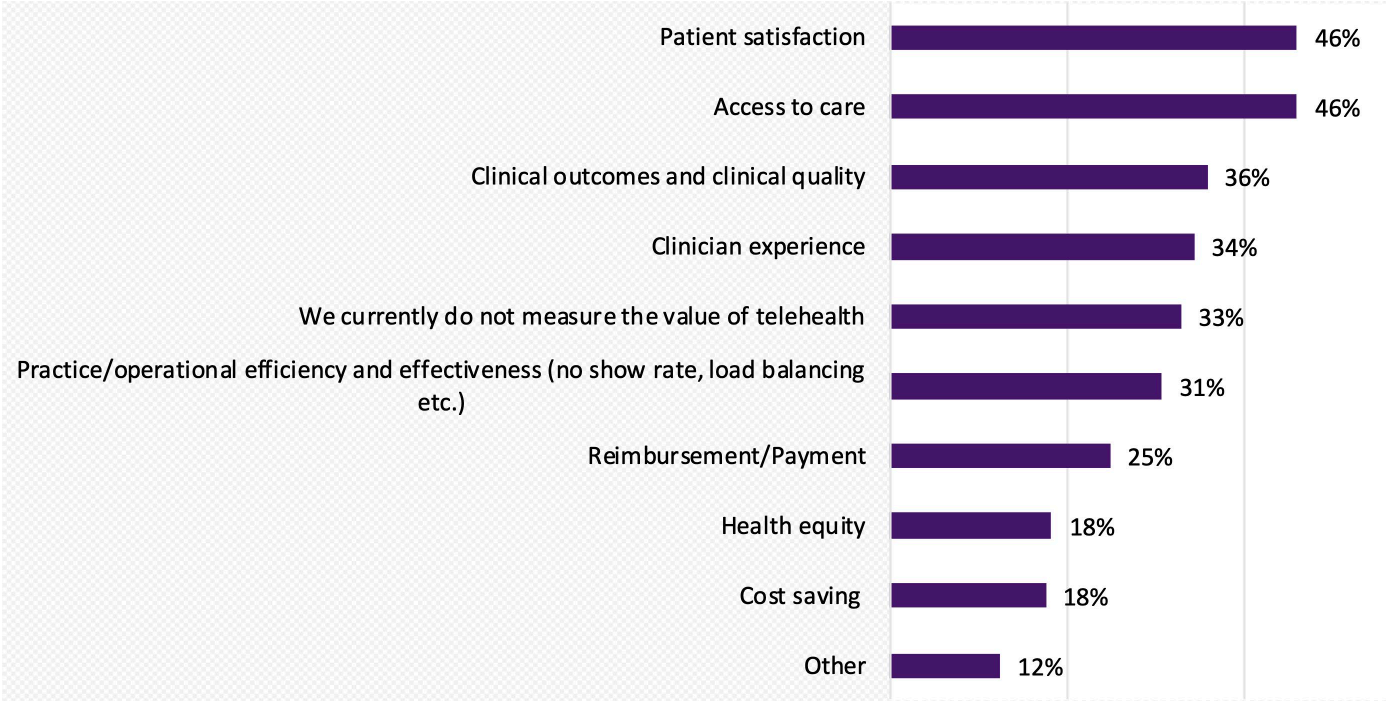
Most Neurologists Currently Measure Telehealth Value via Patient Satisfaction and Access (AMA Survey)



86% agree that telehealth offers better access to care,
2/3 agree that it contributes to improved patient satisfaction

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Quality of the Remote Neurologic Exam

- Developing the remote neurologic exam
- Comparing telehealth and in-person examinations
- Validating/adapting in-person neurological assessment scales for virtual use
- Test-retest reproducibility of a single examiner's findings
- Inter-examiner reliability
- How best to teach teleneurology skills?

