
بسم الله الرحمن الرحيم

Telehealth

COVID-19 pandemic

- Transformations ranging from converting hospital spaces and non-healthcare facilities into intensive care units (ICUs) to rolling out new clinical guidelines and policies.
- **Oregon Health & Science University**, the number of digital health visits ballooned from 1,100 in February to nearly 13,000 in March, and all 1,200 ambulatory faculty were able to conduct virtual visits by April 3, 2020.

Robinson E. OHSU telehealth rockets into 'new era of medicine': Global pandemic instigates exponential expansion of OHSU telemedicine program . OHSU News. April 13, 2020. Accessed April 13, 2020

Telehealth

- This response has been fueled by necessity and rapid legislative and regulatory changes to payment and privacy requirements, particularly the temporary waivers and new rules by the Centers for Medicare & Medicaid Services that have broadened access and facilitated payment for a wider range of telehealth services

Medicare Telemedicine Health Care Provider Fact Sheet: Medicare Coverage and Payment of Virtual Services. Baltimore, MD: CMS. March 17, 2020. Accessed April 20, 2020.

CMS News Alert April 13, 2020; CARES Act: AMA COVID-19 pandemic telehealth fact sheet, April 27, 2020

Telehealth

Forward triage for Covid-19

- Sorting of patients before they arrive in the emergency department (ED).

- Direct-to consumer (or on-demand) telemedicine, a 21st-century approach to forward triage that allows patients to be efficiently screened, is both patient-centered and conducive to self-quarantine, and it protects patients, clinicians, and the community from exposure.

- Virtually Perfect? Telemedicine for Covid-19, List of authors.Judd E. Hollander, M.D., and Brendan G. Carr, M.D., April 30, 2020, N Engl J Med 2020; 382:1679-1681, DOI: 10.1056/NEJMp2003539

Telehealth

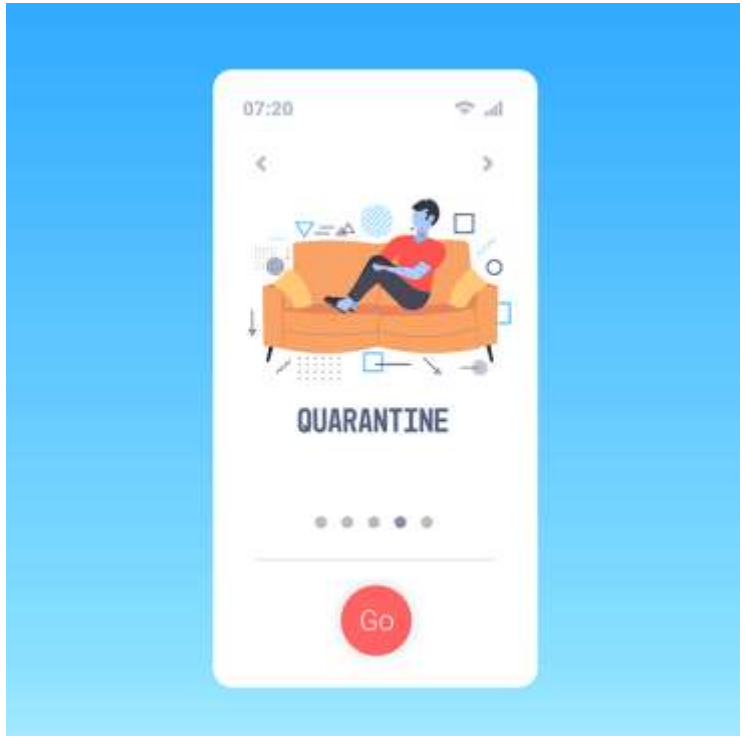
- More than 50 U.S. health systems already have such programs. Jefferson Health, Mount Sinai, Kaiser Permanente, Cleveland Clinic, and Providence, for example, all leverage telehealth technology to allow clinicians to see patients who are at home.
  - At present, the major barrier to large-scale telemedical screening for Covid-19, is coordination of testing.
- As the availability of testing sites expands, local systems that can test appropriate patients while minimizing exposure — using dedicated office space, tents, or in-car testing — will need to be developed and integrated into telemedicine workflows.

Telehealth

- Automated logic flows (bots) that refer moderate to-high-risk patients to nurse triage lines but are also

permitting patients to schedule video visits with established or on-demand providers, to avoid travel to inperson care sites.

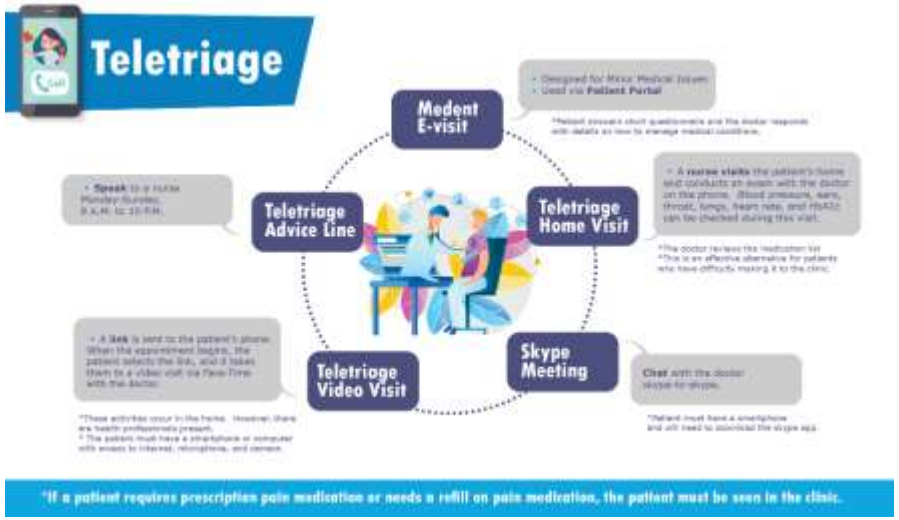
- Jefferson Health's telemedical systems have been successfully deployed to evaluate and treat patients without referring them to in-person care.
- When testing is needed, this approach requires centralized coordination with practice personnel as well as federal and local testing agencies.



Telehealth

- Before the Covid-19 outbreak, many Emergency Departments modified the "provider-in-triage model" (rapid initial evaluation and testing) by allowing a

remote provider to perform intake.



- Joshi AU, Randolph FT, Chang AM, et al. Impact of emergency department tele-intake on left without being seen and throughput metrics. Acad Emerg Med 2020;27:139-47

Teletriage

Medent E-visit

- Designed for Minor Medical Issues
- Used via **Patient Portal**

*Patient answers short questionnaire and the doctor responds with details on how to manage medical conditions.

Teletriage Advice Line

- **Speak** to a nurse Monday-Sunday, 8 A.M. to 10 P.M.

Teletriage Home Visit

- A **nurse visits** the patient's home and conducts an exam with the doctor on the phone. Blood pressure, ears, throat, lungs, heart rate, and HbA1c can be checked during this visit.

*The doctor reviews the medication list
*This is an effective alternative for patients who have difficulty making it to the clinic.

Teletriage Video Visit

- A **link** is sent to the patient's phone. When the appointment begins, the patient selects the link, and it takes them to a video visit via Face-Time with the doctor.

*These activities occur in the home. However, there are health professionals present.
* The patient must have a smartphone or computer with access to internet, microphone, and camera.

Skype Meeting

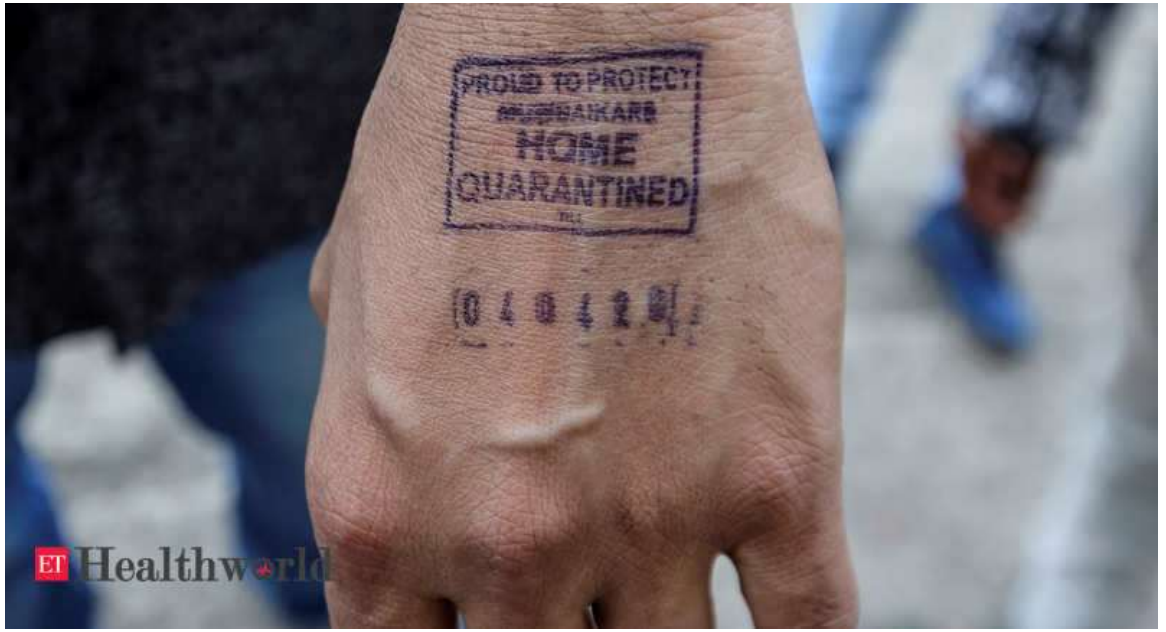
Chat with the doctor skype-to-skype.

*Patient must have a smartphone and will need to download the skype app.

***If a patient requires prescription pain medication or needs a refill on pain medication, the patient must be seen in the clinic.**

Telehealth

- Reports that as many as **100 health care workers at a single institution** have to be quarantined at home because of exposure to Covid-19 have raised concern about workforce capacity.
  - At institutions with ED tele-intake or direct-to-consumer care, quarantined physicians can cover those services, freeing up other physicians to perform in-person care.



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Telehealth

- Office-based practices can also employ quarantined physicians to care for patients remotely.

- The challenge is that other health professionals (nurses, medical assistants, physician assistants) also contribute to in-person care, and telemedicine cannot replace them all.

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Telehealth

- It can allow physicians and patients to **communicate 24/7**, using smartphones or webcam-enabled computers.
- **Respiratory symptoms** — which may be early signs of Covid-19 — are among the conditions most commonly evaluated with this approach.
- Health care providers can easily obtain detailed **travel and exposure histories**.
- **Automated screening algorithms** can be built into the intake process, and local epidemiologic information can be used to standardize screening and practice patterns across providers

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Telehealth

- Can help us avoid direct physical contact and minimize the risk of COVID transmission and finally provide continuous care to the community.

Based on the findings of this review study, clinicians and patients are **strongly recommended to apply telehealth tools** as an appropriate option to prevent and contain COVID-19 infection.

The role of telehealth during COVID-19 outbreak: a systematic review based on current evidence. Elham Monaghesh and Alireza Hajizadeh, BMC Public Health (2020) 20:1193

Telehealth

- **The Pacific Northwest Evidence-based Practice Center** produced two reports on telehealth:

  (1) in 2016 an evidence map on the impact of telehealth on patient outcomes

  (2) in 2019 a systematic review of the evidence about telehealth for acute- and chronic-care consultations.

- A summary of evidence on selected topics from these reports that may be relevant in the context of the response to the **COVID-19 pandemic.**

- Totten AM, Womack DM, Eden KB, et al. Telehealth: Mapping the Evidence for Patient Outcomes From Systematic Reviews. Technical Brief No. 26. (Prepared by the Pacific Northwest Evidence-based Practice Center under Contract No. 290-2015-00009-I.) AHRQ Publication No.16-EHC034-EF. Rockville, MD: Agency for Healthcare Research and Quality; June 2016. PMID: 27536752.
- Totten AM, Hansen RN, Wagner J, et al. Telehealth for Acute and Chronic Care Consultations. Comparative Effectiveness Review No. 216. (Prepared by Pacific Northwest Evidence-based Practice Center under Contract No. 290-2015-00009-I.) AHRQ Publication No. 19-EHC012-EF. Rockville, MD: Agency for Healthcare Research and Quality; 2019. doi: 10.23970/AHRQEPCCER216. PMID: 31577401.

Telehealth

- Telehealth for Acute and Chronic Care Consultations Report:
- built on the evidence map and synthesized evidence from research published between 1996 and May 2018 on the use of technology to facilitate collaboration among clinicians across time and/or distance.

- Based on findings in this report we are able to provide some overall conclusions relevant to telehealth expansion during the **COVID-19 crisis.**

Telehealth

- As hospitals face potential shortages of space and staff to care for a possible surge of critical patients, **remote ICUs** may help efficiently deploy specialized staff.

- **Remote ICUs** allow intensivist physicians or teams including nurses and other staff to monitor and direct care for critically ill patients in other locations.

Telehealth

- **Remote ICUs** have been used both to provide specialized critical care coverage for nights and weekends, compared with weekdays only, and to provide intensivist management to locations without these specialists.

- **Twenty-one studies** evaluated remote ICUs and consistently reported **lower, statistically significant inpatient and ICU mortality rates and small, nonsignificant reductions in length of stay.**

Telehealth

- Key findings related to implementation of remote ICUs:
- **Targeting is important.** Mortality reductions were seen in sicker patients when remote ICUs were employed, while there were no differences when patients were less critically ill.
- **The effects may be from a remote team acting together.** All remote ICU studies included a physician intensivist, all but one included nursing, and half included administrative support.

Telehealth

- Assess possible models for sustaining and funding readiness for tele-critical care and use of telehealth as part of organizational responses to pandemics or other crises

  - Conduct studies of telehealth in the context of newer care delivery and reimbursement structures, such as accountable care organizations

Telehealth

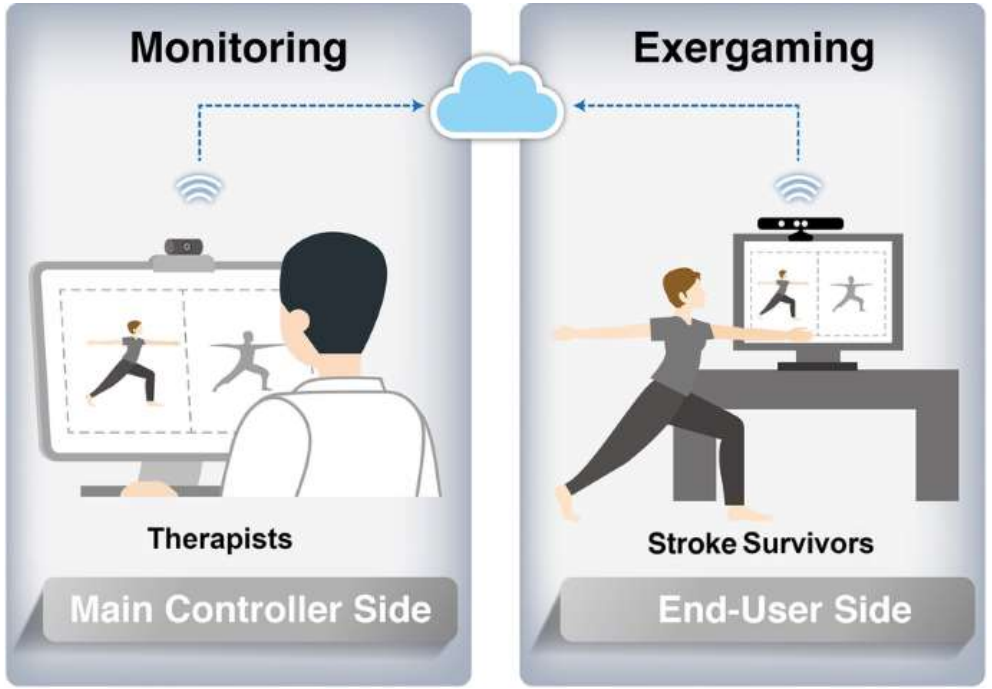
Exercise-based telemedicine interventions do not seem to have added value to usual care.

As substitution of usual care, telemedicine might be applicable but due to limited quality of the evidence, further exploration is needed for the rapidly developing field of telemedicine.

The effectiveness of exercise-based telemedicine on pain, physical activity and quality of life in the treatment of chronic pain: a systematic review, Adamse C, Dekker-van Weering MGH, van Etten-Jamaludin FS, Stuiver MM, Journal of Telemedicine and Telecare **2018** Sep;24(8):511-526, systematic review

Telehealth

Real-time telerehabilitation appears to be **effective and comparable to conventional** methods of healthcare delivery for the improvement of physical function and pain in a variety of musculoskeletal conditions.



- **Real-time telerehabilitation for the treatment of musculoskeletal conditions is effective and comparable to standard practice: a systematic review and meta-analysis [with consumer summary]**, Cottrell MA, Galea OA, O'Leary SP, Hill AJ, Russell TG, Clinical Rehabilitation **2017** May;31(5):625-638

Telehealth

- Implementing telehealth visits with palliative care patients with advanced cancer at the UCSD Moores Cancer Center Outpatient Palliative Care Team
  - Has the potential to improve or maintain patient satisfaction with symptom management and the overall visit, adequately address palliative needs, and improve quality of life.

- Fitzgerald, Kori BSN, RN, PHN, FNP/DNP Student, "Utilization of Evidence-Based Telehealth for Routine Follow-Up Visits in Outpatient Palliative Care" **(2019).** *Doctor of Nursing Practice Final Manuscripts*. 96. https://digital.sandiego.edu/dnp/96

Telehealth

- Telehealth consultations have been used to support
  - Emergency medical services (EMS),
  - Urgent care,
  - Emergency departments.

    - Across 22 EMS studies and 19 emergency department studies, emergency telehealth consultations **improved triage by decreasing the time to decisions about transport and treatment and ultimately to patient receipt of care.**

  - In the current situation, reducing the time patients spend in the emergency department may help to reduce risk of exposure.

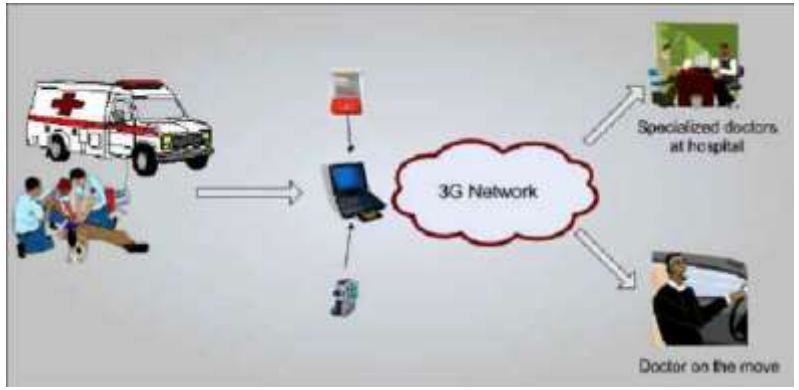
Telehealth

- **Impact occurs when speed matters.**
- Systems that allowed images or data (e.g., electrocardiogram [EKG], electroencephalogram [EEG]) to be quickly shared and interpreted produced positive results.

- Totten AM, Cheney TP, O'Neil ME, et al. Physiologic Predictors of Severe Injury: Systematic Review. Comparative Effectiveness Review No. 205. (Prepared by the Pacific Northwest Evidence-based Practice Center under Contract No. 290-2015-00009-I.) AHRQ Publication No. 18-EHC008-EF. Rockville, MD: Agency for Healthcare Research and Quality; **April 2018**. doi: 10.23970/AHRQEPCCER205. PMID: 30748156.
- Sasser SM, Hunt RC, Faul M, et al. Guidelines for field triage of injured patients: recommendations of the National Expert Panel on Field Triage, 2011. MMWR Recomm Rep. 2012 Jan 13;61(RR-1):1-20. PMID: 22237112

Telehealth

- Fewer heart attack patients died when consultations based on transmitted data were provided to EMS personnel in the field or during transport, and it is plausible this could be generalizable to emergency care of patients in respiratory distress, given that measures of respiration and oxygenation are the first step in current trauma triage,although this has not been studied.



- Totten AM, Cheney TP, O'Neil ME, et al. Physiologic Predictors of Severe Injury: Systematic Review. Comparative Effectiveness Review No. 205. (Prepared by the Pacific Northwest Evidence-based Practice Center under Contract No. 290-2015-00009-I.) AHRQ Publication No. 18-EHC008-EF. Rockville, MD: Agency for Healthcare Research and Quality; April 2018. doi: 10.23970/AHRQEPCCER205. PMID: 30748156.
- Sasser SM, Hunt RC, Faul M, et al. Guidelines for field triage of injured patients: recommendations of the National Expert Panel on Field Triage, 2011. MMWR Recomm Rep. 2012 Jan 13;61(RR-1):1-20. PMID: 22237112

Telehealth

Video-consulted rounds with caregivers: The experience of patients with cancer

- Patients experienced video-consulted rounds as a satisfactory way of involving their families in rounds while also creating a sense of presence and comfort.

- Petersson NB, Jørgensen AL, Danbjørg DB, Dieperink KB. Video-consulted rounds with caregivers: The experience of patients with cancer. European Journal of Oncology Nursing : the Official Journal of European Oncology Nursing Society. 2020 Apr;46:101763. DOI: 10.1016/j.ejon.2020.101763.

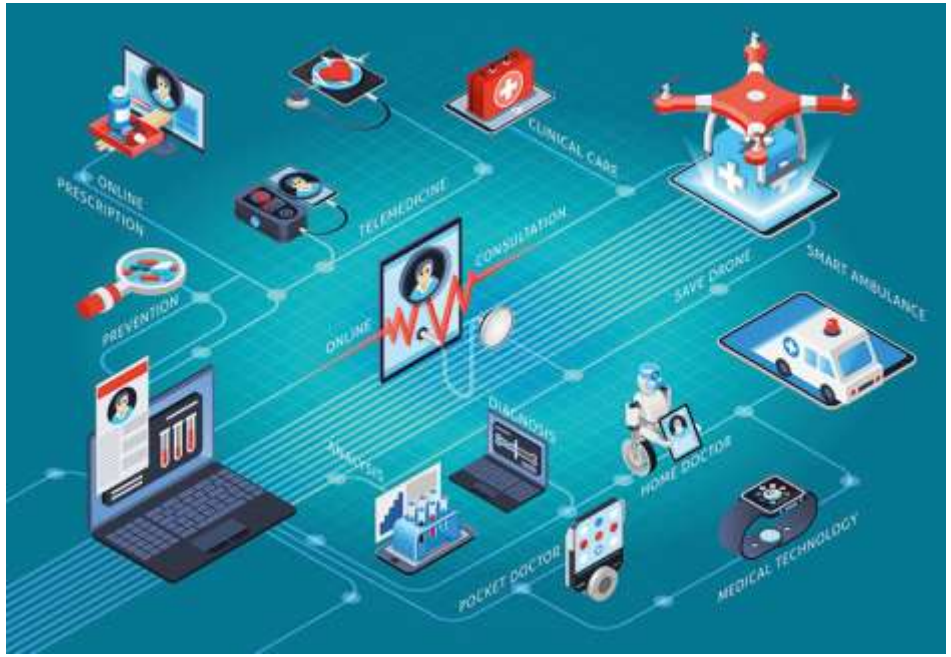
Telehealth

- Cardiac patients and their partners found telerehabilitation technologies a useful digital toolbox in the rehabilitation process.
- **Telerehabilitation** motivated the patients to integrate rehabilitation activities into their work schedule and everyday life and made them feel like unique individuals.

- Dinesen B, Nielsen G, Andreasen JJ, Spindler H, **Integration of Rehabilitation Activities Into Everyday Life Through Telerehabilitation: Qualitative Study of Cardiac Patients and Their Partners**, J Med Internet Res 2019;21(4):e13281, URL: https://www.jmir.org/2019/4/e13281, DOI: 10.2196/13281

Telehealth

- Community paramedicine or mobile integrated health care programs allow patients to be treated in their homes, with higherlevel medical support provided virtually.
  - Houston's Project **ETHAN (Emergency Telehealth and Navigation)** has used telemedical oversight by physicians to augment care offered in person by 911 responders, reducing the need for transportation to the ED.
- In the face of **Covid-19**, Avera Health is preparing to send mobile home health care units directly to patients and is coordinating homebased testing.



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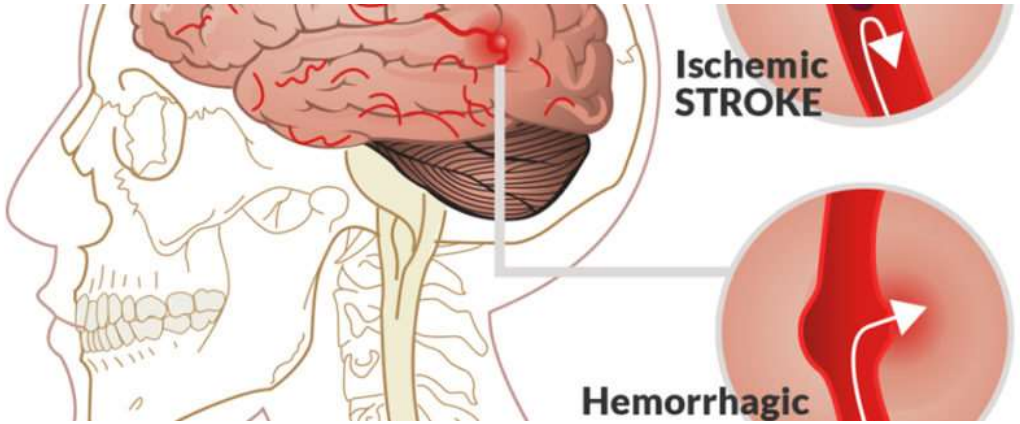
Telehealth

- Much medical decision making is cognitive, and telemedicine can provide rapid access to subspecialists who aren't immediately available in person.
- This approach has been explored most fully in the context of **stroke**, for which systems such as Jefferson Health, Cleveland Clinic, and the University of Pittsburgh provide **virtual emergency neurologic care** at large numbers of hospitals.



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Telehealth

- The Mount Sinai system leverages specialists at eight hospitals and **more than 300 sites to provide virtual emergency consultations** and distribute work among subspecialty providers.
- The barriers to implementing these programs are largely related to
  - Payment,
  - Credentialing,
  - Staffing of specialists

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Telehealth

- **Future research** should:
  - Clearly define telehealth interventions and the context in which they are implemented so they can be compared across studies and replicated by others, including details on usual or alternative models of care used for comparison.
  - Explore in more detail what types of visits and conditions are and are not appropriate for telehealth, particularly given rapid innovations in telehealth that could expand applications.

Telehealth

Future research should:

- Select appropriate outcomes—those that are clinically important and linked to the intervention, instead of those that are most easily measured
- Focus telehealth effectiveness research on clinical applications with limited prior evidence but rapid expansion during a pandemic (e.g., primary care and pre and post surgical visits)

Telehealth

- Economic assessments that use rigorous methods to measure and analyze costs
- Multisite studies rather than relying on pre-post data from a single site and more studies in private, public and military health systems
- Implementation specifics (e.g., technical assistance needs staffing models, etc.) from organizations with varied experiences adopting or expanding telehealth for a range of uses (e.g., from primary to critical care, and postacute and long-term care) in response to COVID-19

Telemedicine in Orthopaedic Surgery

- Reported benefits and roles for **continued telehealth utilization** past the COVID-19 pandemic include
  - Improved acces
  - Improved communication with patients undergoing surgical treatment,
  - Improved reporting of functional outcomes in research settings.

Blank E, Lappan C, Belmont PJ Jr, Machen MS, Ficke J, Pope R, Owens BD. Early analysis of the United States Army's telemedicine orthopaedic consultation program. J Surg Orthop Adv. 2011 Spring;20(1):50-5.

Seto E, Smith D, Jacques M, Morita PP. Opportunities and challenges of telehealth in remote communities: case study of the Yukon Telehealth System. JMIR Med Inform. 2019 Nov 1;7(4):e11353.

De La Cruz Monroy MFI, Mosahebi A. The use of smartphone applications (apps) for enhancing communication with surgical patients: a systematic review of the literature. Surg Innov. 2019 Apr;26(2):244-59. Epub 2019 Jan 2.

Good DW, Lui DF, Leonard M, Morris S, McElwain JP. Skype: a tool for functional assessment in orthopaedic research. J Telemed Telecare. 2012 Mar;18(2):94-8. Epub 2012 Jan 13.

Telemedicine in Orthopaedic Surgery

- A randomized controlled trial based in Norway compared

  video consultations

  with standard orthopaedic visits

  and included new referrals to the outpatient clinic, postoperative patients, and patients undergoing follow-up for traumatic or chronic orthopaedic disorders.

Buvik A, Bugge E, Knutsen G, Smabrekke A, Wilsgaard T. **Quality of care for ˚ remote orthopaedic consultations using telemedicine: a randomised controlled trial. BMC Health** Serv Res. **2016** Sep 8;16(1):483

Telemedicine in Orthopaedic Surgery

- A trained nurse was present with the patient, and the physician had remote control of the camera.
- Patients who were likely to need advanced physical examinations, such as those with athletic knee and shoulder injuries, were excluded from the study.

- Buvik A, Bugge E, Knutsen G, Smabrekke A, Wilsgaard T. Quality of care for ˚ remote orthopaedic consultations using telemedicine: a randomised controlled trial. BMC Health Serv Res. 2016 Sep 8;16(1):483

Telemedicine in Orthopaedic Surgery

- It was **safe** to offer video-assisted consultations for selected orthopaedic patients, with no adverse events reported as a result of this and no difference in patient-reported satisfaction and health.

- Buvik A, Bugge E, Knutsen G, Smabrekke A, Wilsgaard T. Patient reported out- ˚ comes with remote orthopaedic consultations by telemedicine: a randomised controlled trial. J Telemed Telecare. 2019 Sep;25(8):451-9. Epub 2018 Ju

Telemedicine in Orthopaedic Surgery

- A systematic review of telemedicine-based rehabilitation has shown strong evidence in favor of this method for postoperative hip and knee arthroplasty visits.
- The use of telemedicine in the care of patients with sports medicine diagnoses has not previously been addressed.

Pastora-Bernal JM, Mart´ın-Valero R, Bar´on-L´opez FJ, Estebanez-P´erez MJ. **Evidence of benefit of telerehabitation after orthopedic surgery: a systematic review**. J Med Internet Res. 2017 Apr 28;19(4):e142.

Telemedicine in Orthopaedic Surgery

- Some authors reported success in treating patients with orthopaedic trauma, particularly that related to fracture management.

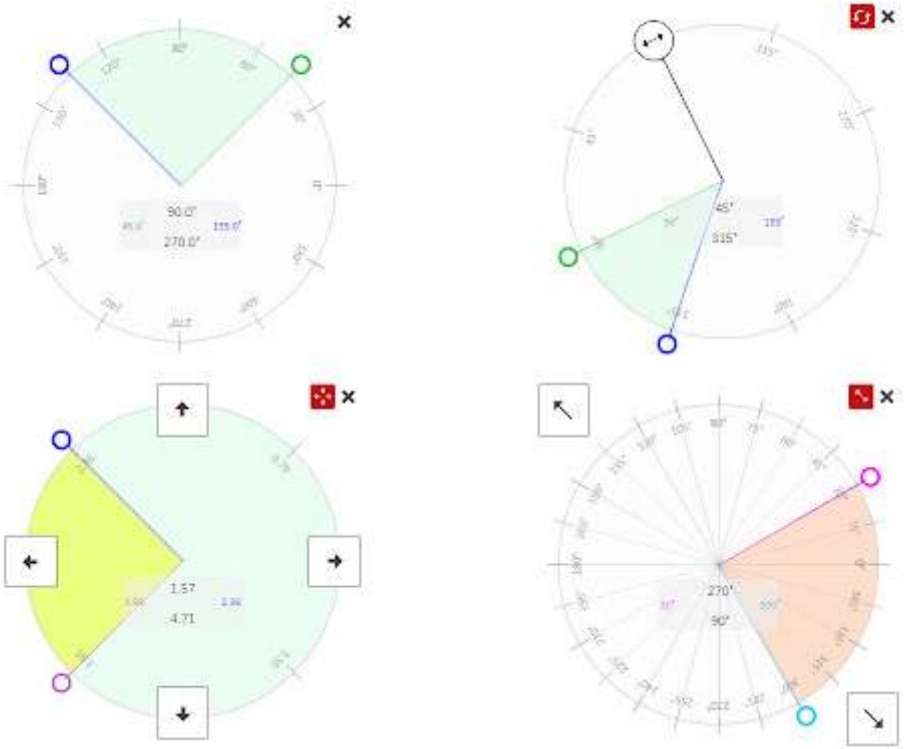
Prada C, Izquierdo N, Traipe R, Figueroa C. Results of a new telemedicine strategy in traumatology and orthopedics. Telemed J E Health. 2019 Jul 9. [Epub ahead of print].

Blank E, Lappan C, Belmont PJ Jr, Machen MS, Ficke J, Pope R, Owens BD. Early analysis of the United States Army's telemedicine orthopaedic consultation program. J Surg Orthop Adv. 2011 Spring;20(1):50-5.

Telemedicine in Orthopaedic Surgery

- **Range of Motion measurements** can be obtained using a **web-based goniometer**, which, in our case was used

  as a browser extension (Protractor; Ben Burlingham) that is compatible with most applications (including Zoom, InTouch Health, and Doxy.me) when launched through the Chrome browser (Google).



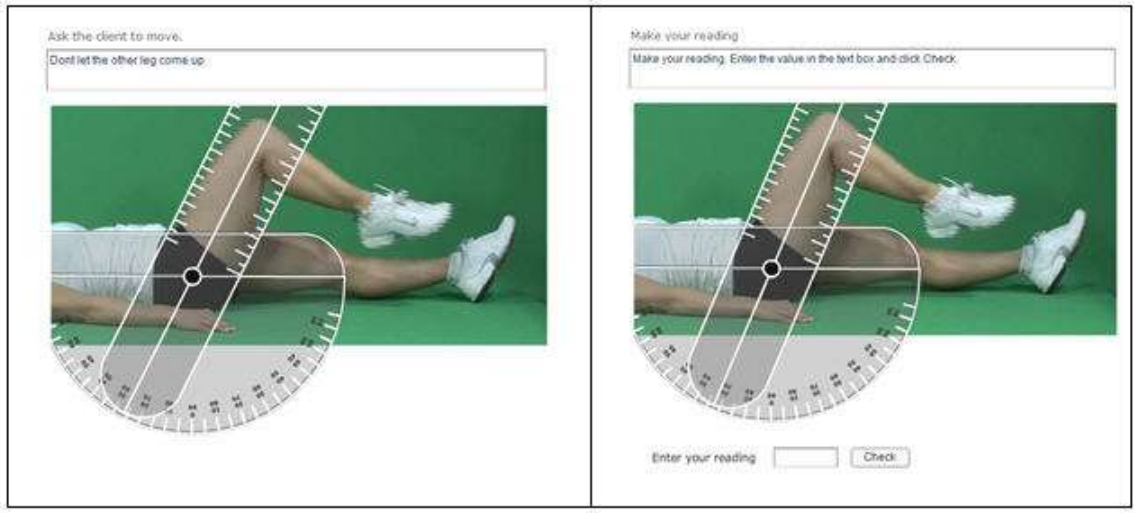
- Burlingham B. Protractor. **2020** Jan 23. Accessed 2020 Apr 14. https://chrome google.com/webstore/detail/protractor/kpjldaeddnfokhmgdlmpdlecmobaonnj

Telemedicine in Orthopaedic Surgery

Virtual goniometers

- Russell et al. reported on the use of an **internet-based goniometer** to assess knee range of motion and found, in a comparison of 540 knee positions, that face-to-face measurements and internet measurements showed

high intrarater and interrater reliability.

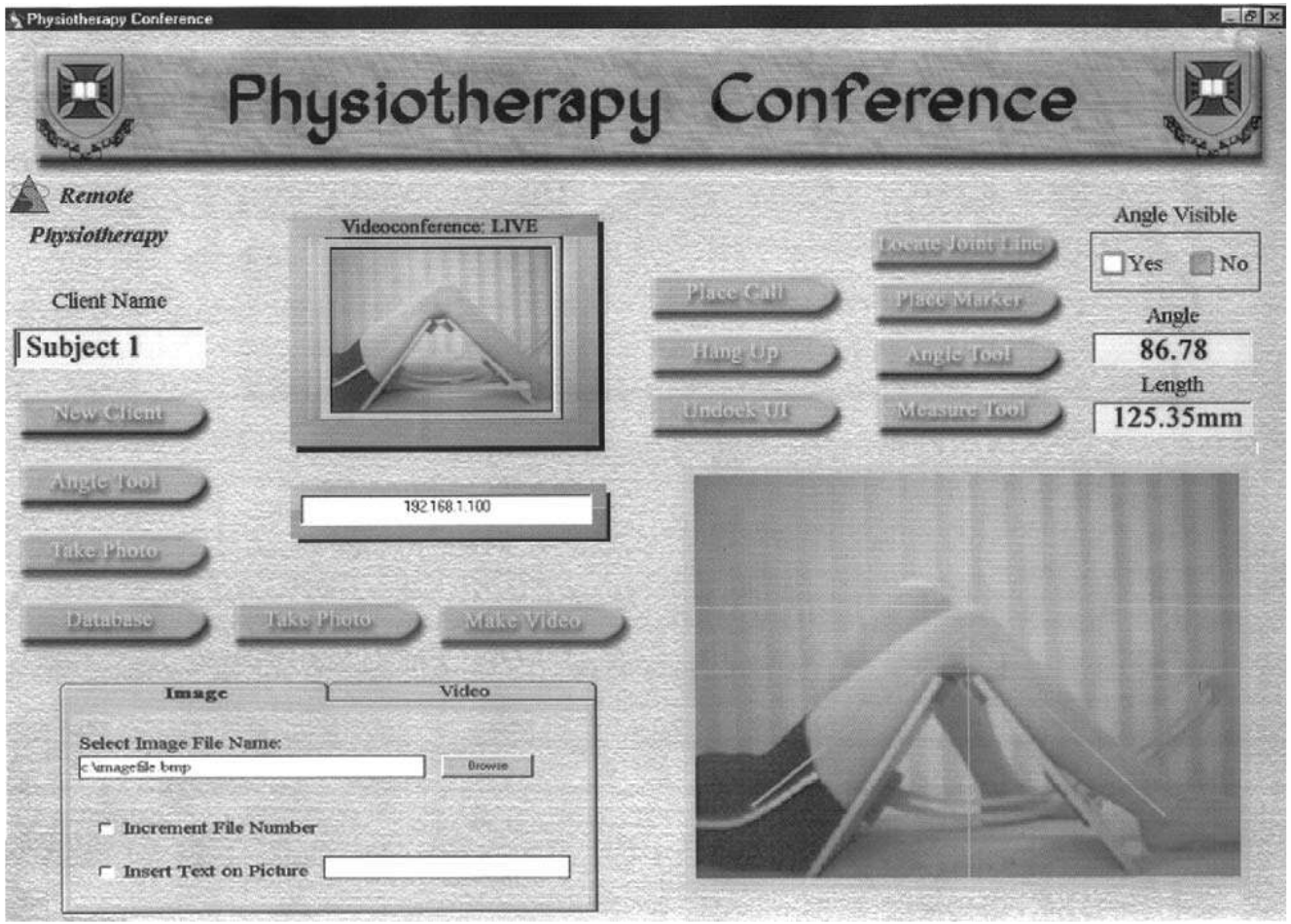


https://jolt.merlot.org/vol7no2/massy-westropp_0611.htm

Russell TG, Jull GA, Wootton R. Can the internet be used as a medium to evaluate knee angle? Man Ther. 2003 Nov;8(4):242-6.

Telemedicine in Orthopaedic Surgery

- The authors measured the angle from a laterally based view, using a line along the axis of the femur and a line drawn from the fibular head to the lateral malleolus.
- **The internet-based goniometer was a valid tool for measuring knee extension and flexion angles.**



Telemedicine in Orthopaedic Surgery

- Dent et al. reported on 52 elbows that underwent range-of motion of motion measurements in person, through teleconference, and with still photography.
    - The authors reported

high agreement between teleconference-based goniometry and in-person measurements,

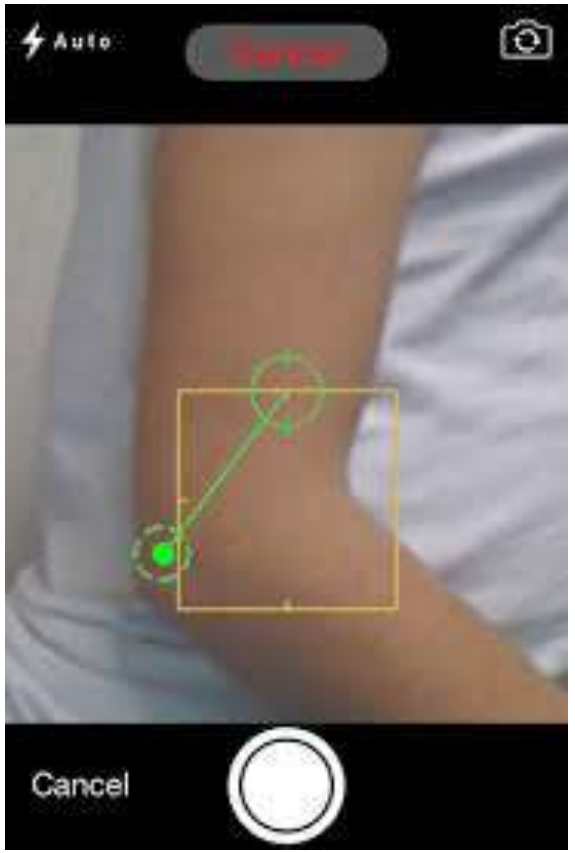
based on the evaluation of healthy control patients

Dent PA Jr, Wilke B, Terkonda S, Luther I, Shi GG. Validation of telec onferencebased goniometry for measuring elbow joint range of motion. Cureus. **2020** Feb 9; 12(2):e6925.

Telemedicine in Orthopaedic Surgery

- Some Authors found **equivalent accuracy and greater precision in joint measurements with digital goniometry** when compared with visual estimation in

shoulder abduction, shoulder internal rotation, elbow flexion, hip abduction, and knee extension.



Russo RR, Burn MB, Ismaily SK, Gerrie BJ, Han S, Alexander J, Lenherr C, Noble PC, Harris JD, McCulloch PC. Is digital photography an accurate and precise method for measuring range of motion of the hip and knee? J Exp Orthop. 2017 Sep 7;4(1):29.

Russo RR, Burn MB, Ismaily SK, Gerrie BJ, Han S, Alexander J, Lenherr C, Noble PC, Harris JD, McCulloch PC. Is digital photography an accurate and precise method for measuring range of motion of the shoulder and elbow? J Orthop Sci. 2018 Mar; 23(2):310-5. Epub 2017 Dec 20.

http://www.drgoniometer.com/

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- Johansen M, Haslund-Thomsen H, Kristensen J, Thorgaard Skou S. . Photo-Based Range-of-Motion Measurement: Reliability and Concurrent Validity in Children With Cerebral Palsy. *Pediatr Phys Ther. 2020;32(2):151-60*
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- Ardiansyah Prima OD, Ono Y, Murata Y, Ito H, Imabuchi T, Nishimura Y.. Evaluation of joint range of motion measured by vision cameras. *Int J Advances Life Sci 2019;11(3-4):128-37*
- García-Rubio J, Pino J, Olivares PR, Ibáñez SJ.. Validity and Reliability of the WIMU TM Inertial Device for the Assessment of Joint Angulations. *Int J Environ Res Public Health. 2019;17(1):193*
- Choi W, Zheng H, Franklin P, Tulu B.. mHealth technologies for osteoarthritis self-management and treatment: A systematic review. *Health Informatics J. 2019;25(3):984-1003*
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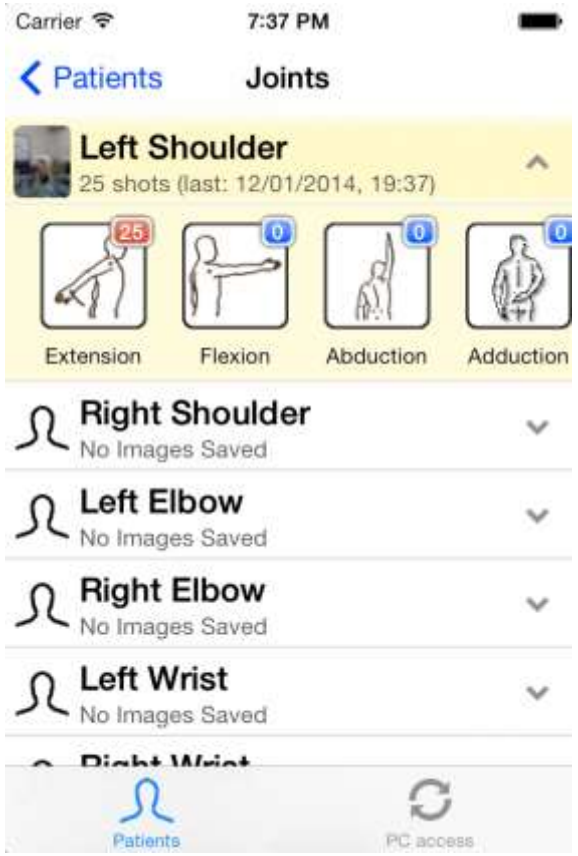
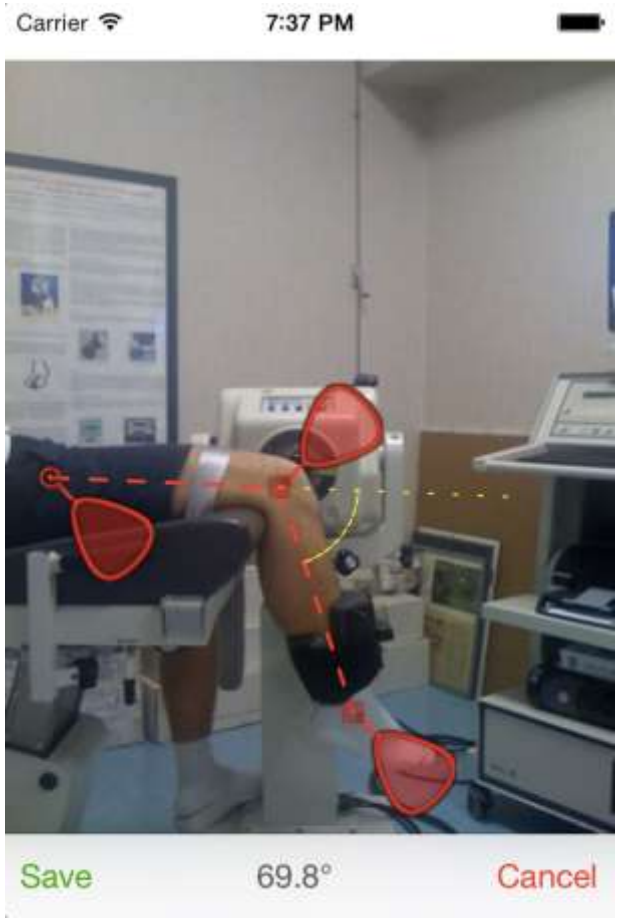




Telemedicine in Orthopaedic Surgery

- **Assessments of function** have been found to be adequately performed during virtual evaluations of the **shoulder**.
    - With regard to the assessment of shoulder function, Goldstein et al. compared Constant scores between conventional face-to-face examinations and video examinations (on smartphones).

Goldstein Y, SchermannH, Dolkart O, Kazum E, Rabin A,Maman E, Chechik O. Video examination via the smartphone: a reliable tool for shoulder function assessment using the Constant score. J Orthop Sci. 2019 Sep;24(5):812-6. Epub **2019** Jan 25.

Telemedicine in Orthopaedic Surgery

- The **mean Constant score** for the video assessment was 0.53 point lower than that for the in-person assessment and concluded that

video evaluations resulted in a reliable estimate of shoulder function.

Constant Score

Subjective Shoulder Assessment (35 total points)

Criteria	Points	Patient Score
Pain (15 points)		
None	15	= 15
Mild	10	
Moderate	5	
Severe	0	
Activities of daily living (10 points)		
Ability to work	0-4	= 4
Ability to engage in recreational activities	0-4	= 4
Ability to sleep	0-2	= 2
Ability to work at a specific level (10 points)		
Waist	2	
Chest	4	
Neck	6	
Head	8	
Above head	10	= 10

Objective Shoulder Assessment (65 points)

Criteria	Points	
Flexion and abduction (scored separately)		
>150	10	Flexion= 10
121°-150°	8	Adbuction= 10
91°-120°	6	
61°-90°	4	
31°-60°	2	
0°-30°	0	
Combined active external rotation (10 points)		
Hand behind head, elbow forward	2	= 2
Hand behind head, elbow back	2	= 2
Hand on top of head, elbow forward	2	= 2
Hand on top of head, elbow back	2	= 2
Full elevation from top of head	2	2
Combined active internal rotation (10 points)		
Interscapular region	10	= 10
Inferior tip of scapula	8	
Twelfth rib	6	
Lumbosacral junction	4	
Buttock	2	
Lateral thigh	0	
Strength (25 points)	1/lb	= 25

Score
100

FROM: Constant CR, CORR 1987;214:160
*example is a patient with normal shoulder function. Change values as indicated under "Patient Score" to determine patients Constant Score.