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Cochrane Library

Cochrane Database of Systematic Reviews

Diagnostic test accuracy of remote, multidomain cognitive assessment (telephone and video call) for dementia (Review)

- Despite the common and increasing use of remote cognitive assessment, supporting evidence on test accuracy is limited
- Available data do not allow us to suggest a preferred test
- Remote testing is complex
  - This is reflected in the heterogeneity seen in tests used, their application, and their analysis
- More research is needed to describe accuracy of contemporary approaches to remote cognitive assessment

Beishon LC, et al. Diagnostic test accuracy of remote, multidomain cognitive assessment (telephone and video call) for dementia. Cochrane Database Syst Rev. 2022 Apr 8;4(4):CD013724.

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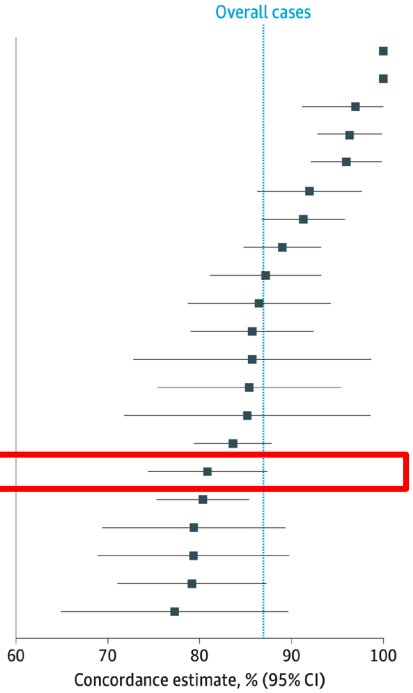
Telemedicine Diagnostic Concordance by Clinical Area

Clinical area	Concordant, No./total No.
Radiation oncology	67/67
Hematology oncology	65/65
Allergy and immunology	32/33
Transplant	105/109
Psychiatry and psychology	95/99
Neurological surgery	80/87
Orthopedic surgery	136/149
Urology	186/209
Obstetrics and gynecology	102/117
Pulmonary medicine	64/74
Cardiovascular disease	90/105
Sleep medicine	24/28
Physical medicine and rehabilitation	41/48
Women's health	23/27
Family medicine	245/293
Neurology	114/141
Gastroenterology and hepatology	192/239
General internal medicine	50/63
Dermatology	46/58
Community internal medicine	76/96
Otorhinolaryngology	34/44



Demaerschalk BM, et al. Assessment of Clinician Diagnostic Concordance With Video Telemedicine in the Integrated Multispecialty Practice at Mayo Clinic During the Beginning of COVID-19 Pandemic From March to June 2020. JAMA Network Open. 2022;5(9):e2229958. doi:10.1001/jamanetworkopen.2022.29958

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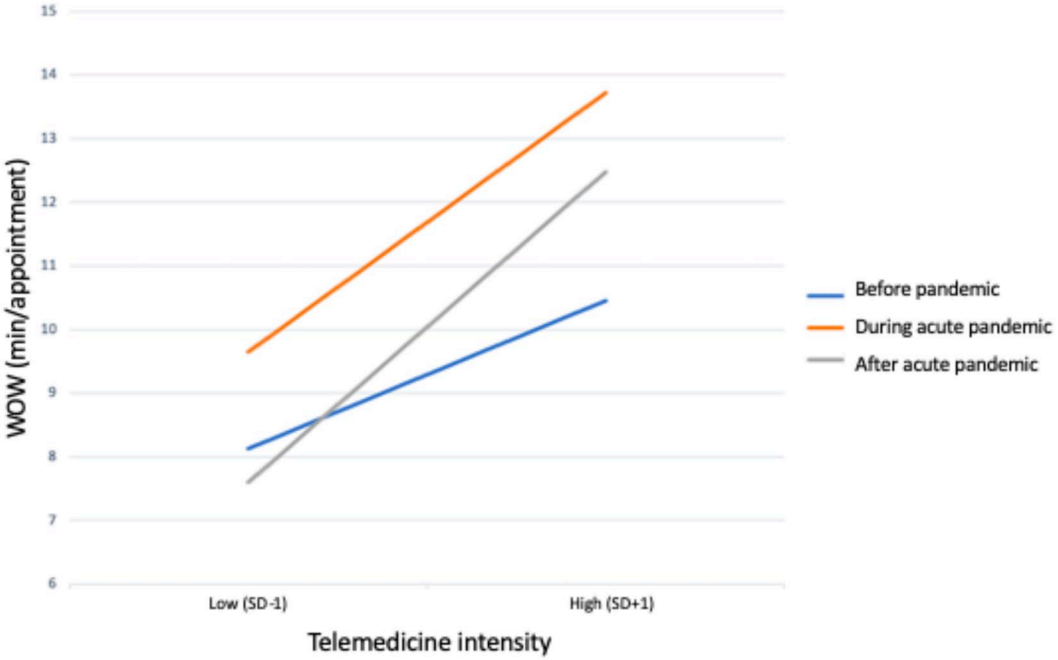
Work Outside Work per Appointment by Telemedicine



Lawrence K, et al. The Impact of Telemedicine on Physicians' After-hours Electronic Health Record "Work Outside Work" During the COVID-19 Pandemic: Retrospective Cohort Study. JMIR Med Inform. 2022 Jul 28;10(7):e34826. doi: 10.2196/34826.

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Medicare Beneficiaries' Use of Telehealth in 2020: Trends by Beneficiary Characteristics and Location

- Medicare telehealth visits increased 63-fold in 2020
- Most beneficiaries (92%) received telehealth visits from their homes
- Telehealth increased to 8% of primary care visits, while 3% of specialist visits were telehealth
- Black and rural beneficiaries had lower use of telehealth compared with White and urban beneficiaries
- Future telehealth policies should support home visits
- The smaller % of specialist telehealth visits suggests the need for more evidence to support the effectiveness of telehealth in medical specialties
- Current models of telehealth may decrease access to care for certain populations
- Future policies need to address this disparity

Samson LW, et al. https://aspe.hhs.gov/reports/medicare-beneficiaries-use-telehealth-2020.

Original Investigation | Health Policy

Assessment of Patient Preferences for Telehealth in Post-COVID-19 Pandemic Health Care

- Surveyed a nationally representative sample of adult members of the RAND American Life Panel
- Respondents were generally willing to use video visits but preferred in-person care
- Those who preferred video visits were more sensitive to paying out-of-pocket cost
- Age, race/ethnicity, educational level, and income were correlated with preference for video visits versus in-person visits

- Patient preferences are an important determinant of telehealth usage when patients have a choice
- In-person care is still more popular than telehealth care in many circumstances
- Several low-usage groups identified in the HHS study may have had lower telehealth use because they preferred in-person visits, not due to the digital divide
- Would their preferences shift if they had equal access to telehealth technologies or further education about telehealth?

Predmore ZS, et al. JAMA Netw Open. 2021 Dec 1;4(12):e2136405.

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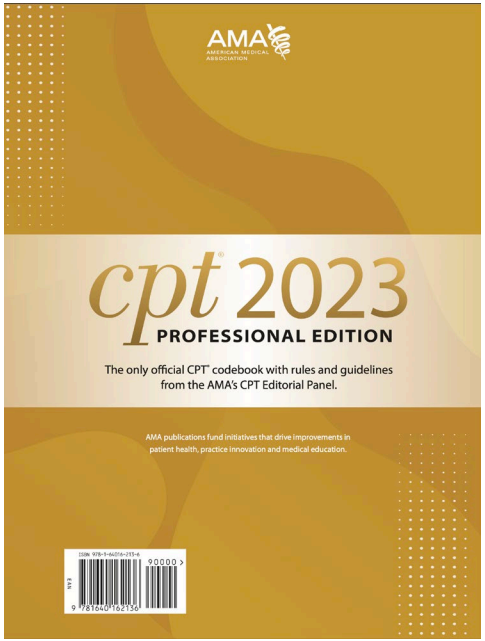
Non-In-Person Services are Supported by CPT



Care Management Services

- Principal care management codes
- Chronic care management codes

Telemedicine Services

- Appendix P: Synchronous Real-Time Interactive Audio-Video Telemedicine Services
- Appendix T: Synchronous Real-Time Interactive Audio-Only Telemedicine Services