Telemedicine in Orthopaedic Surgery

- **Challenges** have been reported with telemedicine visits, particularly with implementation within the elderly population.
  - These patients may also benefit the most from televisit capabilities because of their limited mobility and higher risk of morbidity during the current pandemic.

McLiesh P. Telehealth in contemporary orthopaedic nursing. Int J Orthop Trauma Nurs. 2019 May;33:1-3. Epub 2019 Mar 13.

Telemedicine in Orthopaedic Surgery

- The use of mobile radiology services in Norway has been shown to increase access to imaging.

Kjelle E, Lysdahl KB, Olerud HM. Impact of mobile radiography services in nursing homes on the utilisation of diagnostic imaging procedures. BMC Health Serv Res. 2019 Jun 26;19(1):428.

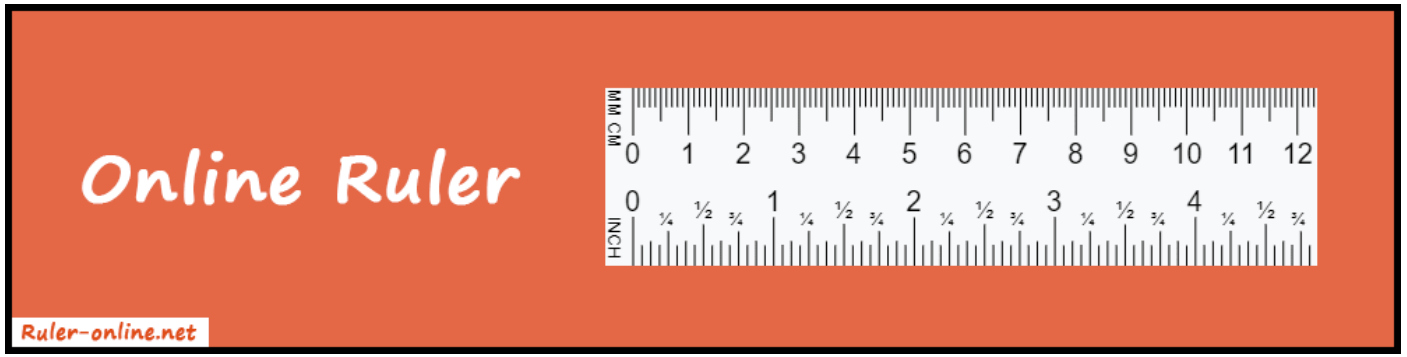
Telemedicine in Orthopaedic Surgery

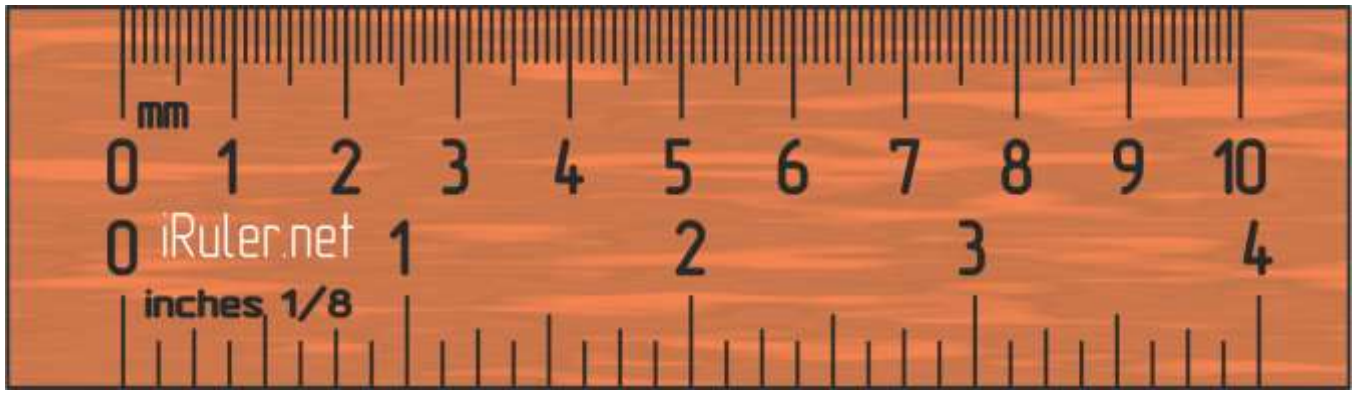
- The use of telemedicine for orthopaedic visits in Norway has been shown to be **cost-effective**, particularly when considering travel time for patients.
- The authors reported that this conclusion held as long as >151 visits were performed per year.

Buvik A, Bergmo TS, Bugge E, Smaabrekke A, Wilsgaard T, Olsen JA. Costeffectiveness of telemedicine in remote orthopedic consultations: randomized controlled trial. J Med Internet Res. 2019 Feb 19;21(2):e11330.

Telemedicine in Orthopaedic Surgery

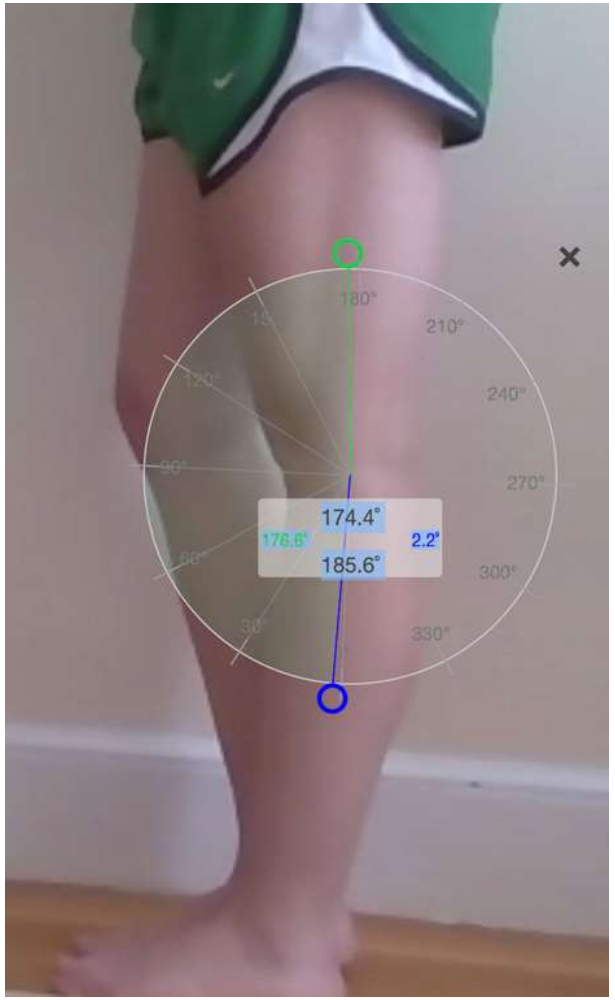
- For **leg length**, a virtual ruler can be used to make side-to-side comparisons of the measurements of the distance from the anterior superior iliac spine (ASIS) to the floor.
- Patients can be asked to place a *finger on the ASIS* to assist with finding this landmark for measurement.





Telemedicine in Orthopaedic Surgery

- Alignment
- Range of Motion

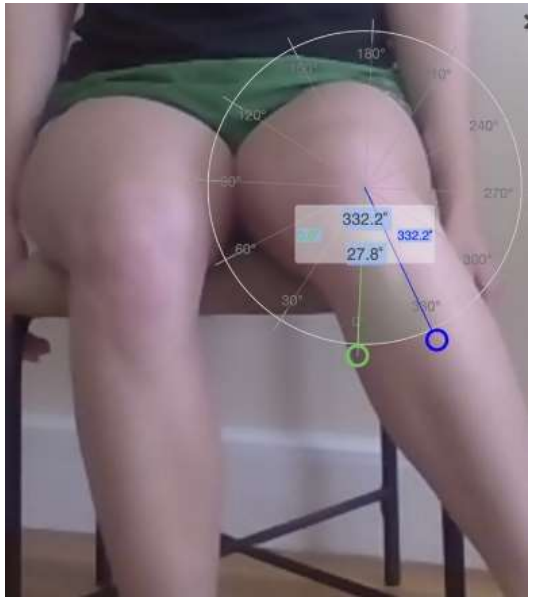


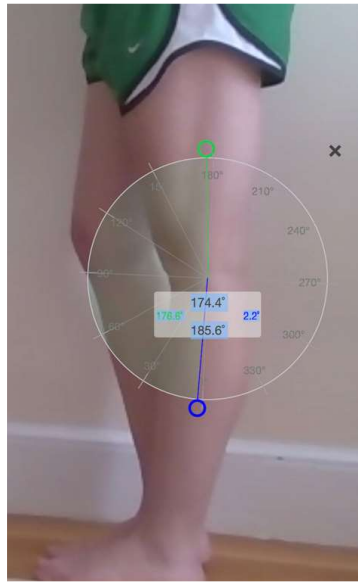
Telemedicine in the Era of COVID-19 The Virtual Orthopaedic Examination. Miho J. Tanaka, MD, Luke S. Oh, MD, Scott D. Martin, MD Eric M. Berkson, MD
The Journal of Bone and Joint Surgery, Section COVID-19
June 17, 2020; 102 (12): e57, DOI: 10.2106/JBJS.20.00609

Telemedicine in Orthopaedic Surgery

- Digital lines can be added to evaluate for pelvic obliquity, and side-to-side comparisons of pixel measurements can serve as a substitute for leg-length or circumference measurements.

- Observation of the J sign in a sitting position facing the camera can be helpful in the evaluation of patellar instability.





Telemedicine in Orthopaedic Surgery

- The **Thessaly test**, in which the patient stands on the affected leg bent at 20 while rotating the body internally and externally, can be performed to screen for meniscal pathology.
  - A positive finding occurs with pain and mechanical sensations over the side of the affected meniscus.

Telemedicine in Orthopaedic Surgery

- To measure hip flexion, the patient is asked to lie back with one side to the camera and to pull the knee to the chest.

- The measurements of internal and external rotation are obtained by having the patient sit in a chair facing the camera and rotating the hip with the knee bent at 90.

Telemedicine in the Era of COVID-19 The Virtual Orthopaedic Examination. Miho J. Tanaka, MD, Luke S. Oh, MD, Scott D. Martin, MD, Eric M. Berkson, MD; The Journal of Bone and Joint Surgery, Section COVID-19, **June 17, 2020**; 102 (12): e57, DOI: 10.2106/JBJS.20.00609

Telemedicine in Orthopaedic Surgery

- External rotation can be assessed by asking the patient to initiate crossing the legs or placing them in a figure-of-4 position.

- Localization of pain and tenderness is assessed by asking the patient to point to this area.

Telemedicine in Orthopaedic Surgery

- In atraumatic cases, flexion, adduction, and internal rotation (FADIR) and

flexion, abduction, and external

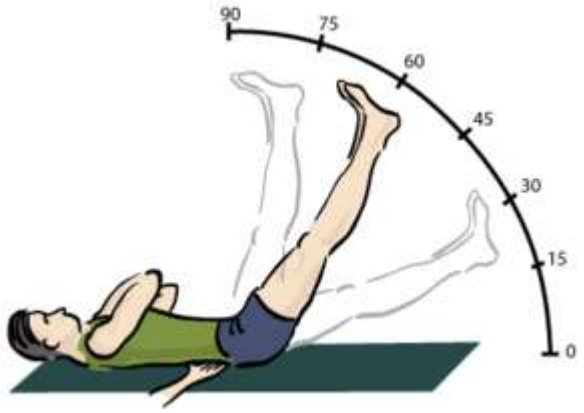
rotation (FABER)

tests may be performed by demonstrating (or providing a visual example of) the test and having the patient mimic this motion, to help

differentiate between hip and spine-related pain.

Telemedicine in Orthopaedic Surgery

- A straight-leg raise to test for hip strength and pain is performed.



- The evaluation of abduction strength in the side-lying position (gluteus medius, L5) can be assessed.
- Having the patient perform **toe-walking** can demonstrate strength in L5/S1 and having the patient perform **heel-walking** can demonstrate strength in L4.

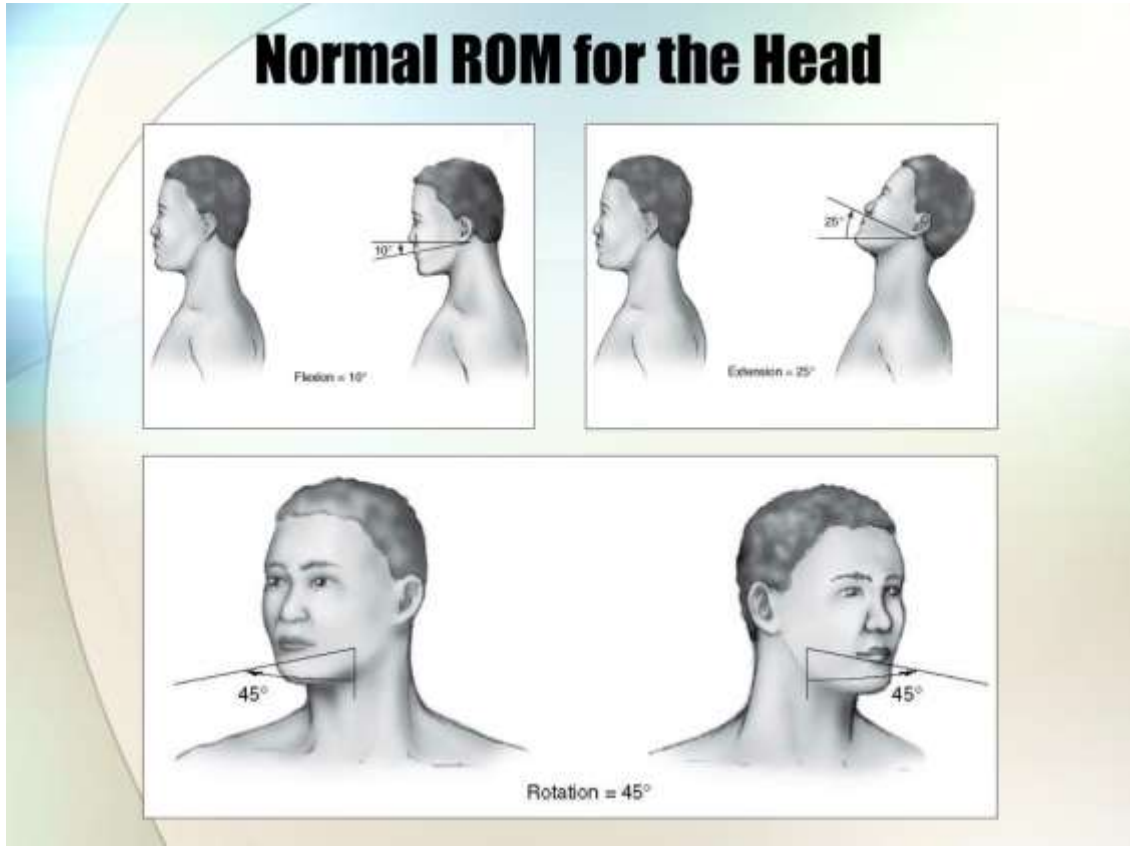
Telemedicine in Orthopaedic Surgery

- Hip extension strength can be assessed by having the patient sit back in a chair and arise without using the arms to assist.

Telemedicine in Orthopaedic Surgery

Neck & Shoulder

- Cervical range of motion.
- Inspection anteriorly and posteriorly for overlying skin changes, scars, erythema or ecchymosis, and atrophy.
- The patient is asked to point with 1 finger to the area of maximal discomfort.



Telemedicine in Orthopaedic Surgery

- Palpation: the patient can be directed to find the sternal notch and then walk the fingers to the sternoclavicular joint, across the clavicle, to the acromioclavicular joint.

- The bicipital groove faces forward with the arm in 10 of external rotation and can often be localized and palpated by a cooperative patient.

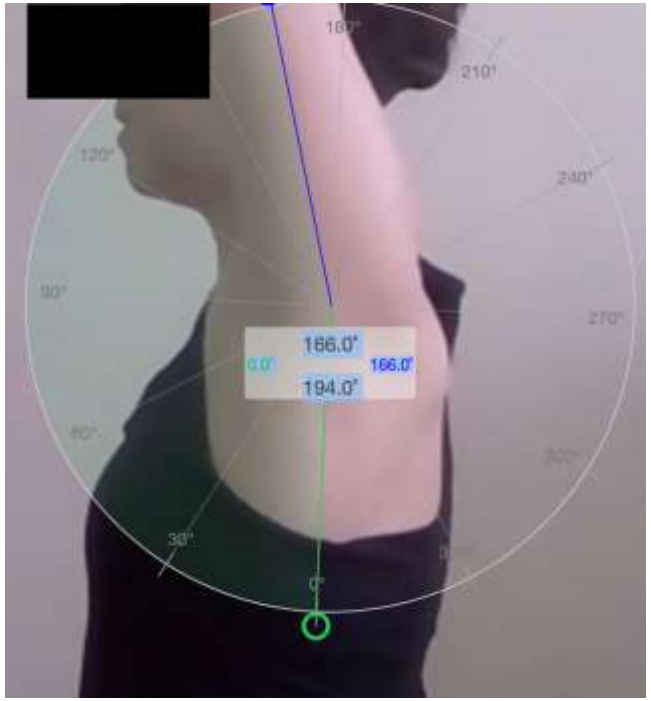
- Tenderness in each of these areas is noted

Telemedicine in Orthopaedic Surgery

- The **bicipital groove** faces forward with the arm in 10 degrees of external rotation and can often be localized and palpated by a cooperative patient.
- Tenderness in each of these areas is noted

Telemedicine in Orthopaedic Surgery

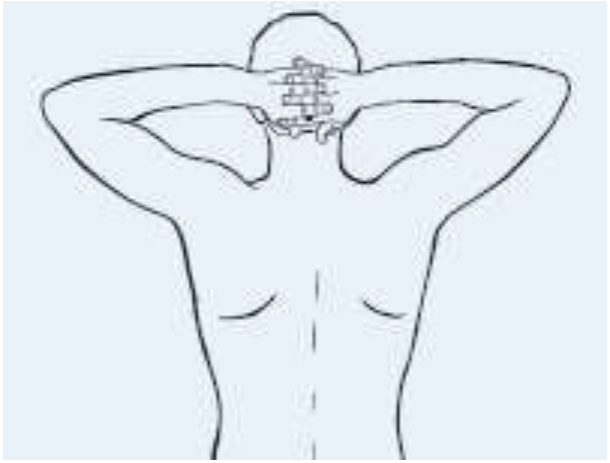
- An internet-based goniometer can be used to assess forward flexion by measuring the angle between the midaxillary line and a line along the axis of the humeral shaft.
  - Active abduction is performed with the patient facing the camera.
- With the arms at the waist, external rotation is assessed.
  - Forward flexion is assessed by having the patient turn 90 to the side

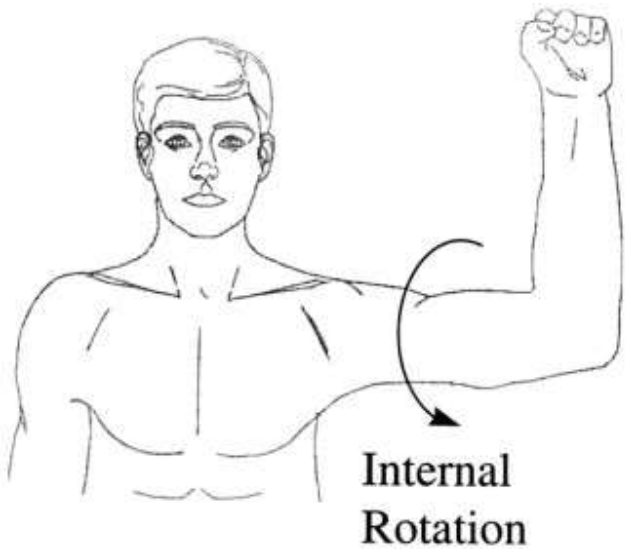


Telemedicine in the Era of COVID-19 The Virtual Orthopaedic Examination. Miho J. Tanaka, MD, Luke S. Oh, MD, Scott D. Martin, MD, Eric M. Berkson, MD; The Journal of Bone and Joint Surgery, Section COVID-19, **June 17, 2020**; 102 (12): e57, DOI: 10.2106/JBJS.20.00609

Telemedicine in Orthopaedic Surgery

- In the same position, the arms are abducted to 90, and external and internal rotation are assessed in the limb closest to the camera.
  - Internal rotation is additionally viewed with the patient facing away from the camera.
  - Instruction using visual demonstration and mirroring can be helpful in this setting.





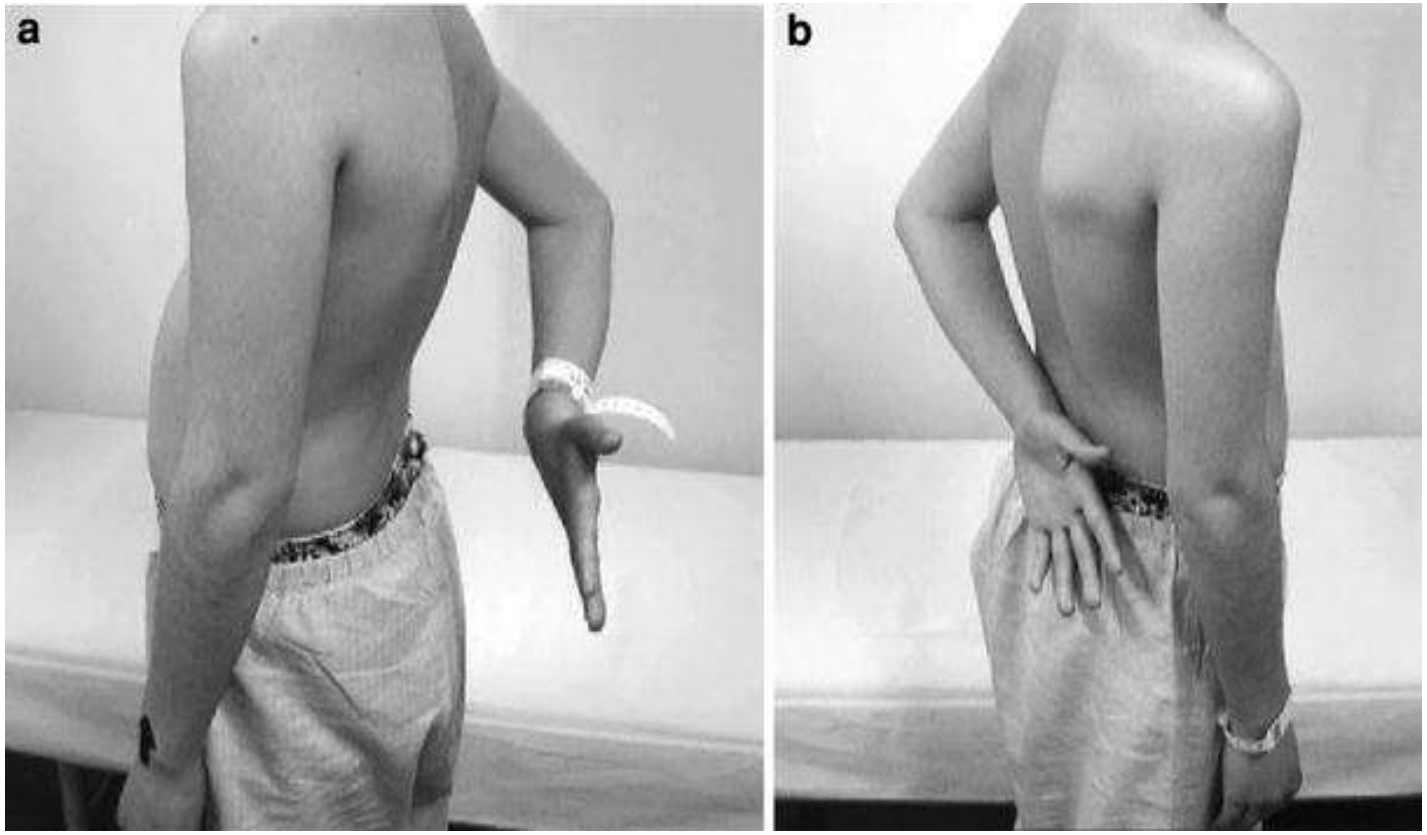
Telemedicine in Orthopaedic Surgery

Strength testing

in the upper extremity can be performed against gravity and with the addition of common household items of known weights.

Telemedicine in Orthopaedic Surgery

- The **lift-off test** against gravity is viewed from the side.



Telemedicine in Orthopaedic Surgery

- The inability to abduct the arm in pronation while grasping a 0.5-kg (1-lb) item may indicate a need for further imaging to assess for a **large supraspinatus tear**.

Raise your hand as high as you can out to your side and then lower your arm slowly. Is this painful when you lower the arm?

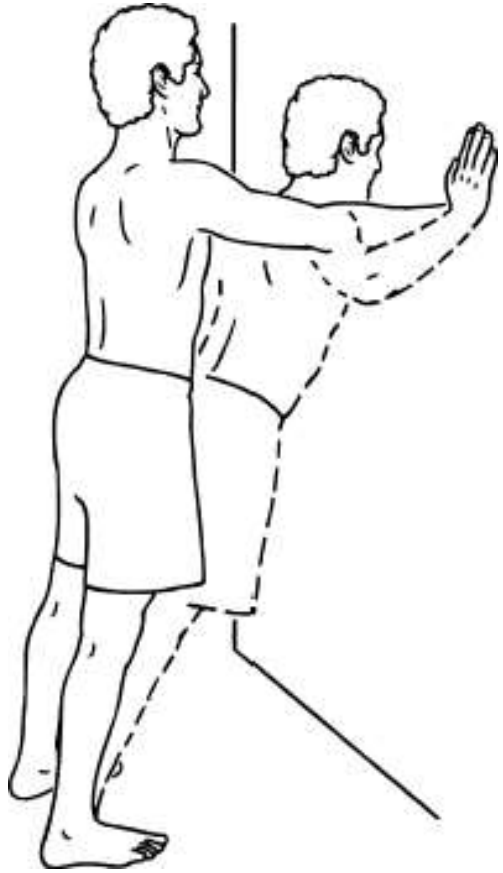
The Shoulder Telehealth Assessment Tool in Transition to Distance Orthopedics
Gregory R. Sprowls, Jaycen C. Brown, Brett N. Robin, Arthrosc Tech. 2020 Nov; 9(11): e1673–e1681. Published online 2020 Oct 24. doi: 10.1016/j.eats.2020.07.008 PMCID: PMC7695579

Telemedicine in Orthopaedic Surgery

- A similar assessment can be performed in the side-lying position to test for weakness in external rotation.
    - Evaluations of the distal aspect of the extremity, including anterior and posterior interosseous and ulnar nerve function and inspection for swelling or skin changes, are performed to complete the assessment for an **acute injury**.

Telemedicine in Orthopaedic Surgery

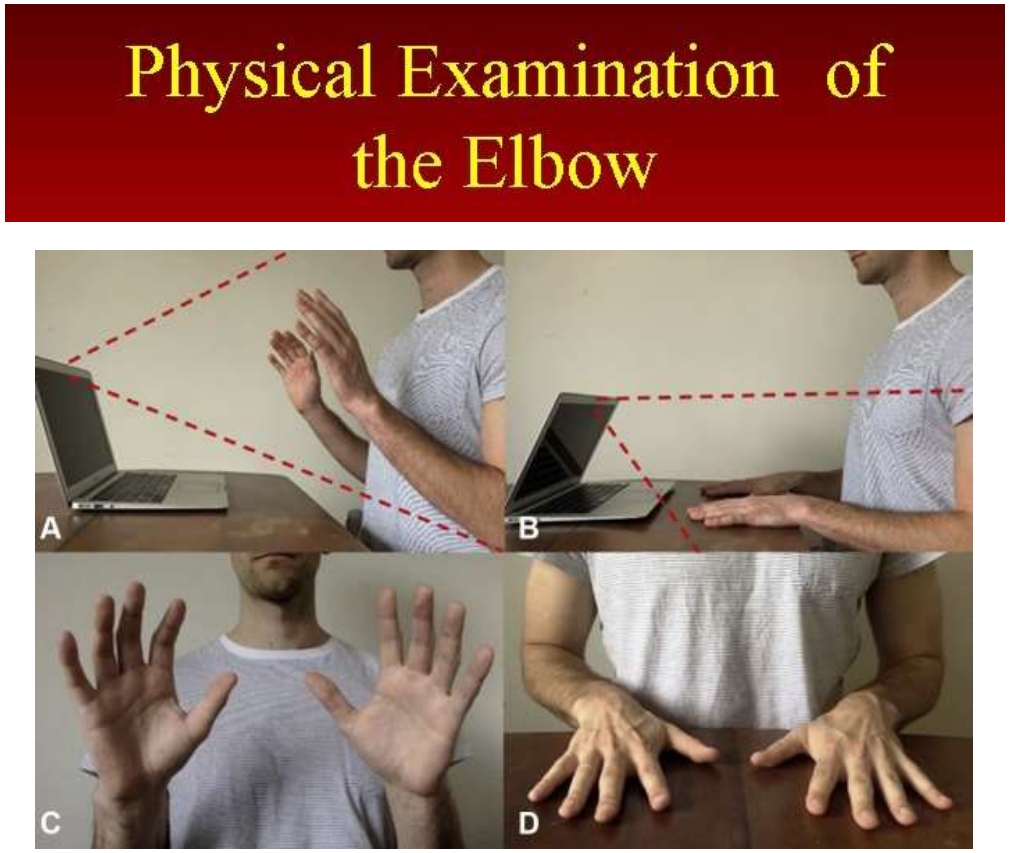
- In atraumatic cases, scapular motion is assessed by having the patient face away from the camera during active abduction and forward flexion.
  - A wall push-up can be performed while observing for scapular symmetry and strength along with an evaluation for scapular winging.



Telemedicine in Orthopaedic Surgery

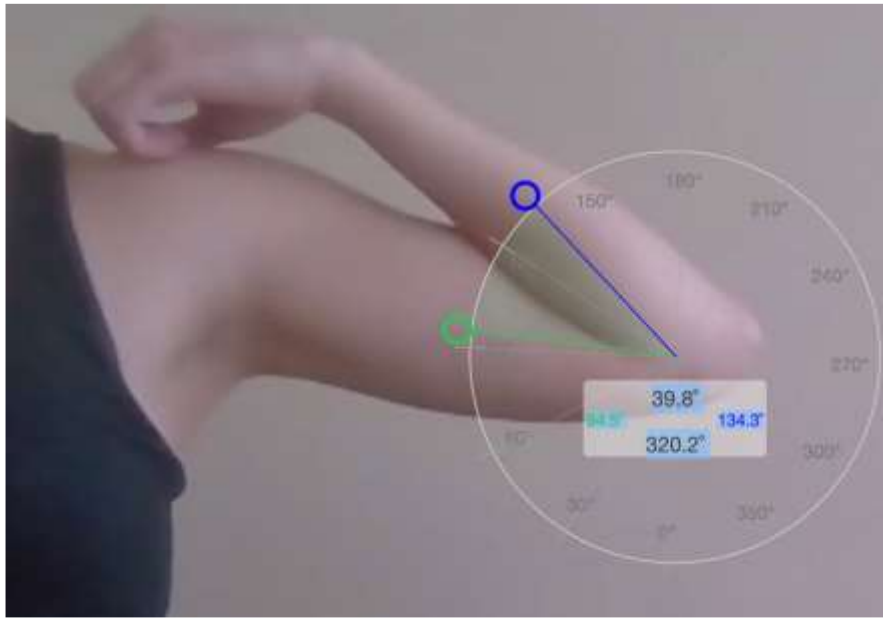
Elbow

- The virtual examination of the elbow begins with visual inspection.
- The presence of skin changes, effusion, erythema, or ecchymosis is noted. The patient is asked to point to the area of maximal pain.
  - Flexion and extension of the elbow are observed with the patient facing the camera and abducting the arm to 90, with the palms facing upward.



Telemedicine in Orthopaedic Surgery

- Range of motion of the elbow is assessed from the front, with the arm abducted to 90.
- **Supination and pronation** are assessed by having the patient facing the camera, with the arms at the sides and the elbows bent to 90.
- **Abduction and extension of the fingers** during assessment of supination and pronation can aid in visualization and in measurements if a goniometer is utilized



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Telemedicine in Orthopaedic Surgery

- The **chair push-up test** can be used for the evaluation of posterolateral rotatory instability.
- The patient is asked to turn 90 with the injured elbow closest to the camera and to then push off from a chair with the fingers pointed away from the body.
- Pain or apprehension during this maneuver may indicate possible posterolateral rotatory instability.

Telemedicine in Orthopaedic Surgery

- **Strength testing** can be performed against gravity and while holding objects of known weight during wrist and elbow flexion and extension.

TABLE II Approximate Weights of Household Items That Can Be Used During Strength or Provocative Testing of the Upper Extremity

Item	Approximate Weight*
Handheld plastic stapler	0.2 (0.5)
Bottle of water (450 mL or 16 oz); empty wine bottle (750 mL)	0.5 (1)
Quart of milk (950 mL); 1-L bottle of soda	1 (2)
Half-gallon of milk (1.9 L); 2-L soda bottle (full); unopened bottle of wine (750 mL)	2 (4 to 5)
Gallon of milk (3.8 L)	4 (8)

*The values are given in kilograms, with pounds in parentheses.

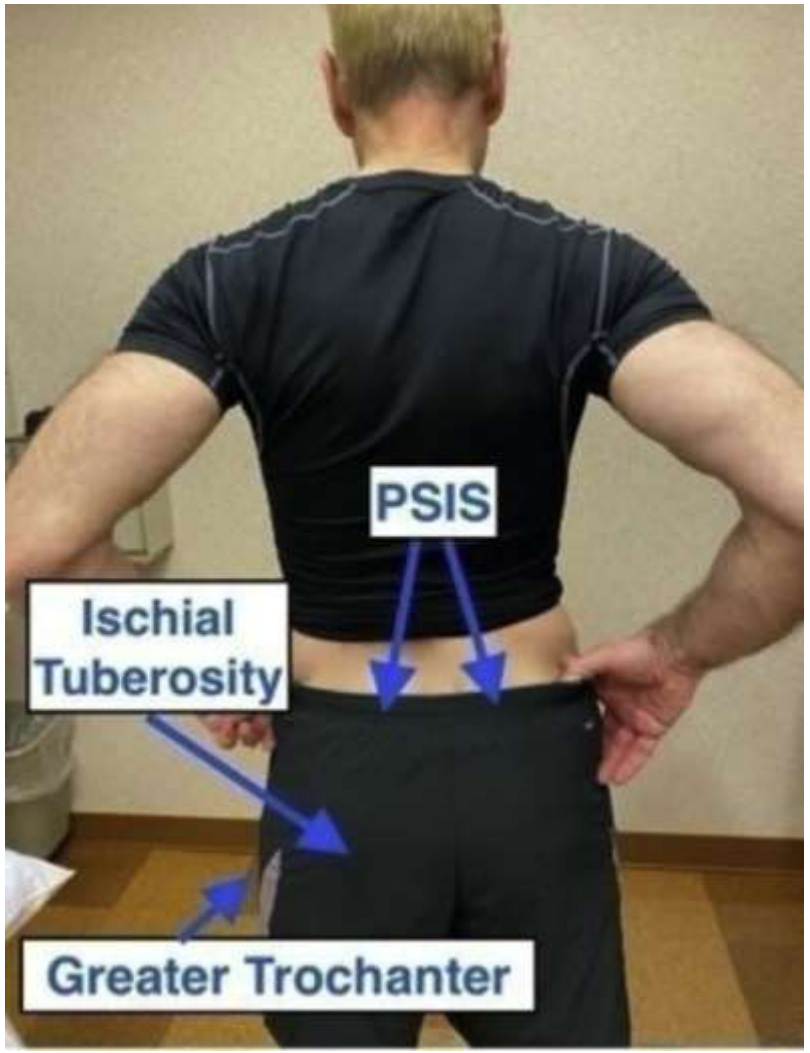
Telemedicine in Orthopaedic Surgery

Edward R. Laskowski, MD, Shelby E. Johnson, MD, Randy A. Shelerud, MD, Jason A. Lee, DO, Amy E. Rabatin, MD, Sherilyn W. Driscoll, MD, Brittany J. Moore, MD, Michael C. Wainberg, MD, Carmen M. Terzic, MD, PhD

Mayo Clinic Proceedings
Volume 95 Issue 8 Pages 1715-1731 (August 2020)
DOI: 10.1016/j.mayocp.2020.05.026

Telemedicine in Orthopaedic Surgery

Low Back
Inspection



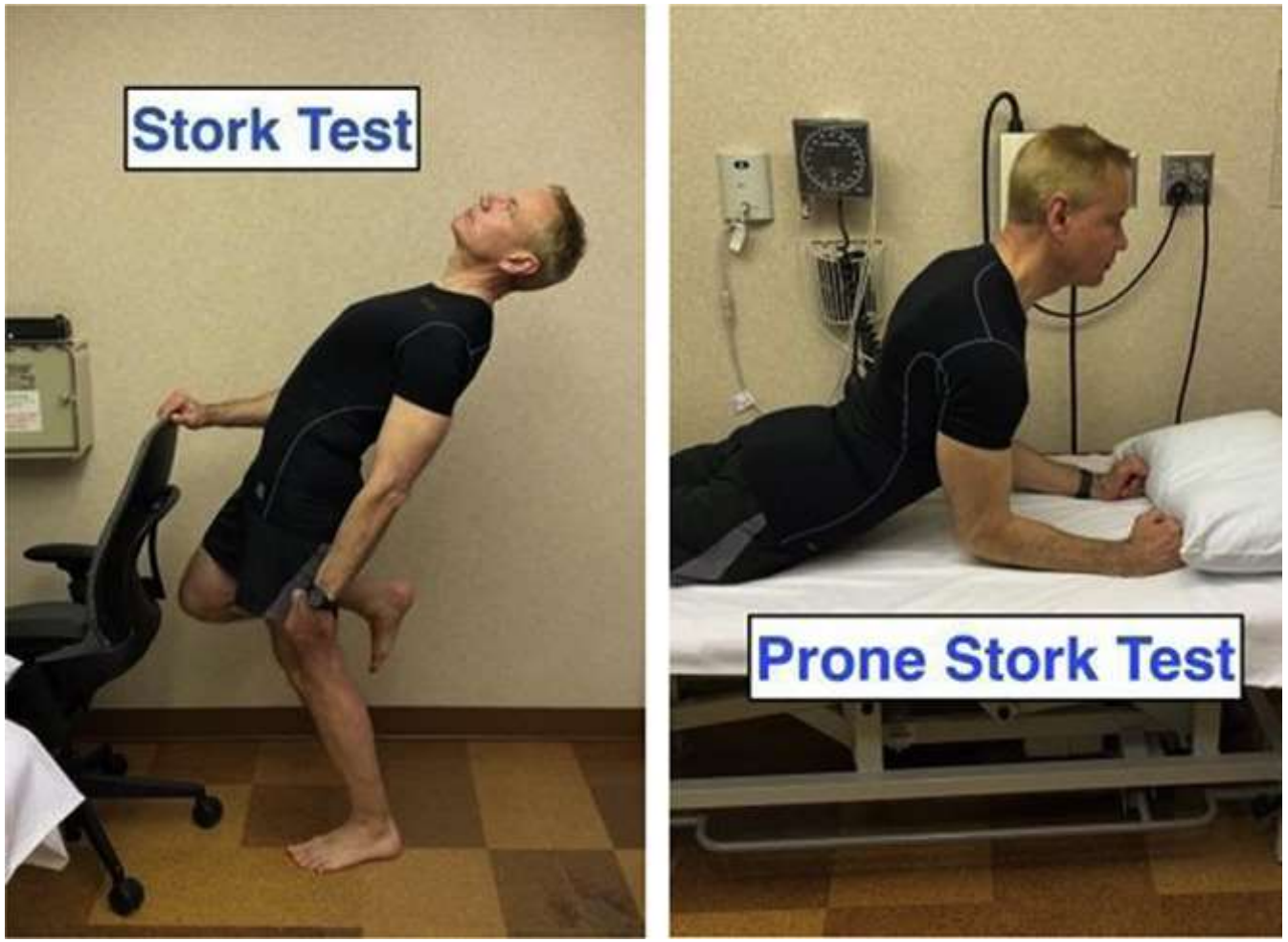
Mayo Clinic Proceedings 2020 951715-1731DOI: (10.1016/j.mayocp.2020.05.026)

Telemedicine in Orthopaedic Surgery

Mayo Clinic Proceedings 2020 951715-1731DOI: (10.1016/j.mayocp.2020.05.026)

Telemedicine in Orthopaedic Surgery

Stork Test for Facet/Posterior Element Pain



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Telemedicine in Orthopaedic Surgery

Mayo Clinic Proceedings 2020 951715-1731DOI: (10.1016/j.mayocp.2020.05.026)

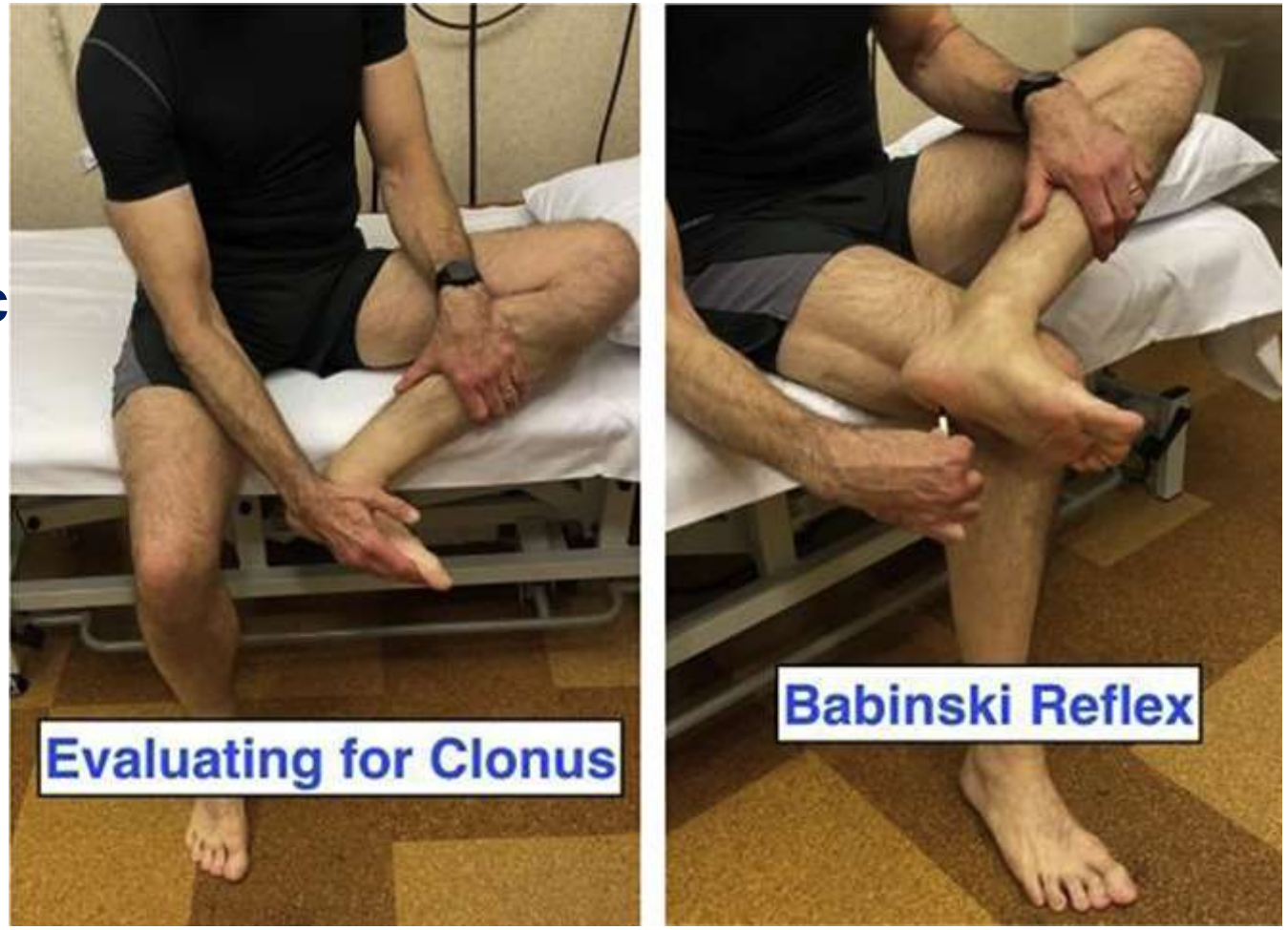
Telemedicine in Orthopaedic Surgery

Neural Tension Tests

Mayo Clinic Proceedings 2020 951715-1731DOI: (10.1016/j.mayocp.2020.05.026)

Telemedicine in Orthopaedic Surgery

Tests for Possible Cervical Spondylotic Myelopathy



Mayo Clinic Proceedings 2020 951715-1731DOI: (10.1016/j.mayocp.2020.05.026)

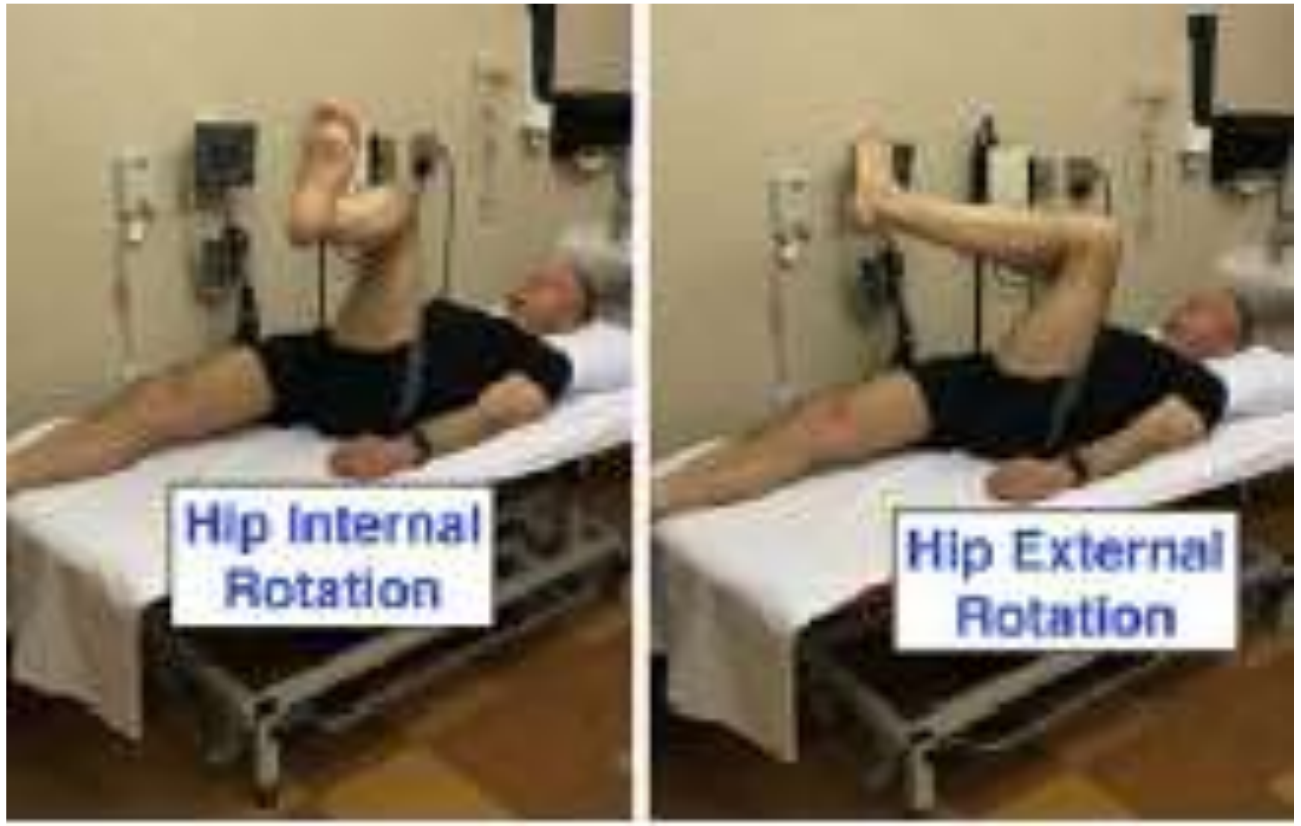
Telemedicine in Orthopaedic Surgery

Muscle Strength
Lower Limbs

Mayo Clinic Proceedings 2020 951715-1731DOI: (10.1016/j.mayocp.2020.05.026)

Telemedicine in Orthopaedic Surgery

Hip Examination



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Telemedicine in Orthopaedic Surgery

Hip Examination

Mayo Clinic Proceedings 2020 951715-1731DOI: (10.1016/j.mayocp.2020.05.026)

Telemedicine in Orthopaedic Surgery

Seated
Hip Examination

Mayo Clinic Proceedings 2020 951715-1731DOI: (10.1016/j.mayocp.2020.05.026)