Digital Medicine Services

- Appendix R: Digital Medicine Services Taxonomy

Artificial Intelligence Services

- Appendix S: Artificial Intelligence Taxonomy for Medical Services and Procedures

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Non-In-Person Services						
	Clinician-to-Patient Services (Visit)		Clinician-to-Clinician Services (Consultation)		Clinician/Clinical Staff-to-Patient Services (Care Management and Monitoring)	
	Synchronous	Asynchronous	Synchronous	Asynchronous	Chronic Care	Principal Care
Encounter Activity	Real-time audio or audiovisual interaction	Store-and-forward digital communication	Real-time consultative communication between requesting and consulting clinicians	Store-and-forward consultative digital exchange of clinical information between requesting and consulting clinicians	Chronic care management services are provided when medical and/or psychosocial needs of the patient require establishing, implementing, revising, or monitoring the care plan; remote physiological and therapeutic monitoring	Principal care management services focus on the medical and/or psychological needs manifested by a single, complex chronic condition expected to last at least 3 months
CPT Codes	Telephone (99441-99443) and E/M codes	Digital E/M codes (99421-99423) (98970-98972)	Inter-professional consult codes (99446-99449, 99451) >>> transition to virtual face-to-face E/M consultation	Inter-professional consult codes (99446-99449, 99451, 99452)	Chronic management codes, complex chronic care management codes, remote monitoring codes	PCM codes (99424-99427)
Common Terminology for Telehealth options	**Telephone Visit** **Video Visit (Audio-Visual)** **Virtual Check-In**	**E-Visits** **Virtual Check-In**	**Tele-Consults** **Interactive A-V Conferencing**	**E-Consults**	**Telehealth Visit and Tele/E-Consult** options available **Remote Monitoring**	

Three Categories of AI Medical Applications			
Service Components	AI Category: Assistive	AI Category: Augmentative	AI Category: Autonomous
Primary objective	Detects clinically relevant data	Analyzes and/or quantifies data in a clinically meaningful way	Interprets data and independently generates clinically relevant conclusions
Provides independent diagnosis and/or management decision	No	No	Yes
Analyzes data	No	Yes	Yes
Requires physician or other QHP interpretation and report	Yes	Yes	No

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AMA: Closing the Digital Health Disconnect (Draft)

Blueprint for Optimizing Digitally Enabled Care

Foundational Pillars

- Build for **Patients** and **Clinicians**
- Design with an **Equity Lens**
- Recenter Care Around the Patient-Physician **Relationship**
- Improve and Adopt Payment Models that Incentivize **High-Value Care**
- Create Technologies and Policies that **Reduce Fragmentation**
- Scale **Evidence-Based** Models Quickly

Stakeholder Opportunities

Physicians
Use human-centered digital tools that optimize in-person care; Optimize EHRs; Partner to extend capabilities

Health Plans
Evaluate effectiveness of new models; Support providers through equitable payment; Better-design VBP; Eliminate virtual care cost-sharing; Require info sharing with members' PCPs

Employers
Incentivize employee relationships with PCPs; Require info sharing with employees' PCPs and adherence to quality metrics; Develop multi-condition platforms; Create on-site virtual care environments

Health Tech Companies
Seek patient and provider input; Center designs in health equity; Simplify provider workflows; Improve coordination

Venture Capital and Private Equity Funds
Direct investments to companies that: work with incumbents, address needs of vulnerable populations, and perform efficacy research of their products; Reduce fragmentation

Policy Makers
Increase broadband and effectiveness research funding; Strengthen interoperability; Align virtual care rules across states and payors