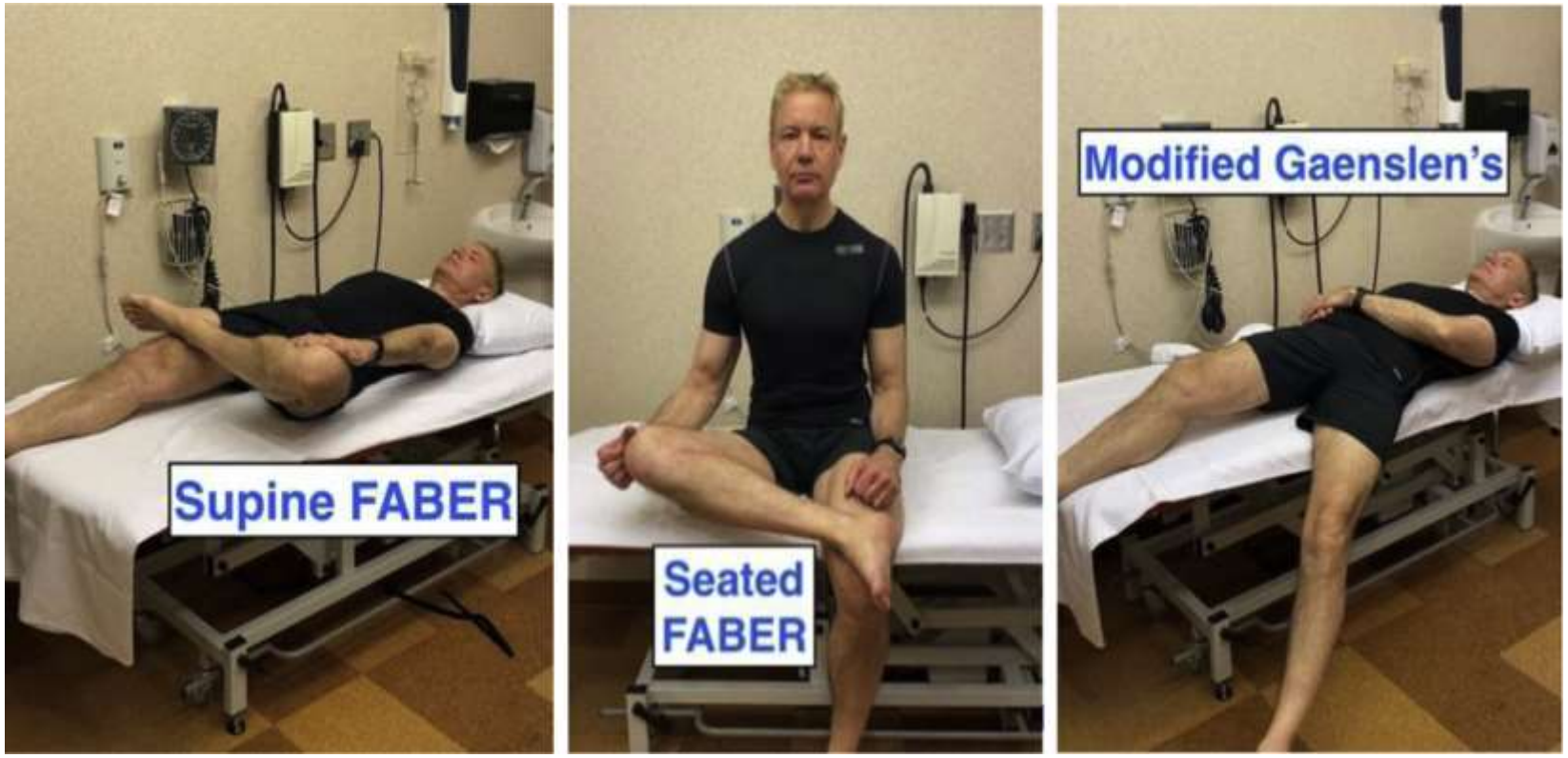
Telemedicine in Orthopaedic Surgery

Seated
Hip Examination

Mayo Clinic Proceedings 2020 951715-1731DOI: (10.1016/j.mayocp.2020.05.026)

Telemedicine in Orthopaedic Surgery

Sacroiliac Joint Tests



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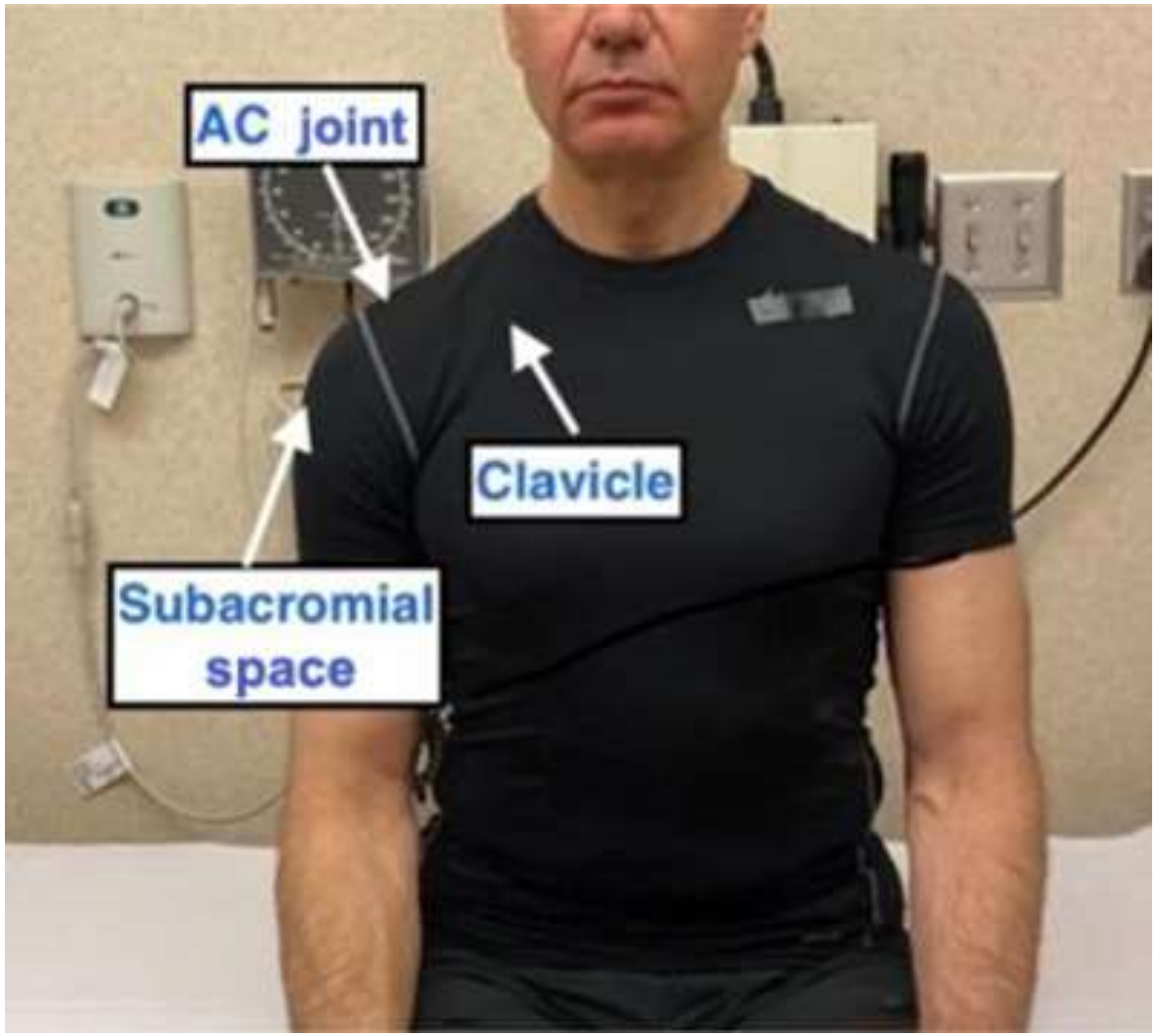
Telemedicine in Orthopaedic Surgery

Shoulder Examination



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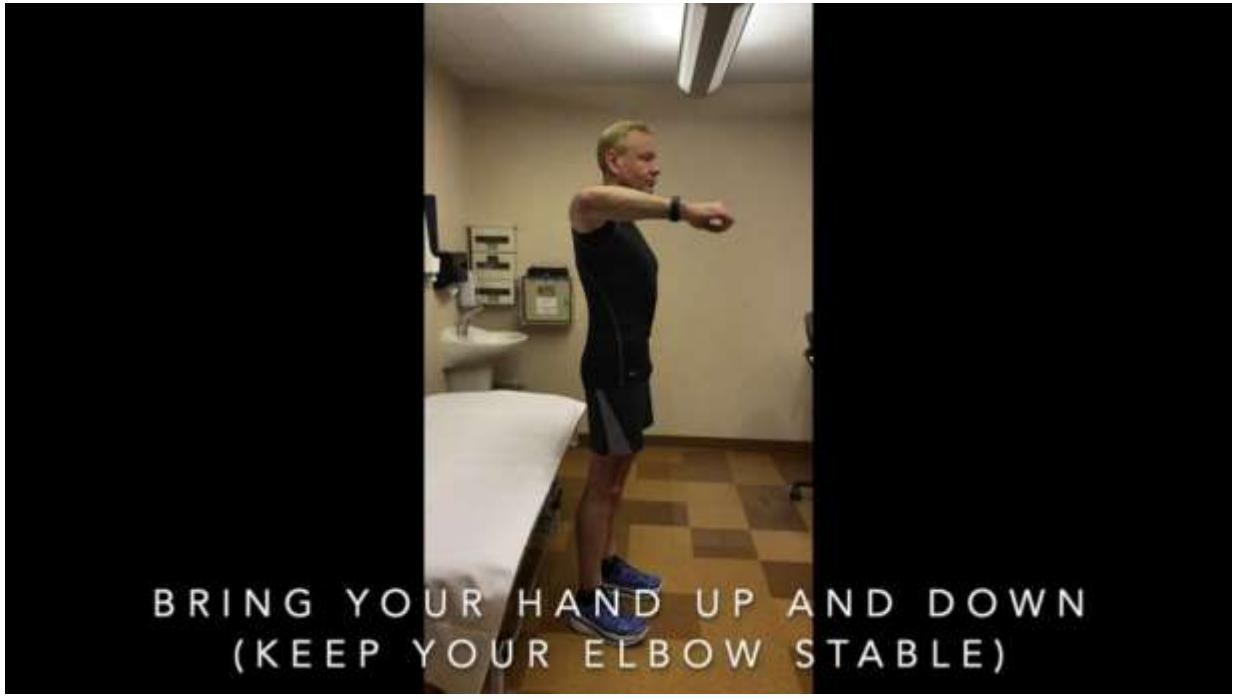
Telemedicine in Orthopaedic Surgery

Shoulder Examination



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Telemedicine in Orthopaedic Surgery

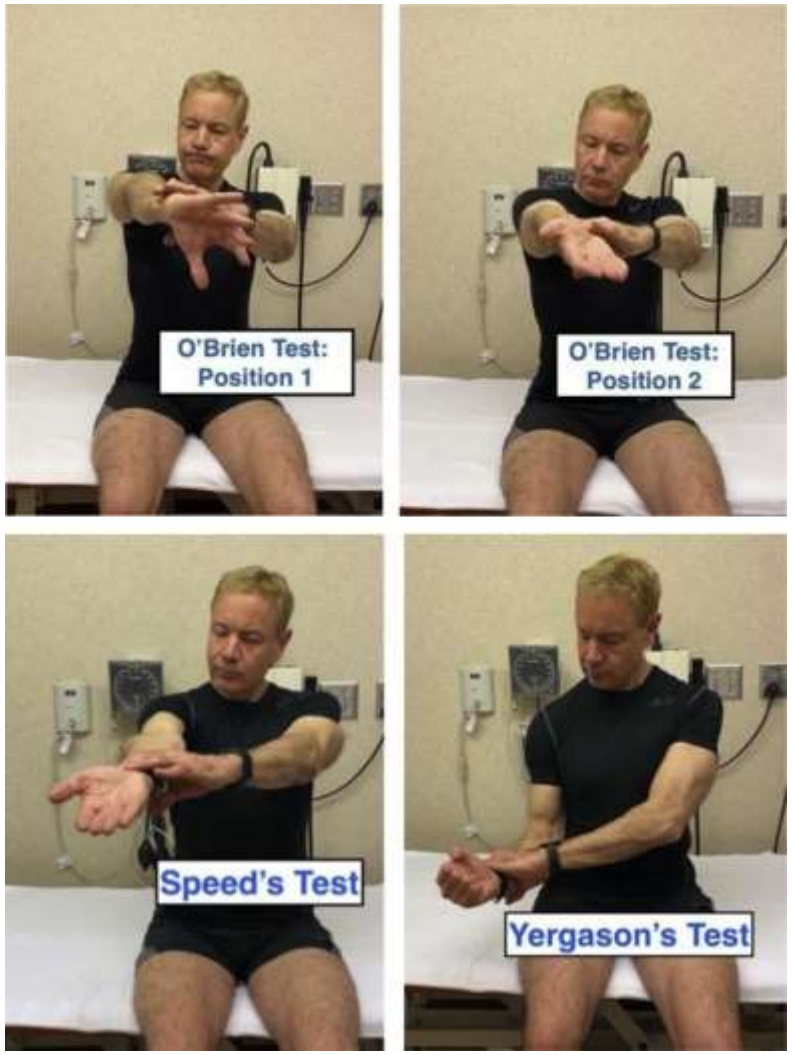
Shoulder Examination Impingement Tests

Mayo Clinic Proceedings 2020 951715-1731DOI: (10.1016/j.mayocp.2020.05.026)

Telemedicine in Orthopaedic Surgery

Shoulder Examination

Bicipital Tendon Tests



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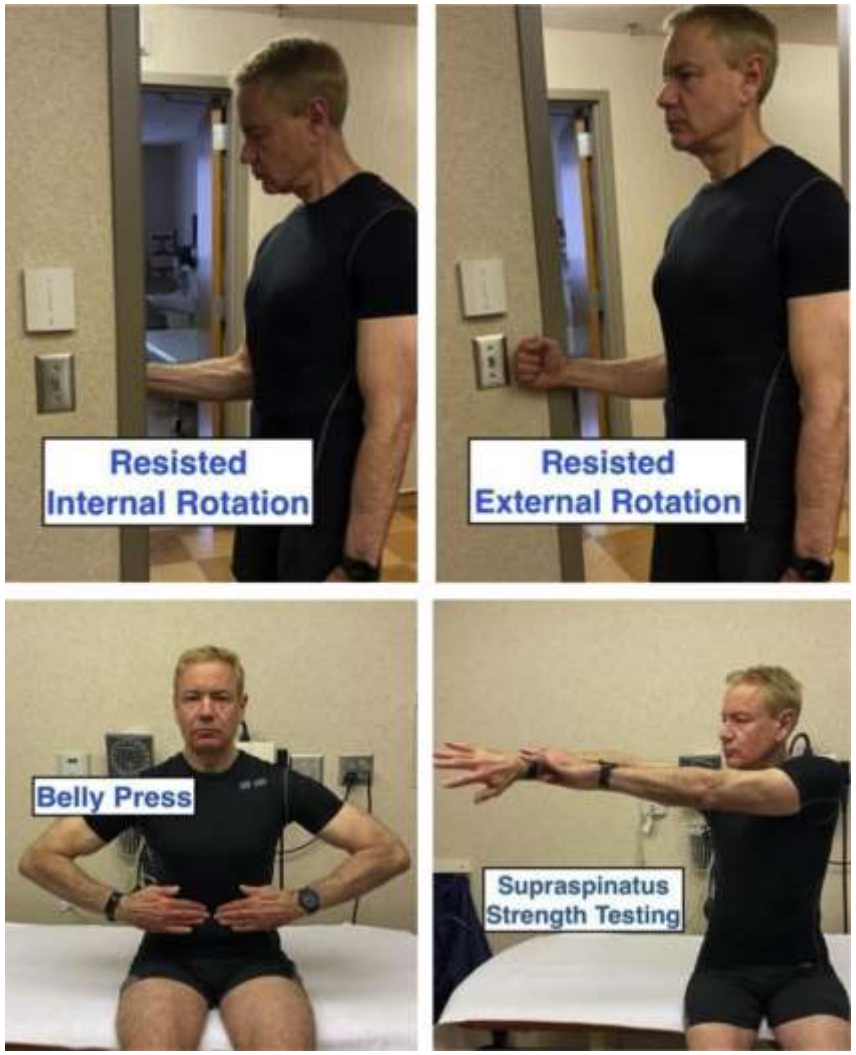
Telemedicine in Orthopaedic Surgery

Shoulder Examination

Muscle Strength Testing



Mayo Clinic Proceedings 2020 951715-1731DOI: (10.1016/j.mayocp.2020.05.026)

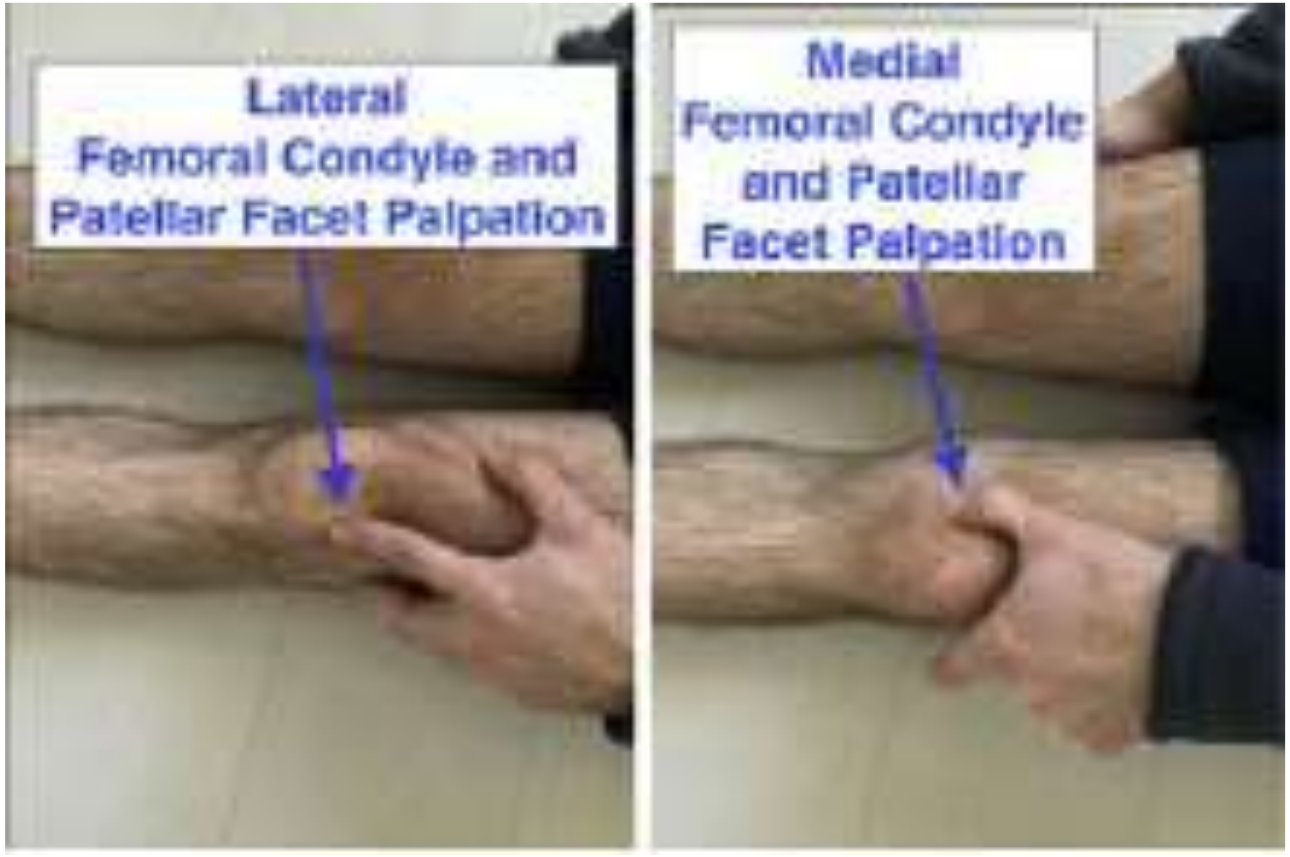
Telemedicine in Orthopaedic Surgery

Triceps Strength Testing

Mayo Clinic Proceedings 2020 951715-1731DOI: (10.1016/j.mayocp.2020.05.026)

Telemedicine in Orthopaedic Surgery

Knee Examination



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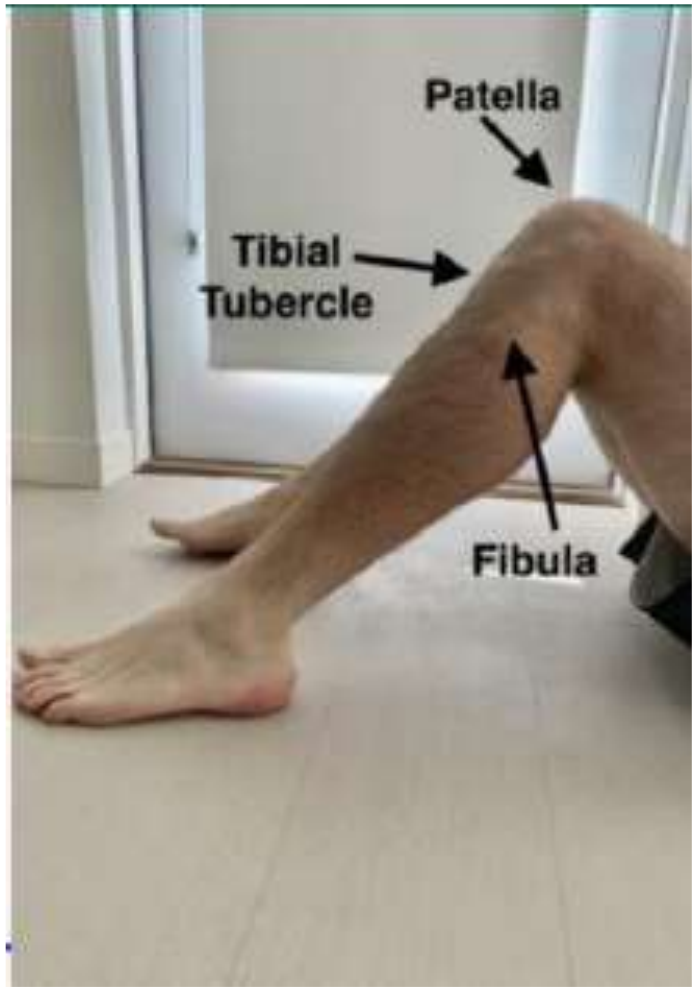
Telemedicine in Orthopaedic Surgery

Knee Examination



Mayo Clinic Proceedings 2020 951715-1731DOI: (10.1016/j.mayocp.2020.05.026)

Telemedicine in Orthopaedic Surgery

Seated
Knee Evaluation

Mayo Clinic Proceedings 2020 951715-1731DOI: (10.1016/j.mayocp.2020.05.026)

Telemedicine in Orthopaedic Surgery

Seated
Knee Evaluation

Mayo Clinic Proceedings 2020 951715-1731DOI: (10.1016/j.mayocp.2020.05.026)

Telemedicine in Orthopaedic Surgery

Ankle Examination

Mayo Clinic Proceedings 2020 951715-1731DOI: (10.1016/j.mayocp.2020.05.026)

Telemedicine in Orthopaedic Surgery

Ankle Examination

Mayo Clinic Proceedings 2020 951715-1731DOI: (10.1016/j.mayocp.2020.05.026)

Telemedicine in Orthopaedic Surgery

- In atraumatic cases, localization of the maximal point of pain during provocative testing can be performed with repeated wrist extension and supination while holding a weighted object to assess for lateral epicondylitis.
  - Similarly, repeated wrist flexion and pronation while holding a weighted object can be helpful in assessing for **medial epicondylitis**.

Telemedicine in Orthopaedic Surgery

- Provocative testing
- Discrete palpation
- Strength testing
- Stability testing

Telemedicine in Orthopaedic Surgery

Sharing the information with patient

- After the assessment, the **screen-sharing** function:
- shared visualization and explanation of imaging studies.
    - Without the use of anatomic models, prepared pictures can be used as adjunct visual aids during the discussion with the patient.

Telemedicine in Orthopaedic Surgery

- In acute injuries with concerns for **distal biceps injury**, the muscle contour is assessed for asymmetry, both at rest and while the patient is flexing the biceps or holding weighted items with both arms at the waist.

Telemedicine in Orthopaedic Surgery

- Similarly, the evaluation of **triceps injuries** involves inspection of the muscle contour for swelling or asymmetry posteriorly.

Telemedicine in Orthopaedic Surgery

Future Directions

- The standardization of virtual examinations and the validation of measurements
- Technological advancements to potentially incorporate motion-capture imaging and remote dynamic testing.

Cai L, Ma Y, Xiong S, Zhang Y. Validity and reliability of upper limb functional assessment using the Microsoft Kinect V2 Sensor. Appl Bionics Biomech. 2019 Feb 11;2019:7175240.

Wochatz M, Tilgner N, Mueller S, Rabe S, Eichler S, John M, V¨oller H, Mayer F. Reliability and validity of the Kinect V2 for the assessment of lower extremity rehabilitation exercises. Gait Posture. 2019 May;70:330-5. Epub 2019 Mar 26.