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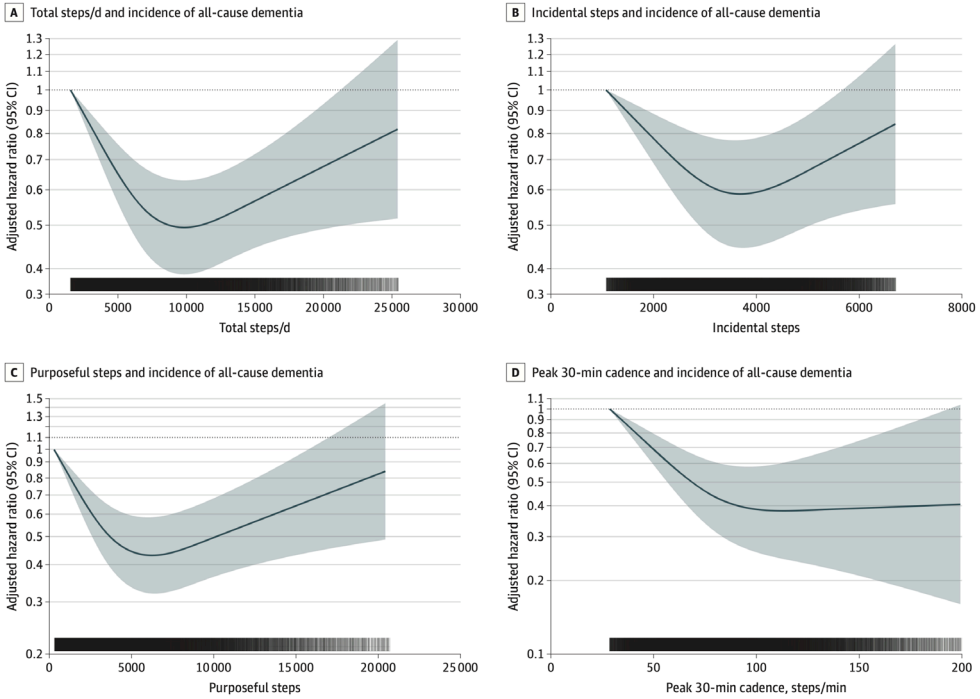
Association of Daily Step Count With Dementia



del Pozo Cruz B, et al. Association of Daily Step Count and Intensity With Incident Dementia in 78 430 Adults Living in the UK. JAMA Neurol. doi:10.1001/jamaneurol.2022.2672

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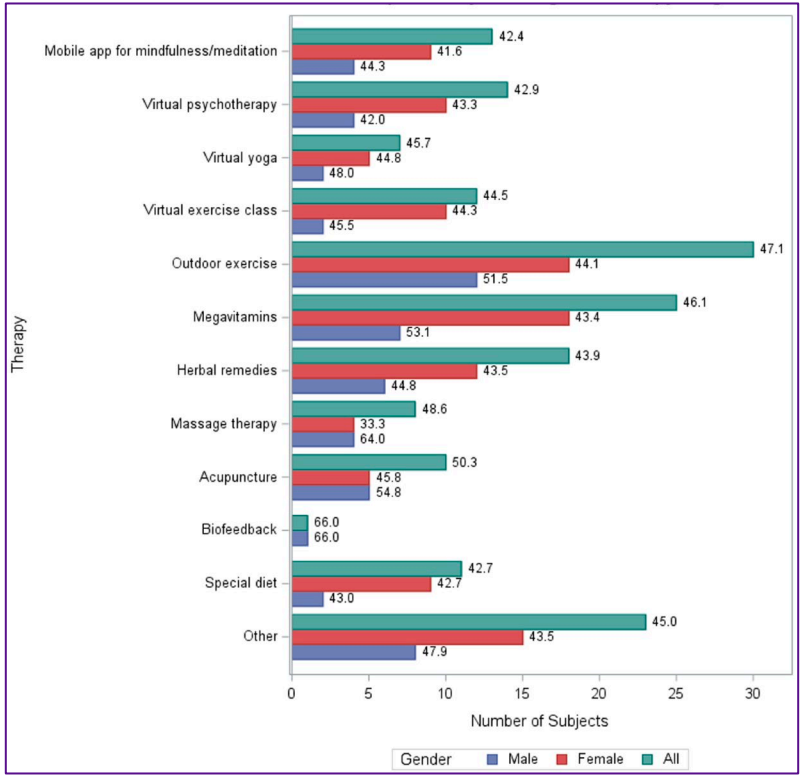
Technology as Treatment



Minen MT, et al. The use of virtual complementary and integrative therapies by neurology outpatients: An exploratory analysis of two cross-sectional studies assessing the use of technology as treatment in an academic neurology department in New York City. Digit Health. 2022 Jul 17;8:20552076221109545. doi: 10.1177/20552076221109545. eCollection 2022 Jan-Dec

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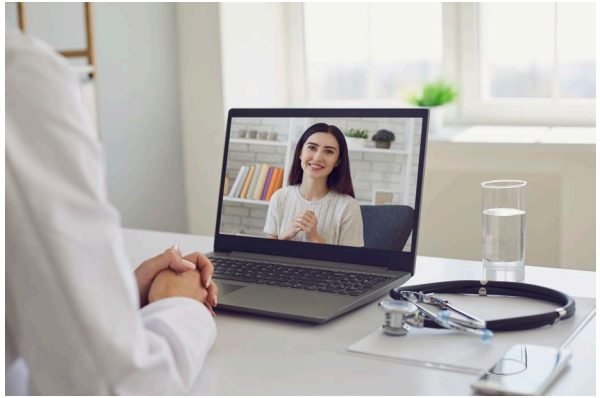
Future Care: In-Person Visits + Telehealth Services + AI



Mary Ellen Podmolik @mepodmolik · May 17

One of the best things about virtual care is caregivers, family and medical team all can be on the same screen, says @nbusis ."Medicine is a team sport." #MHTransformSummit @modrnhealthcr

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Telehealth is the Practice of Medicine

- Telemedicine is a care delivery model
- The medicine is the same as in-person care as are the challenges
- Telehealth is not about the technology, but rather about workflows, operations, expertise
- The appropriate comparator is the alternative
  - Not necessarily an in-person visit with the same provider
  - Might be no care at all
- You ***are*** doing a physical exam
- You might get more information than from an office visit
- Focus on actionable information and possible triage

Adapted from: Hollander JE, Sites FD. The Transition from Reimagining to Recreating Health Care Is Now. NEJM Catalyst. April 8, 2020. https://catalyst.nejm.org/doi/full/10.1056/CAT.20.0093.

AAN Resources at http://aan.com/telehealth

TELEHEALTH RESOURCES

- GUIDE TO PRACTICING TELENEUROLOGY
- TELEHEALTH FOR PATIENTS WITH A NEUROMUSCULAR DISORDER
- CODING & BILLING
- REGULATIONS
- ADVOCACY
- TRAINING & EDUCATIONAL MATERIALS
- RESEARCH & EVIDENCE APPRAISAL

TELEHEALTH

Telehealth uses digital information and telecommunication technologies to provide health care when participants are separated in space and/or time. Telehealth has been used in various capacities for decades across many fields of medicine.

One area of telehealth that took on a new level of importance during the COVID-19 pandemic was telemedicine, which typically refers to the use of real-time audiovisual technologies to allow neurologists to perform clinical services remotely.

The AAN believes that telehealth will continue to play an essential role in the care of patients with neurologic conditions and supports efforts to implement and improve the ability for neurologists to provide telehealth services.

Top Resources

1. **New: Telehealth for Patients with a Neuromuscular Disorder** - Tips and tricks for planning a high-quality visit.
2. **Clinical Case Study: Telehealth for Neurology** - Models of subspecialty care and the future of teleneurology.
3. **Coding in the World of COVID-19: Non-Face-to-Face Evaluation and Management Care** (*Continuum*® Practice Issue)

Coming Soon: Telehealth for Patients with a Vestibular Disorder - Tips for performing a virtual evaluation.

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Telehealth Immersion Program

part of the AMA STEPS Forward™ Innovation Academy

Clinical Case Study: Telehealth For Neurology

June 1, 2022

https://www.ama-assn.org/practice-management/digital/telehealth-immersion-program-past-events

The Use of Telehealth for Disability Evaluations in Medicine and Allied Health: A Workshop

SHARE

https://www.nationalacademies.org/event/03-09-2022/the-use-of-telehealth-for-disability-evaluations-in-medicine-and-allied-health-a-workshop

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