Telemedicine in Orthopaedic Surgery, Challenges and Opportunities

Melvin C. Makhni, Grant J. Riew, and Marissa G. Sumathipala

Investigation performed at Harvard Medical School, Boston, Massachusetts

J Bone Joint Surg Am. 2020;102:1109-15 d
http://dx.doi.org/10.2106/JBJS.20.00452

Telemedicine in Orthopaedic Surgery

Benefits

(1) high patient satisfaction rates

(2) Increased patient convenience,

(3) Increased access to care,

(4) Decreased overhead for providers,

(5) Societal cost savings.

J Bone Joint Surg Am. 2020;102:1109-15 d http://dx.doi.org/10.2106/JBJS.20.00452

Telemedicine in Orthopaedic Surgery

- Challenges

The use of telemedicine has been strikingly low as a percentage of total health-care services.

Prior to COVID-19, only between 2.4% and 10% of patients utilized virtual visits.

J Bone Joint Surg Am. 2020;102:1109-15 d http://dx.doi.org/10.2106/JBJS.20.00452

Telemedicine in Orthopaedic Surgery

- Challenges
  - Lack of Awareness, Access, and Technology Literacy
  - Technology Implementation and Maintenance Costs
    - Inefficiencies Introduced
  - Decreased Ability to Perform Physical Examinations
    - Lack of Perceived Benefit
  - Negative Financial Implications for Providers
    - Possible Increased Medicolegal Exposure
      - Regulatory Barriers

J Bone Joint Surg Am. 2020;102:1109-15 d http://dx.doi.org/10.2106/JBJS.20.00452

Telemedicine in Orthopaedic Surgery

- The widespread use of telemedicine in orthopaedic surgery is feasible.
  - In addition to improving the cost and quality of care, developing virtual care pathways would prepare health systems for future public-health crises.
- However, successful adoption of telemedicine is contingent on coordinated initiatives between doctors, patients, insurance companies, private enterprises, and health-care systems.

J Bone Joint Surg Am. 2020;102:1109-15 d http://dx.doi.org/10.2106/JBJS.20.00452

Telemedicine in Orthopaedic Surgery

- By tackling the challenges of implementation and training, raising awareness and improving education, streamlining technology, and collaborating with patients, providers, and payors to align incentives, the **field of orthopaedic surgery may benefit from telemedicine** in the years to come.

J Bone Joint Surg Am. 2020;102:1109-15 d http://dx.doi.org/10.2106/JBJS.20.00452

Telemedicine in Orthopaedic Surgery

- Examples:
  - Tennis Elbow
  - Plantar Fascitis
  - Stenosing Tenosynovitis
  - Ankle Sprain
  - Non-displaced Fractures
  - …
  - ..
  - .

J Bone Joint Surg Am. 2020;102:1109-15 d http://dx.doi.org/10.2106/JBJS.20.00452

Telemedicine in Rehabilitation

- This study demonstrated that a six-week course of structured telephone calls thrice-weekly to patients at their home, to monitor self-administered osteoarthritis-specific exercises for patients with knee OA (i.e., tele-physiotherapy) achieved comparable results to physiotherapy conducted in the clinic.

Int J Telerehabil. 2013 Fall; 5(2): 11–20. Published online 2013 Dec 19. doi: 10.5195/ijt.2013.6125,
PMCID: PMC4352988, PMID: 25945214, Adesola C. Odole, Oluwatobi D. Ojo

Telemedicine & Medical Education

- On March 23, 2020, the Association of American Medical Colleges (AAMC) issued guidance on medical student involvement during the coronavirus disease (COVID-19) pandemic, recommending that

  medical students not participate in direct patient care, unless there is a critical workforce need, and only on a voluntary basis.

Unmuting Medical Students' Education: Utilizing Telemedicine During the COVID-19 Pandemic and Beyond, Ariella Magen Iancu; Michael Thomas Kemp; Hasan Badre Alam, J Med Internet Res 2020 | vol. 22 | iss. 7 | e19667

Telemedicine & Medical Education

- The cornerstone of medical education is patient care.
- While direct patient care has been appropriately limited at most schools, the lessons learned from these critical patient interactions cannot be fully replaced by readings, lectures, case studies, or online modules.

Unmuting Medical Students' Education: **Utilizing Telemedicine During the COVID-19 Pandemic and Beyond,** Ariella Magen Iancu; Michael Thomas Kemp; Hasan Badre Alam, J Med Internet Res **2020** | vol. 22 | iss. 7 | e19667

Telemedicine & Medical Education

- Telemedicine Curriculum:
  - The American Medical Association (AMA) has similarly articulated the value of telemedicine curricula in medical schools and residency programs.
    - The United States Medical Licensing Exam incorporates telephone encounters into its Step 2 Clinical Skills exam.
  - Multiple curricular resources already exist that have identified core competencies for telemedicine for physicians.
  - Other health professions have even initiated discussions around establishing competencies associated with virtual care.

Unmuting Medical Students' Education: Utilizing Telemedicine During the COVID-19 Pandemic and Beyond, Ariella Magen Iancu; Michael Thomas Kemp; Hasan Badre Alam, J Med Internet Res 2020 | vol. 22 | iss. 7 | e19667

Telemedicine & Medical Education

SUPERVISION

- Professionalism
- Observed History-Taking Skills
- Telemedicine Physical Exam
- Patient Centered Discussion of Clinical Reasoning and Treatment Plan
- Troubleshooting Technology issues
- Billing and Coding

VIRTUAL MENTORING

- Networking
- Developing Relationships
- Team teleconferences
- Career planning

VIRTUAL CLASSROOM

- Recorded lectures
- Interactive Video Patient Case Conferences
- Virtual poster sessions

DIDACTIC CURRICULUM

- Telemedicine Encounter Types
  - Synchronous
    - Facilitated
    - Non-Facilitated
  - Asynchronous
- Advantages and Limitations
- Technology platforms
- Regulations and Licensure

The Future of Telehealth in Allergy and Immunology Training
https://www.jaci-inpractice.org/action/showPdf?pii=S2213-2198%2820%2930481-5

Telemedicine & Medical Education

Telemedicine Curriculum activities:

- Multimedia lessons (speakers or a headset required)
- Interactive learning activities
- Simulated patient encounters
- Participation in actual patient care via telemedicine
- Pretests, posttests, and a course evaluation

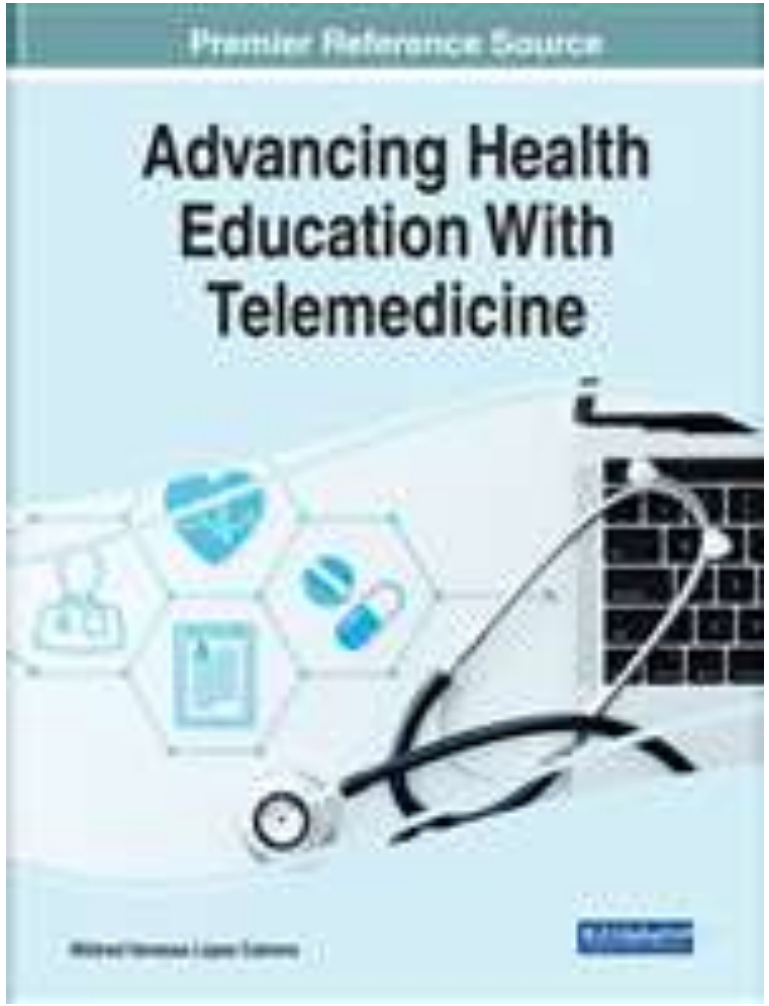
https://chicago.medicine.uic.edu/departments/academic-departments/medical-education/dme-educational-programs/telemedicine-in-practice-curriculum/

Telemedicine & Medical Education

- Suggested skills associated with optimal telemedicine care:
  - Unique physical exam techniques that can be learned involve functional physical exams
  - Application of remote monitoring devices collaboration with on-site providers.
  - Virtual evaluations can extend to include home assessments, such as in-home mobility barriers.

Telemedicine & Medical Education

- Suggested skills associated with optimal telemedicine care:
  - Training for professionalism in a virtual domain can cover education on privacy concerns, electronic prescribing (e-prescribing), and reporting of practices.
  - Trainees should also learn technological skills such as screen sharing to discuss diagnostic findings, assessing for technological literacy, and coaching patients through the use of virtual health platforms.



Telemedicine & Medical Education

- Some programs have already started to institute courses to teach these telemedicine communication and evaluation skills.

- Sartori DJ, Olsen S, Weinshel E, Zabar SR. Preparing trainees for telemedicine: a virtual OSCE pilot. Med Educ 2019 May 11;53(5):517-518. [doi: 10.1111/medu.13851] [Medline: 30859605]
- Waseh S, Dicker AP. Telemedicine Training in Undergraduate Medical Education: Mixed-Methods Review. JMIR Med Educ 2019 Apr 08;5(1):e12515 [FREE Full text] [doi: 10.2196/12515] [Medline: 30958269]

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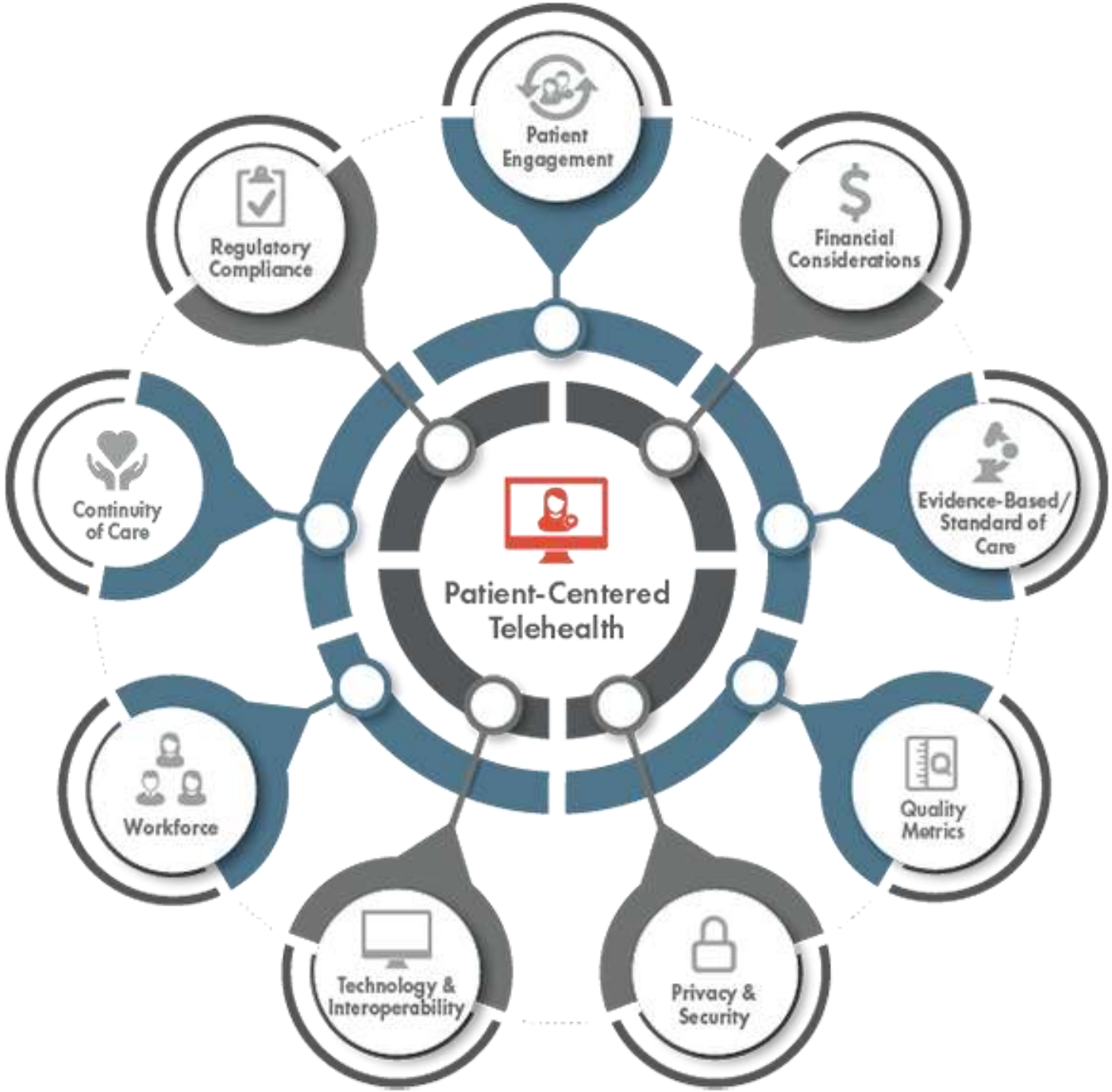
Telemedicine & Medical Education

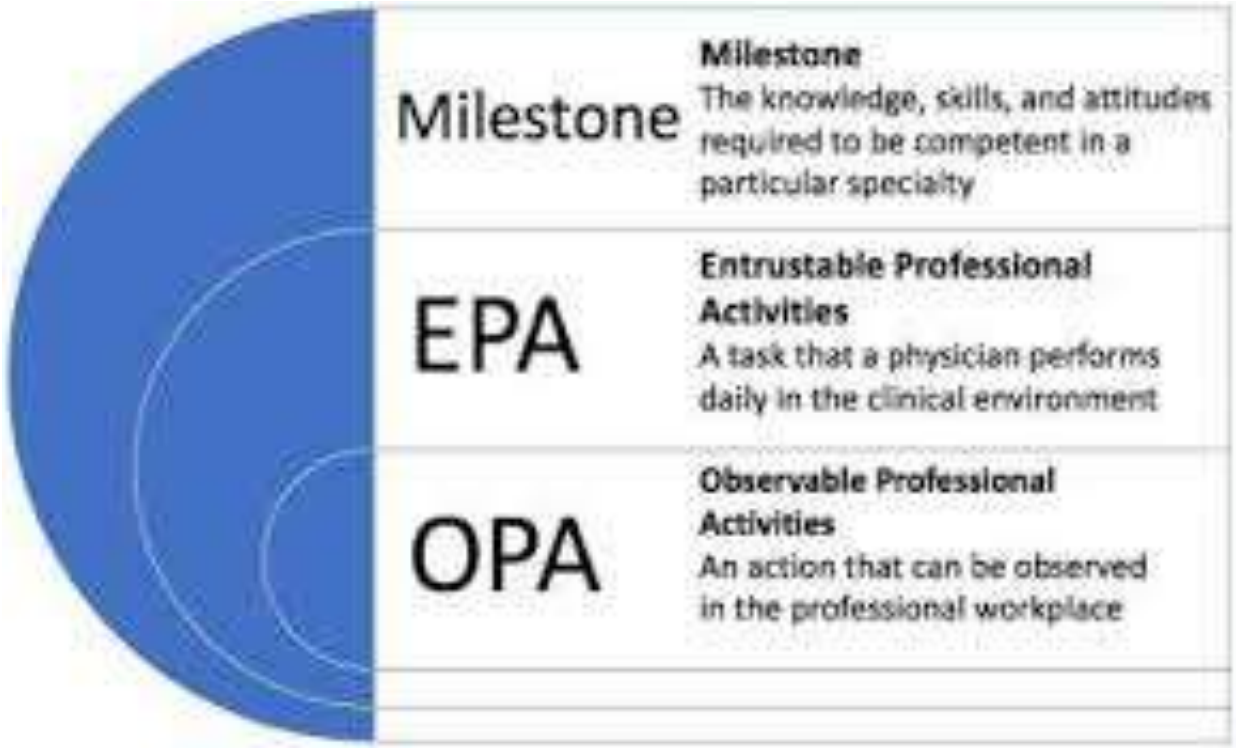


Telemedicine & Medical Education

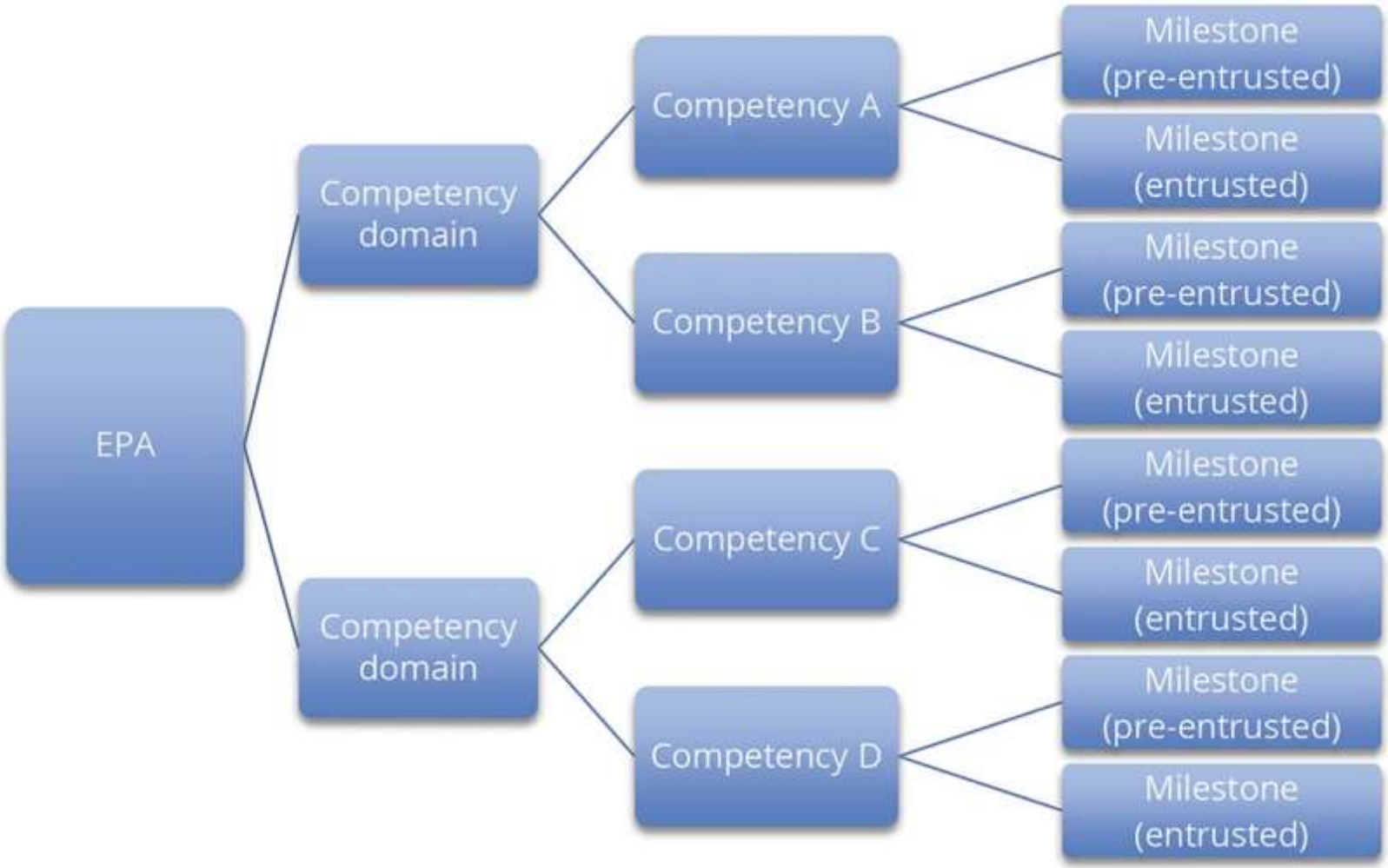
- 13 Core Entrustable Professional Activities for entering residency (EPAs)

Telemedicine & Medical Education

- 13 Core Entrustable Professional Activities for entering residency (EPAs)

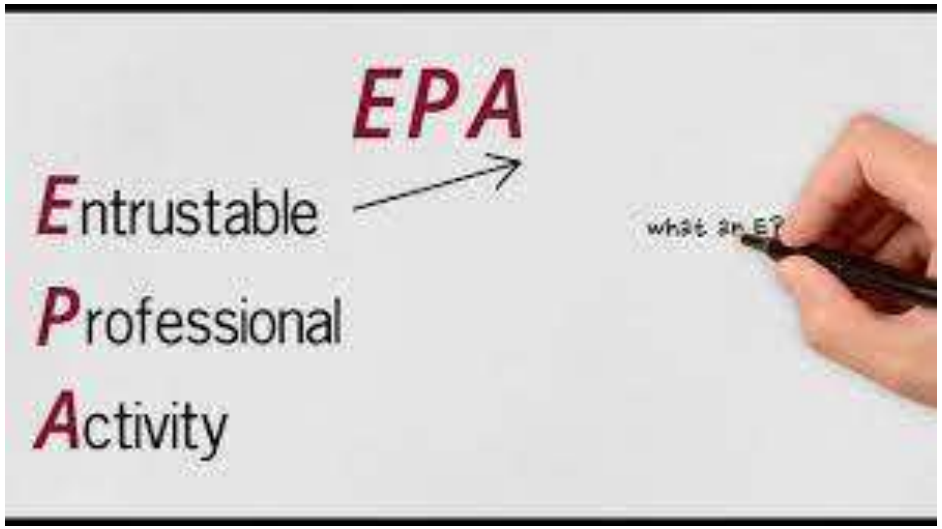


Telemedicine & Medical Education



Telemedicine & Medical Education

Telemedicine curricular activities that align with each of the Association of American Medical Colleges' Core Entrustable Professional Activities (EPAs)



Core Entrustable Professional Activities (EPAs) for entering residency. Association of American Medical Colleges. 2014. URL: https://www.aamc.org/what-we-do/mission-areas/medical-education/cbme/core-epas [accessed 2020-03-26]

Table 1. Telemedicine curricular activities that align with each of the Association of American Medical Colleges' C Activities (EPAs) [16].

EPA	Telemedicine curricular activity
EPA 1: Gather a history and perform a physical exam	• Clinical e-visit[a] • Virtual consult
EPA 2: Prioritize a differential diagnosis	• Clinical e-visit • Virtual consult • Pathology/radiology cases
EPA 3: Diagnostic and screening tests	• Clinical e-visit • Virtual consult • Pathology/radiology cases
EPA 4: Enter and discuss orders and prescriptions	• Clinical e-visit • Virtual consult
EPA 5: Document a clinical encounter	• Clinical e-visit • Virtual consult • Pathology/radiology cases
EPA 6: Provide an oral presentation of a clinical encounter	• Clinical e-visit • Virtual consult • Pathology/radiology cases • Student-led patient education project

EPA 7: Clinical questions to advance patient care	• Post e-visit reflection • Virtual journal clubs • Student-led inquiry projects
EPA 8: Give or receive a patient hand-off	• Virtual standardized patients and Objective Structured Clinical Examinations [8,9]
EPA 9: Collaborates as a member of an interprofessional team	• Interdisciplinary rounds • Teleconsults [4] • Tumor board [17] • Group discussions with other health-professional schools
EPA 10: Recognize urgent or emergent situations	• Clinical e-visit • Telestroke team [18] • Teletrauma team [19] • COVID-19 call centers, forward triage response team [4]
EPA 11: Obtain informed consent for tests and/or procedures	• Clinical e-visits in surgery, surgical subspecialties, obstetrics and gynecology, etc [20]
EPA 12: General procedures of a physician	• Online procedure courses, augmented and virtual reality simulations, including CPR[b] training and ultrasound techniques [20] • Participation in live-streamed surgical theaters [20]
EPA 13: Identify system failures and contribute to culture of safety and improvement	• Post e-visit reflection • Quality improvement training • Student reflections

Telemedicine & Medical Education

- Using telehealth technology, students could
- Gather a history and perform a virtual physical exam

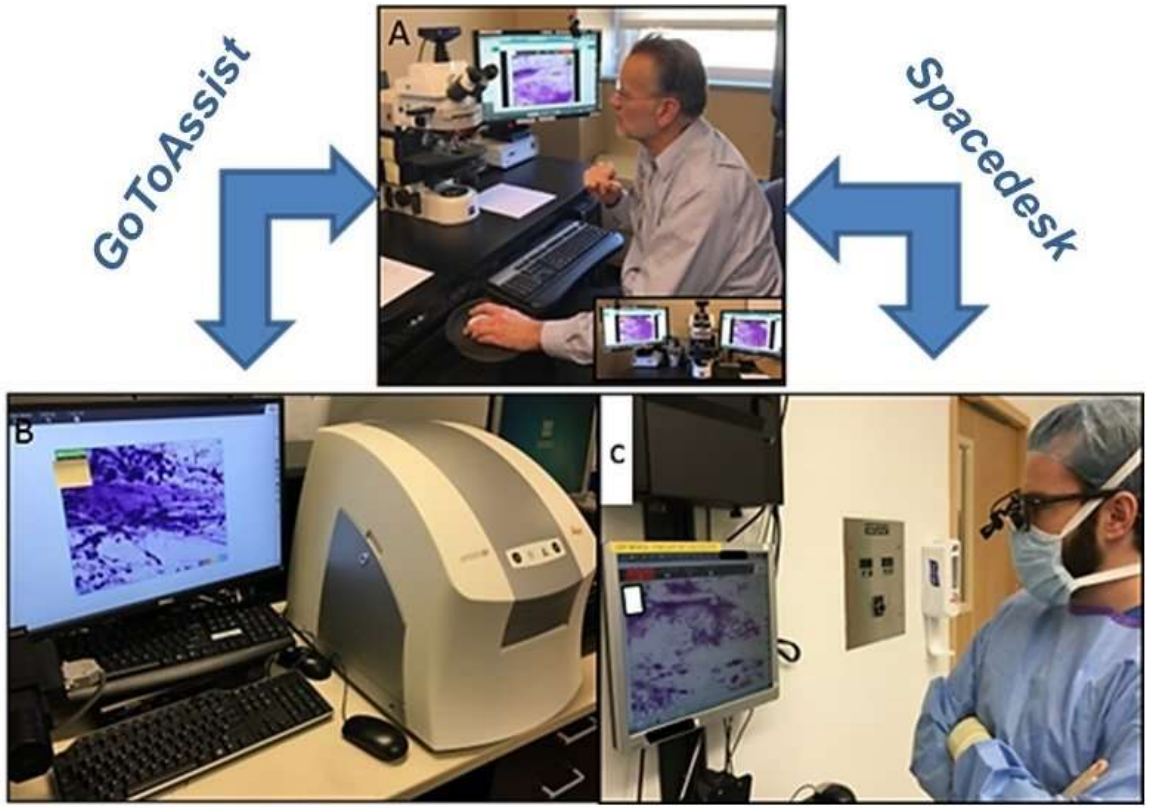
(EPA 1), focusing on communication skills, rapport building, and functional physical exam maneuvers.

- Students could summarize their findings to both the patient and attending in patient-friendly language.

- Participate in virtual consults by talking to admitted patients via a tablet or other similar equipment following the above format (EPAs 1-6).

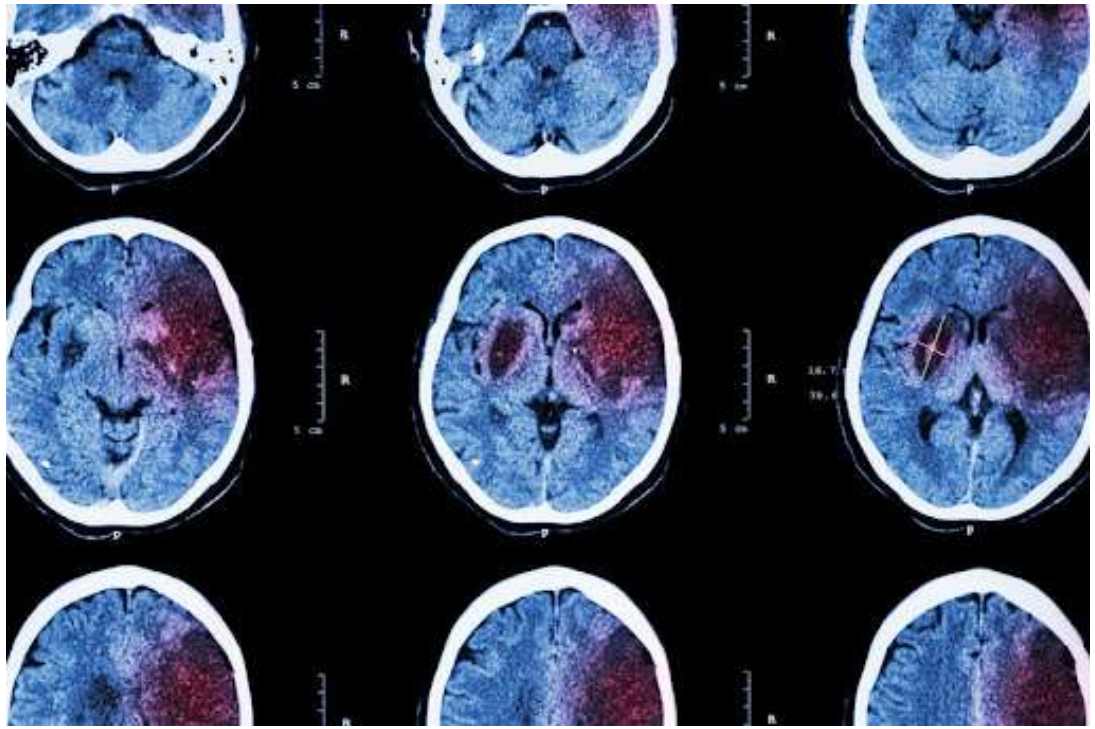
Telemedicine & Medical Education

- In pathology and radiology, screen-sharing technologies could allow students to become involved in review of slides and imaging remotely (EPAs 2 and 3).

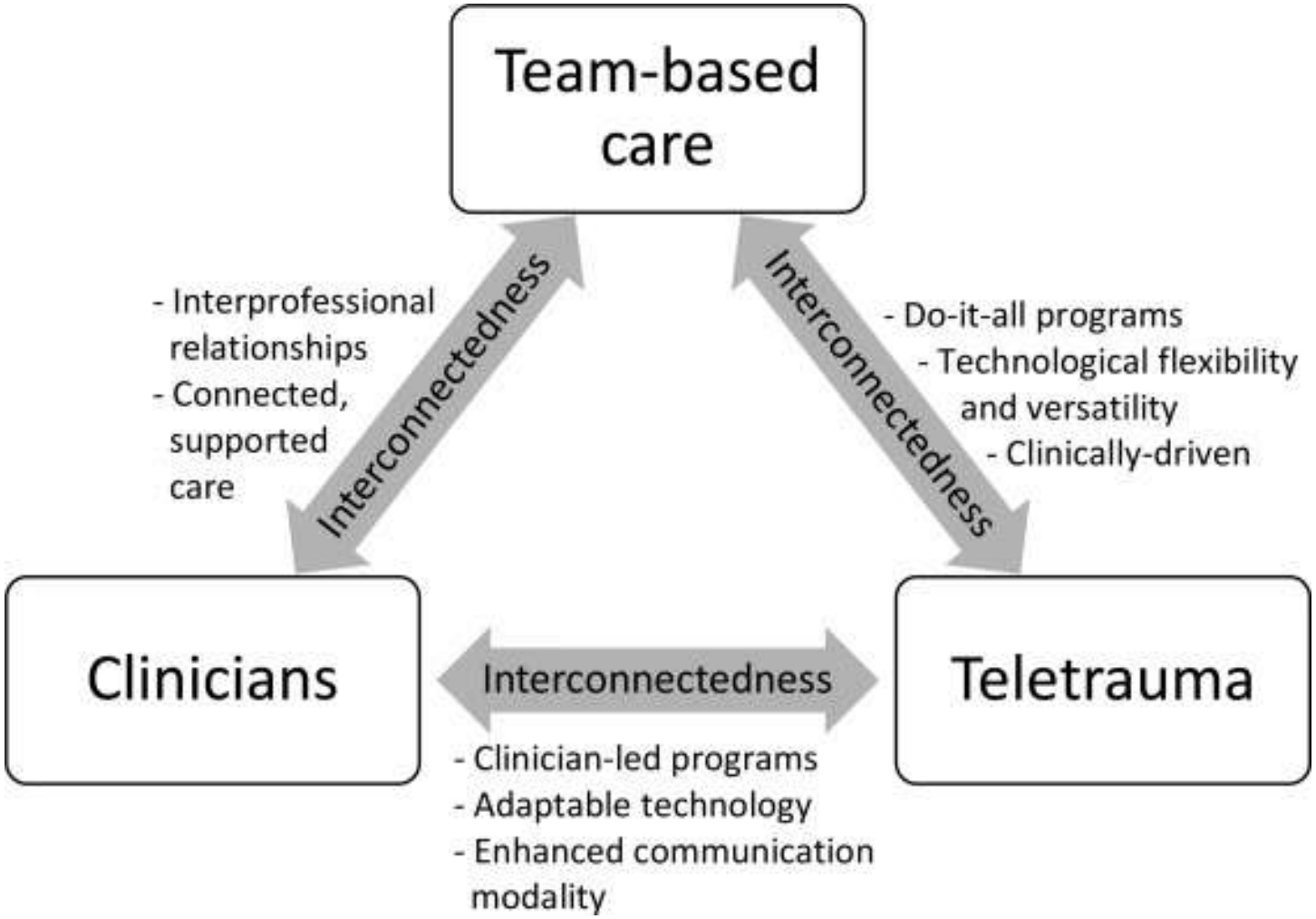


Telemedicine & Medical Education

- Unique experiences such as opportunities to triage urgent cases may exist for hospitals that have
  - Telestroke or
  - Teletrauma teams or
  - Virtual interdisciplinary rounds (EPA 9).



Telemedicine & Medical Education



Telemedicine & Medical Education

- Students could benefit from participating in as few as one opportunity to augment their online learning.
- Furthermore, with so many clinicians going online, the use of telemedicine in education is not dependent on a single department.
- As previously stated, even as clerkships return and social distancing measures are relaxed, the high use of telemedicine will likely persist.

Neurosurgery Global TeleRounds

Mount Sinai Health System

Telemedicine & Medical Education

- Students can participate in consults or rounds without stepping into patient rooms through the use of tablets.

- Bashshur R, Doarn CR, Frenk JM, Kvedar JC, Woolliscroft JO. Telemedicine and the COVID-19 Pandemic, Lessons for the Future. Telemedicine and e-Health 2020 May 01;26(5):571-573. [doi: 10.1089/tmj.2020.29040.rb]
- DeJong C, Lucey CR, Dudley RA. Incorporating a New Technology While Doing No Harm, Virtually. JAMA 2015 Dec 08;314(22):2351-2352. [doi: 10.1001/jama.2015.13572] [Medline: 26647252]

Telemedicine & Medical Education

- The rapid adoption of Telemedicine due to the COVID-19 outbreak can serve as an opportunity to augment medical education curricula and to continue to provide medical students with critical educational opportunities when in-person encounters are limited.
  - If hospital systems are already building and expanding videoconferencing and e-visit tools for providers, why not include students as well?

Telemedicine & Medical Education

- Telemedicine-specific educational goals can be incorporated into curricula and integrated with existing clinical experiences to provide students with core telemedicine and clinical skills to prepare them for current and future pandemics.

Telemedicine and Medical Education in the Age of COVID-19. Jumreornvong Oranicha; Yang Emmy; Race Jasmine; Appel Jacob; September 2020, Academic Medicine, DOI: 10.1097/ACM.0000000000003711

Telemedicine & Medical Education

- Medical educators could explore 5 major telemedicine domains:

(1) Access to care
(2) Cost
(3) Cost effectiveness
(4) Patient experience
(5) Clinician experience

Telemedicine and Medical Education in the Age of COVID-19. Jumreornvong Oranicha; Yang Emmy; Race Jasmine; Appel Jacob; September 2020, Academic Medicine, DOI: 10.1097/ACM.0000000000003711

Telemedicine & Medical Education

- Schools could use the following learning vehicles to help medical students explore these domains
- (1) asynchronous lectures covering telehealth history;
- (2) discussions on applications, ethics, safety, etiquette, and patient considerations;
- (3) faculty-supervised standardized patient telehealth encounters;
- (4) hands-on diagnostic or therapeutic procedures using telehealth equipment.

Telemedicine and Medical Education in the Age of COVID-19. Jumreornvong Oranicha; Yang Emmy; Race Jasmine; Appel Jacob; September 2020, Academic Medicine, DOI: 10.1097/ACM.0000000000003711

Telemedicine & Medical Education

June 2016

- **AMA encourages telemedicine training for medical students, residents**
- **New policy builds upon the AMA's efforts to create the medical school of the future**
  - "The vast majority of medical students are not being taught how to use technologies such as telemedicine or electronic health records during medical school and residency.
- *As innovation in care delivery and technology continue to transform healthcare, we must ensure that our current and future physicians have the tools and resources they need to provide the best possible care for their patients," said AMA Immediate Past President Robert M. Wah, M.D.*

Telemedicine & Medical Education

- The AMA launched its Accelerating Change in Medical Education initiative in 2013 to bridge the gaps that exist between how medical students are trained and how healthcare is delivered.
- The AMA has since awarded $12.5 million in grants to 32 medical schools to develop innovative curricula that can ultimately be implemented in medical schools across the country.
- These innovative models are already supporting training for an estimated 19,000 medical students who will one day care for 33 million patients each year.

INTRODUCTION TO TELE-OPHTHALMOLOGY

A GUIDE FOR OPHTHALMOLOGISTS

Prepared by:
The American Society of Cataract and Refractive Surgery and
The American Society of Ophthalmic Administrators
Telemedicine Task Force

Telemedicine for Ophthalmology Information Statement - 2018

Telehealth includes four primary domains:

- Live audio-video (synchronous) telemedicine: Real-time, bidirectional communication between a patient and provider using audiovisual telecommunications and data collection technology.
- Store-and-forward (asynchronous) telemedicine: Electronic transmission of health care data (e.g., images, text, or other digital data) to a provider for evaluation and service delivery using methods other than real-time interaction with the patient.
- Remote patient monitoring (RPM): Health data collection directly from the patient, typically during their usual activities of daily living, with transmission to a provider for analysis and possible action (e.g., tele-intensive care)
- Mobile Health (mHealth): Health care, patient communication, and education based on mobile communication platforms, e.g. fitness tracker, cell phones, tablet computers, etc.

Telemedicine for Ophthalmology Information Statement - 2018

- **Diabetic retinopathy (DR)**
- **Retinopathy of prematurity (ROP)**
- **Anterior Segment Disease**
- **Home Monitoring**
- **Automated Refraction**

Telemedicine for Ophthalmology Information Statement - 2018

- Important Issue:
  - Validation: It must be ensured that quality of care and long-term outcome are not compromised by insufficient performance of the technology or the system.

Telemedicine for Ophthalmology Information Statement - 2018

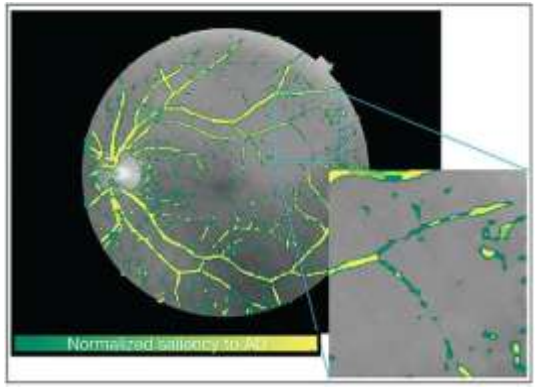
One example of a validation standard is the Early Treatment Diabetic Retinopathy Study (ETDRS), which uses 7 standard field stereoscopic color photographs as the reference standard for detection of diabetic retinopathy.[13] Based on this standard, the American Telemedicine Association (ATA) describes four categories for telemedicine programs based on their capability of detecting DR.[14]

- Category 1 - differentiate the presence or absence of none or very mild non-proliferative diabetic retinopathy (NPDR) from mild NPDR or more severe DR.
- Category 2 - distinguish sight-threatening disease (greater than moderate NPDR, proliferative DR, or diabetic macular edema) from less severe disease
- Category 3 - identify defined levels of diabetic retinopathy and macular edema and may be used to remotely manage the disease
- Category 4 - match or exceed the accuracy of ETDRS imaging; can replace the 7-field reference standard in a clinical or research setting.

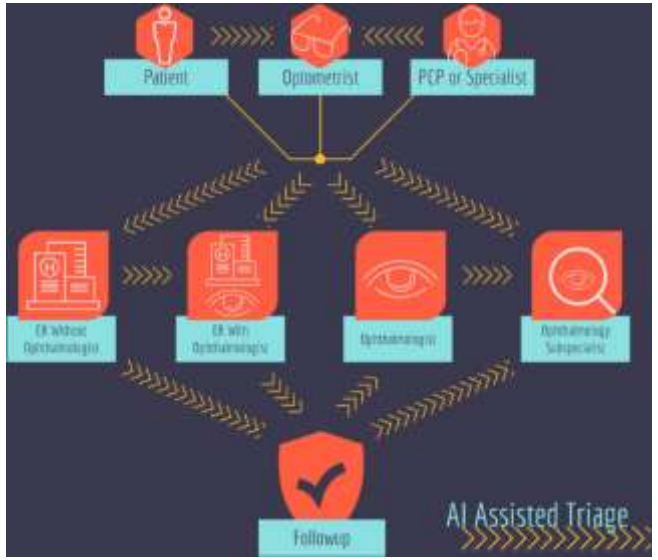
Tele-Ophtalmology

- Tele-ophthalmology
  - Remote sharing of patient data for physician diagnosis
  - Sophisticated artificial intelligence (AI) algorithms that provide automatic interpretive utilities to assist in clinical decision making.
- For example, automatic screening programs to detect abnormal corneal topography, such as keratoconus, have been available for decades.
- The first AI platform to read and interpret fundus photographs has been approved for use by the FDA.
- While this platform is accessed remotely, similar disease recognition utilities can be built into smart fundus cameras.
- Such AI programs are regarded as devices by the FDA and must be approved for use in the U.S. before being marketed.

Tele-Ophtalmology



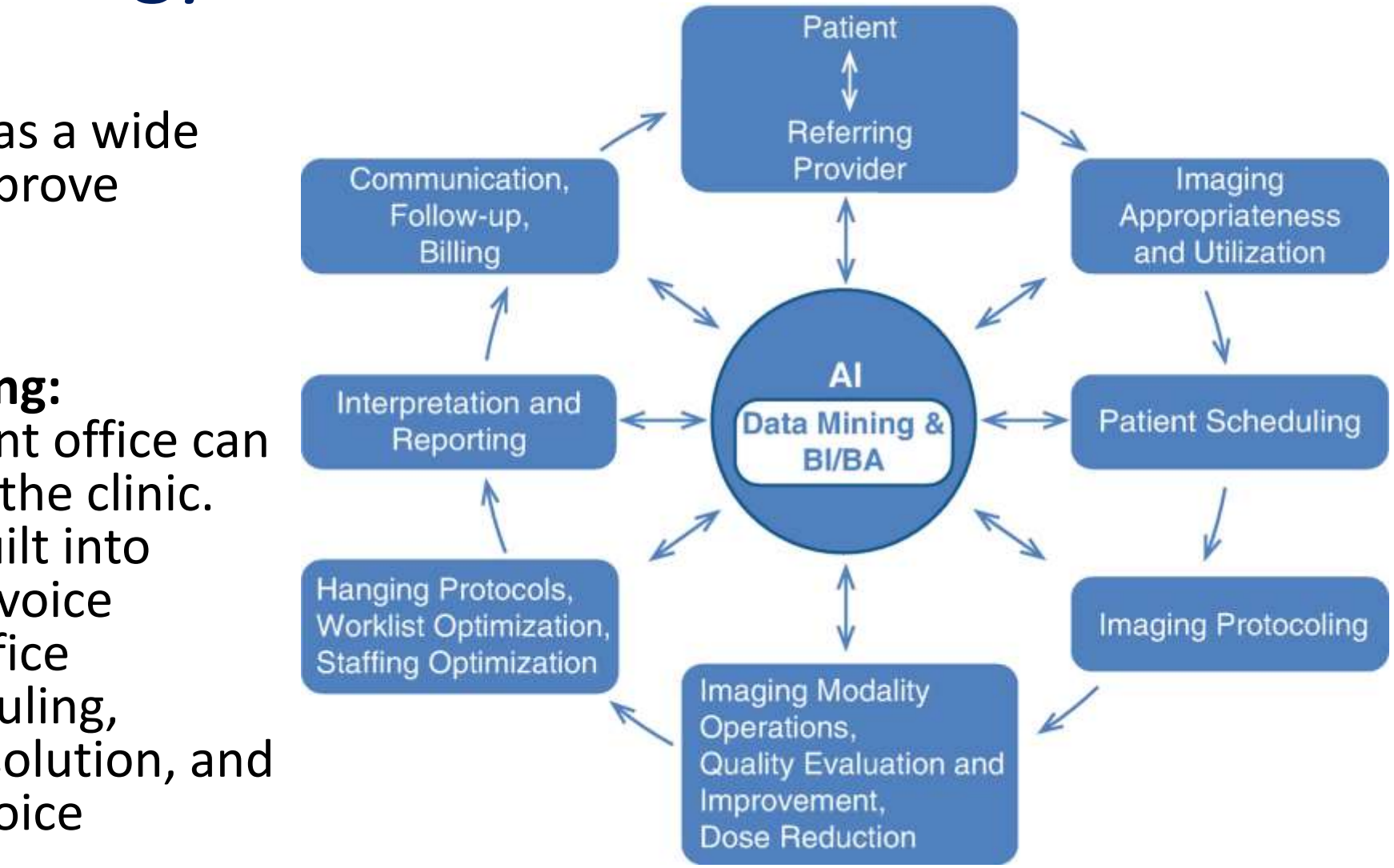
- Tele-ophthalmology has been proven to provide timely and cost-effective access to care, positively impacting patient outcomes.
- While physicians still face challenges, such as reimbursement and engagement, more favorable policies and regulations that embrace telemedicine are beginning to be released.
- Additionally, advances in AI will greatly impact the future of tele-ophthalmology, with increased success in medical device diagnostics and robotic capabilities.



Tele-Ophtalmology

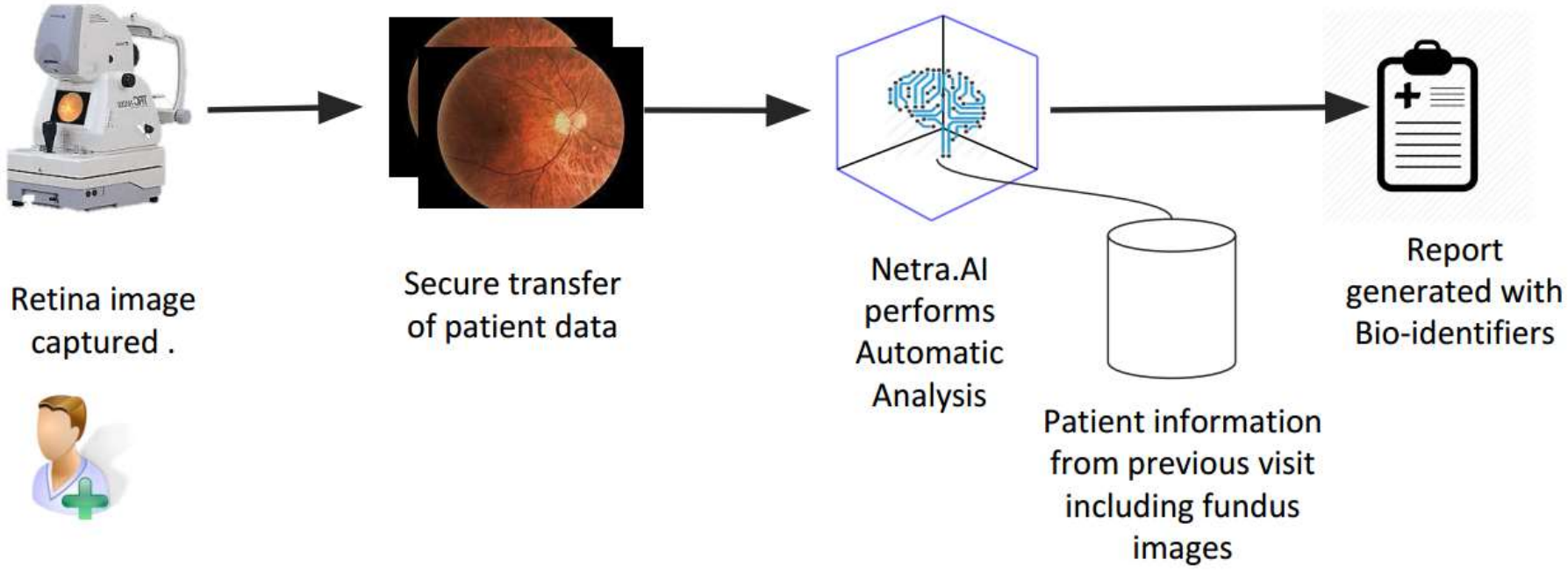
AI in tele-ophthalmology has a wide range of applications to improve medical practice.

- **AI in scheduling and billing:** Mundane tasks in the front office can weigh down efficiency in the clinic. Currently, AI programs built into patient schedulers and invoice generators can reduce office workload by smart scheduling, insurance conundrum resolution, and improved accuracy of invoice generation and follow up.

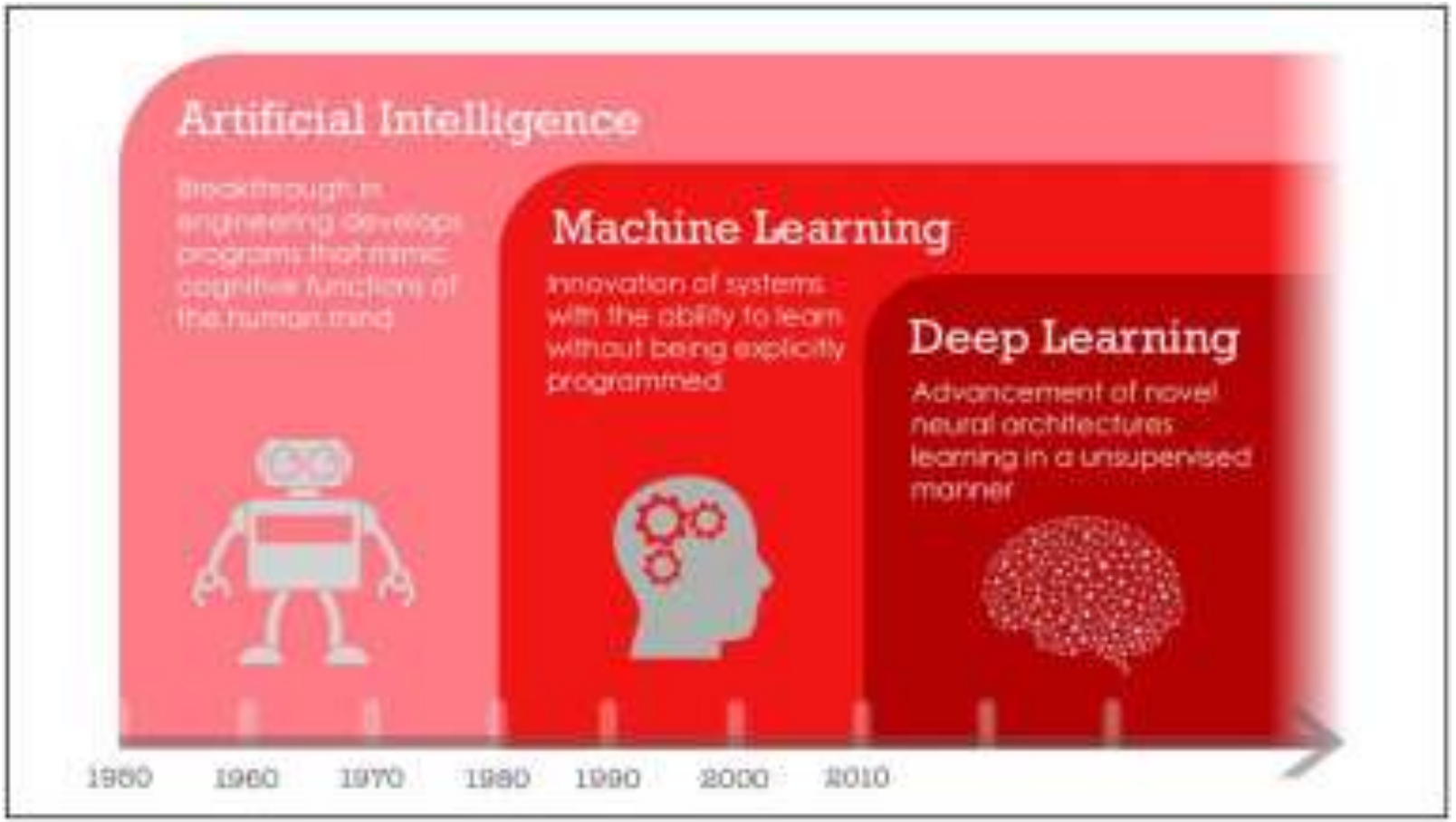


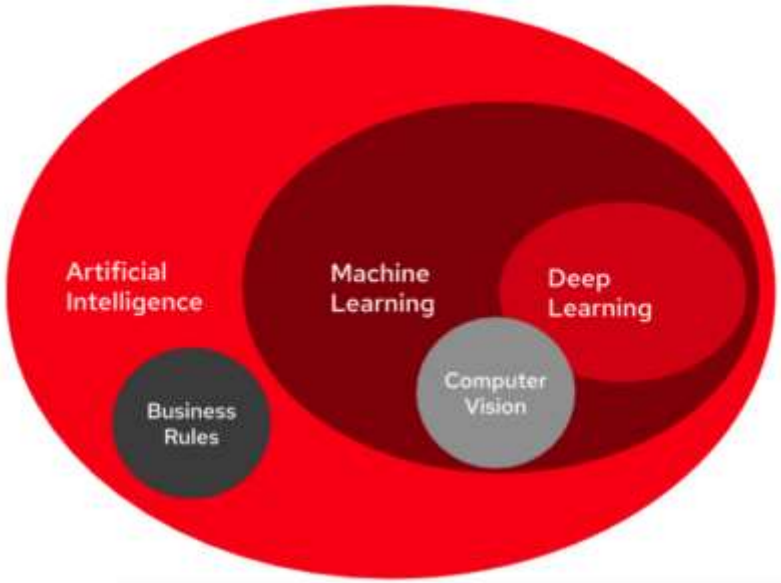
Tele-Ophtalmology

- **AI in diagnostics:** AI utilities in medicine are computer software programs that are trained to emulate physician interpretation of test results. Importantly, such programs are only as useful and accurate as the universe of data that has been used for training.



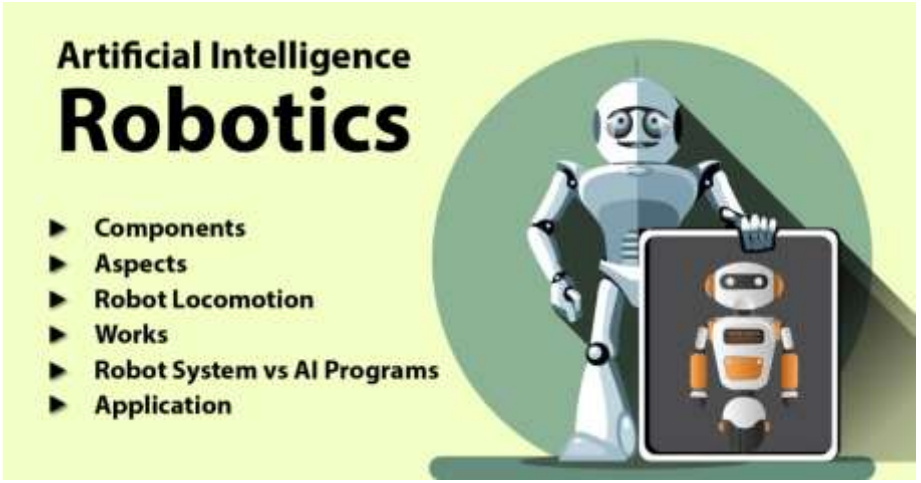
Tele-Ophtalmology





Tele-Ophtalmology

- **AI and robotics in medicine:** Computer-assisted surgery has made possible both minimally invasive surgery and remote surgery.
- Many ophthalmic devices, from fundus cameras to microperimeters, use AI-guided robotics for auto-alignment, focus, and image or data capture.
- Some can function autonomously to screen patients without clinic personnel assistance conversing with a patient, even offering instructions in the patient's native language.
- Such technology is extremely useful in remote and underserved areas of the world.



Tele-Ophtalmology

- **Monitoring patients at home:** Remote patient monitoring devices allow for the collection and tracking of health data for an individual patient. It is important that the data being collected by remote monitoring systems is continuously monitored and analyzed on an individualized basis.
- Additional AI utilities need to be developed as watchdogs to aid in assessing individual patient data on arrival.
- These utilities will be used to make more advanced analysis with patients' stored data history and formulate a decision based on AI that determines the need for physician attention and the urgency of care.

Telemedicine to follow patients in a General Surgery department, RCT

- A prospective randomized clinical trial (RCT) was conducted in 200 patients to compare conventional vs telemedicine follow-up in the outpatient clinics.
- The primary outcome was the feasibility of telemedicine follow-up and the secondary outcomes were its clinical impact and patient satisfaction
- The primary outcome was achieved in 90% of the conventional follow-up group and in 74% of the telemedicine group (P = 0.003). No differences were found in clinical outcomes (P = 0.832) or patient satisfaction (P = 0.099).
- Telemedicine is a good complementary service to facilitate follow-up management in selected patients from a General Surgery department.

- Telemedicine to follow patients in a general surgery department. A randomized controlled trial March 2020, The American Journal of Surgery 219(6), DOI: 10.1016/j.amjsurg.2020.03.023

TeleRadiology

- Radiology was founded on a technological discovery by Wilhelm Roentgen in 1895.
- Teleradiology also had its roots in technology dating back to 1947 with the successful transmission of radiographic images through telephone lines.
- The evidence regarding feasibility of teleradiology and related information technology applications has been well documented for several decades.

The Empirical Foundations of Teleradiology and Related Applications: A Review of the Evidence, Rashid L. Bashshur, Elizabeth A. Krupinski, James H. Thrall, Noura Bashshur. VOL. 22 NO. 11 NOVEMBER 2016 TELEMEDICINE and e-HEALTH; DOI: 10.1089/tmj.2016.0149

TeleRadiology

- The majority of studies focused on intermediate outcomes, as indicated by comparability between teleradiology and conventional radiology.
- A consistent trend of concordance between the two modalities was observed in terms of diagnostic accuracy and reliability.
- Additional benefits include:
  - Reductions in patient transfer,
  - Reductions in re-hospitalization,
  - Reductions in length of stay.

The Empirical Foundations of Teleradiology and Related Applications: A Review of the Evidence, Rashid L. Bashshur, Elizabeth A. Krupinski, James H. Thrall, Noura Bashshur. VOL. 22 NO. 11 NOVEMBER 2016 TELEMEDICINE and e-HEALTH; DOI: 10.1089/tmj.2016.0149

TeleRadiology

- Computed radiography with teleradiology had significant clinical value in this resource-limited setting, with the potential to affect both patient outcomes and treatment costs through providing improved diagnostics and avoiding unnecessary treatments and medications.
- Final analysis included 536 cases.
- Diagnosis changed following radiography and teleradiology in 62% of cases, and treatment plans changed in 61%.

The impact of computed radiography and teleradiology on patients' diagnosis and treatment in Mweso, the Democratic Republic of Congo Iona Crumley, Jarred Halton, Jane Greig, Lucien Kahunga, Jean-Paul Mwanga, Arlene Chua, Cara Kosack, January 2020, PLoS ONE 15(1):e0227773, DOI: 10.1371/journal.pone.0227773

TeleRadiology

- Reduced final treatment plans were most common for
  - exploratory surgery (72% decrease),
  - surgical orthopaedic intervention (62% decrease),

  allowing more conservative medical or surgical management in 61 cases.

The impact of computed radiography and teleradiology on patients' diagnosis and treatment in Mweso, the Democratic Republic of Congo
Iona Crumley, Jarred Halton, Jane Greig, Lucien Kahunga, Jean-Paul Mwanga, Arlene Chua, Cara Kosack, January 2020, PLoS ONE 15(1):e0227773, DOI: 10.1371/journal.pone.0227773

The term “telepathology” was Introduced into The English language in 1986 by Weinstein [Weinstein 1986; Kaplan et al. 2012]

Imaging System	Year
Real-time Imaging	
Television microscopy	1952
Dynamic-robotic telepathology	1986
Static Image Telepathology	
Store & Forward telepathology	1987
Whole slide imaging (automated)	1991
Whole slide imaging (operator-directed)	1994
Multi-Modality Telepathology	
Hybrid dynamic robotic/static imaging	1989
Whole slide imaging dynamic robotic/static imaging	2011

AMERICAN TELEMEDICINE ASSOCIATION

CLINICAL GUIDELINES FOR TELEPATHOLOGY

AUGUST 2014

Telesurgery

- Wireless networking and **robotic technology** to allow surgeons to operate on patients who are distantly located. This technology not only benefits today's shortage of surgeons, but it also eliminates geographical barriers that prevent timely and high-quality surgical intervention, financial burden, complications, and often risky long-distance travel.
- The system also provides improved surgical accuracy and ensures the safety of surgeons.

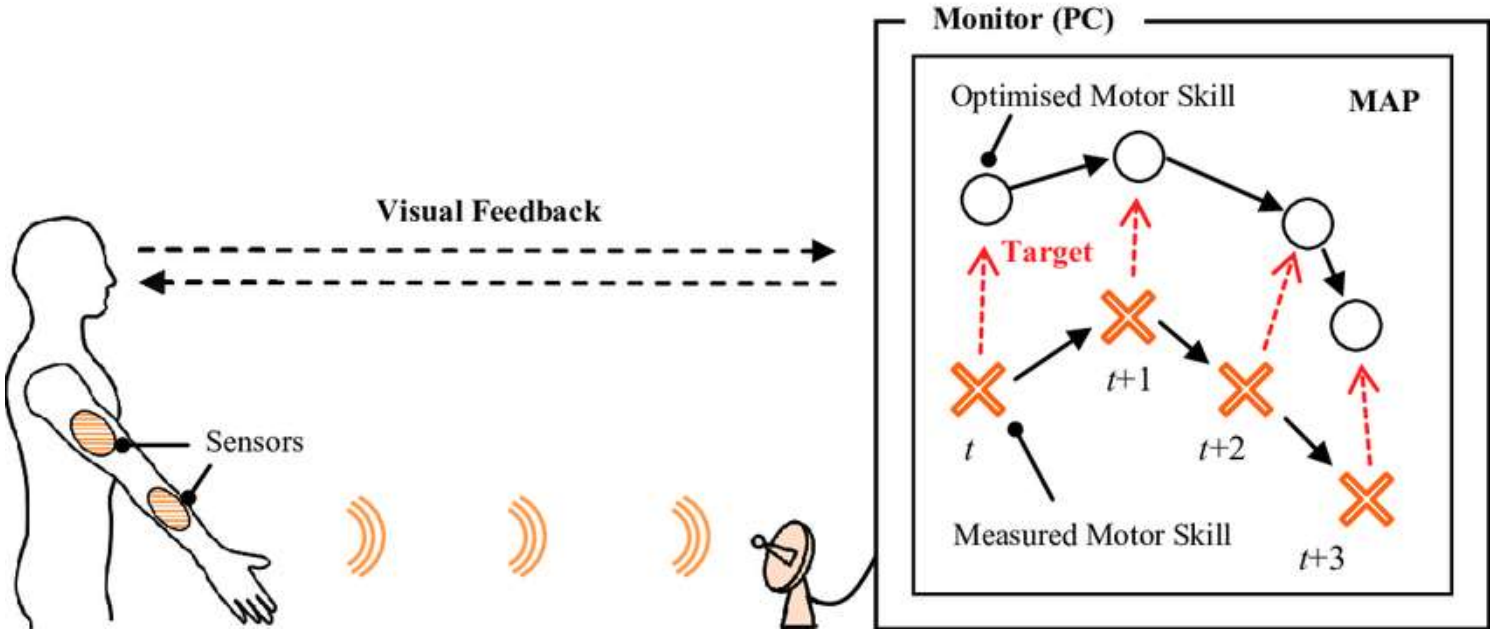
Choi P J, Oskouian R J, Tubbs R (May 31, 2018) Telesurgery: Past, Present, and Future. Cureus 10(5): e2716. DOI 10.7759/cureus.2716

Telesurgery

Benefits of Telesurgery
Provides high-quality surgery to medically underserved locations [6]such as rural areas, battlefields, and spacecraft [5-8]
Eliminates the need for long-distance travels, along with travel-related financial burden and dangers [2-5,7]
Today's 3-Dimensional display system provides a shared, high-definition visual feedback to surgeons at different centers simultaneously [5,9]
Allows for surgical collaboration amongst surgeons at different medical centers in real-time [3,10]
Operator's physiologic tremor can be canceled out in real-time with accelerometer technology [3,11-13], improving surgical accuracy and reducing damage to adjacent healthy tissues [3,12]
Minimized damage to healthy tissues quickens patient recovery [3]

Telesurgery

- **Innovations in the visual feedback system**



Telesurgery

- **Innovations in the visual feedback system**
- In 2014, Shenai et al. introduced Virtual Interactive Presence (VIP), a novel technology that allows remote neurosurgeons to collaborate with a shared 3-Dimensional (3D) display via high-definition binoculars.
- This real-time visual system allows the surgeons to view a merged surgical field display of each other's hand motions.

Choi P J, Oskouian R J, Tubbs R (May 31, 2018) Telesurgery: Past, Present, and Future. Cureus 10(5): e2716. DOI 10.7759/cureus.2716

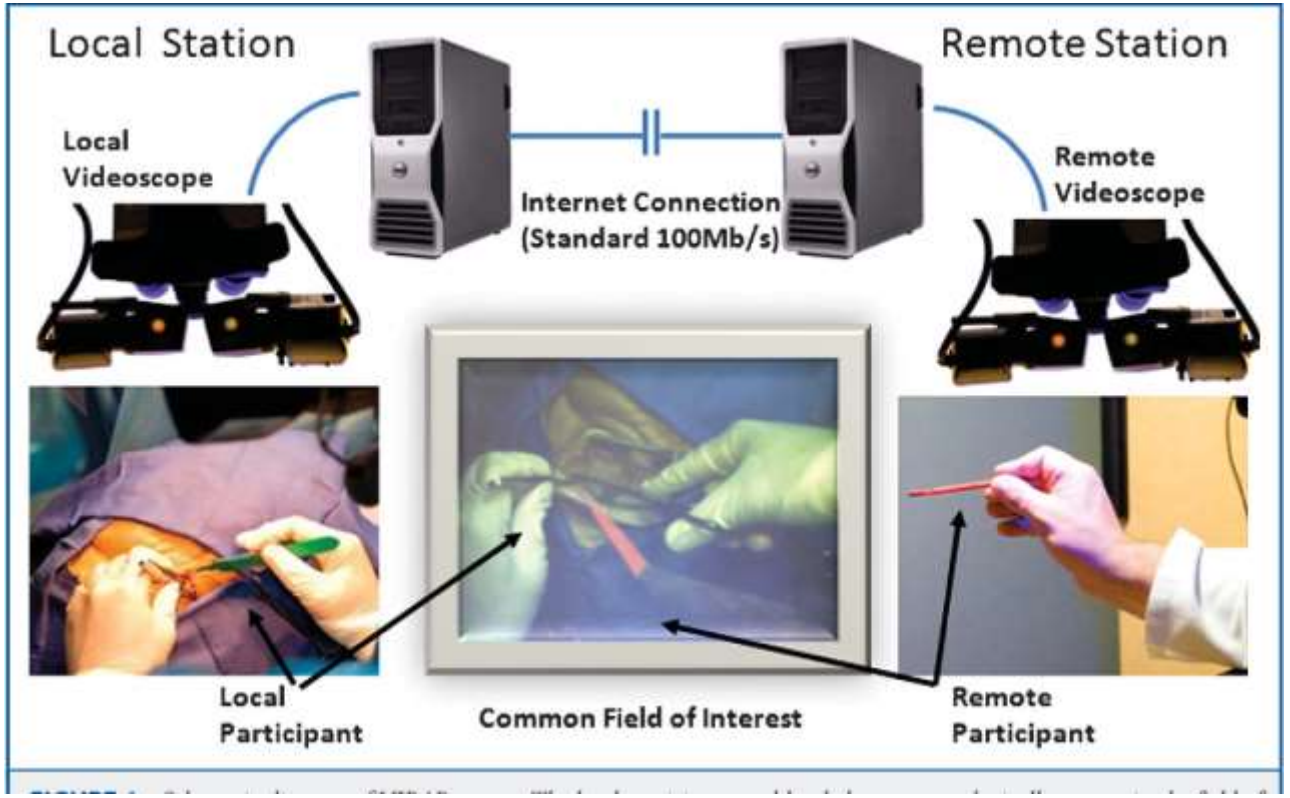
Telesurgery

- **Innovations in the visual feedback system**
- Shenai et al. carried out successful suboccipital craniotomies and microscopic approaches to the pineal gland on a cadaveric model using VIP.

Choi P J, Oskouian R J, Tubbs R (May 31, 2018) Telesurgery: Past, Present, and Future. Cureus 10(5): e2716. DOI 10.7759/cureus.2716

Telesurgery

- Therefore, VIP would not only be applicable in surgical patient care but would also be useful in surgical training since it allows for a profound real-time interaction among surgeons at different medical centers from around the world.



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Telesurgery

- **Studying the latency time**
- A major problem with telesurgery is latency time, which is defined as the time delay in transferring auditory, visual, and even tactile feedback between the two distant locations.
- According to Wirz et al., an ideal latency time is less than 100 milliseconds and a latency time that is greater than 300 milliseconds produces major inaccuracies in instrument handling.

Choi P J, Oskouian R J, Tubbs R (May 31, 2018) Telesurgery: Past, Present, and Future. Cureus 10(5): e2716. DOI 10.7759/cureus.2716

Telesurgery

- **Studying the latency time**
- The first telesurgical cholecystectomy conducted in 2001 had a latency time of 155 milliseconds
- Further, a Da Vinci (Intuitive Surgical, Sunnyvale, CA, USA) prototype was used by Nguan et al. in 2008 to check its feasibility in a telesurgical application.

Choi P J, Oskouian R J, Tubbs R (May 31, 2018) Telesurgery: Past, Present, and Future. Cureus 10(5): e2716. DOI 10.7759/cureus.2716

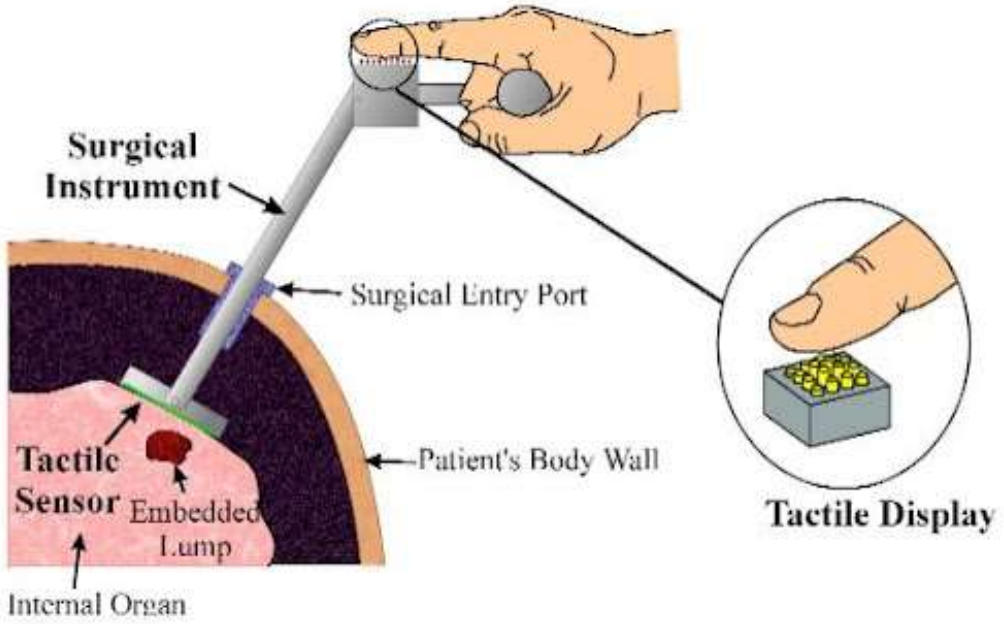
Telesurgery

- Although a latency time of less than 100 milliseconds can be achieved with today's high-speed fiber optic cables and a dedicated asynchronous transfer mode (ATM), 40 technicians must be present during the surgery to maintain this speed.
- Interestingly, Xu et al. studied the effects of latency time training and claimed that a degree of inaccuracy from a time delay can be overcome via training the teleoperator.

Choi P J, Oskouian R J, Tubbs R (May 31, 2018) Telesurgery: Past, Present, and Future. Cureus 10(5): e2716. DOI 10.7759/cureus.2716

Telesurgery

- **Introduction of haptic feedback technology**
- The conventional telesurgery system had a major drawback in that it failed to provide tactile information and the operator solely relied on a visual feedback.
- The technology that enables transmission of tactile information to the teleoperator is termed "haptic feedback."

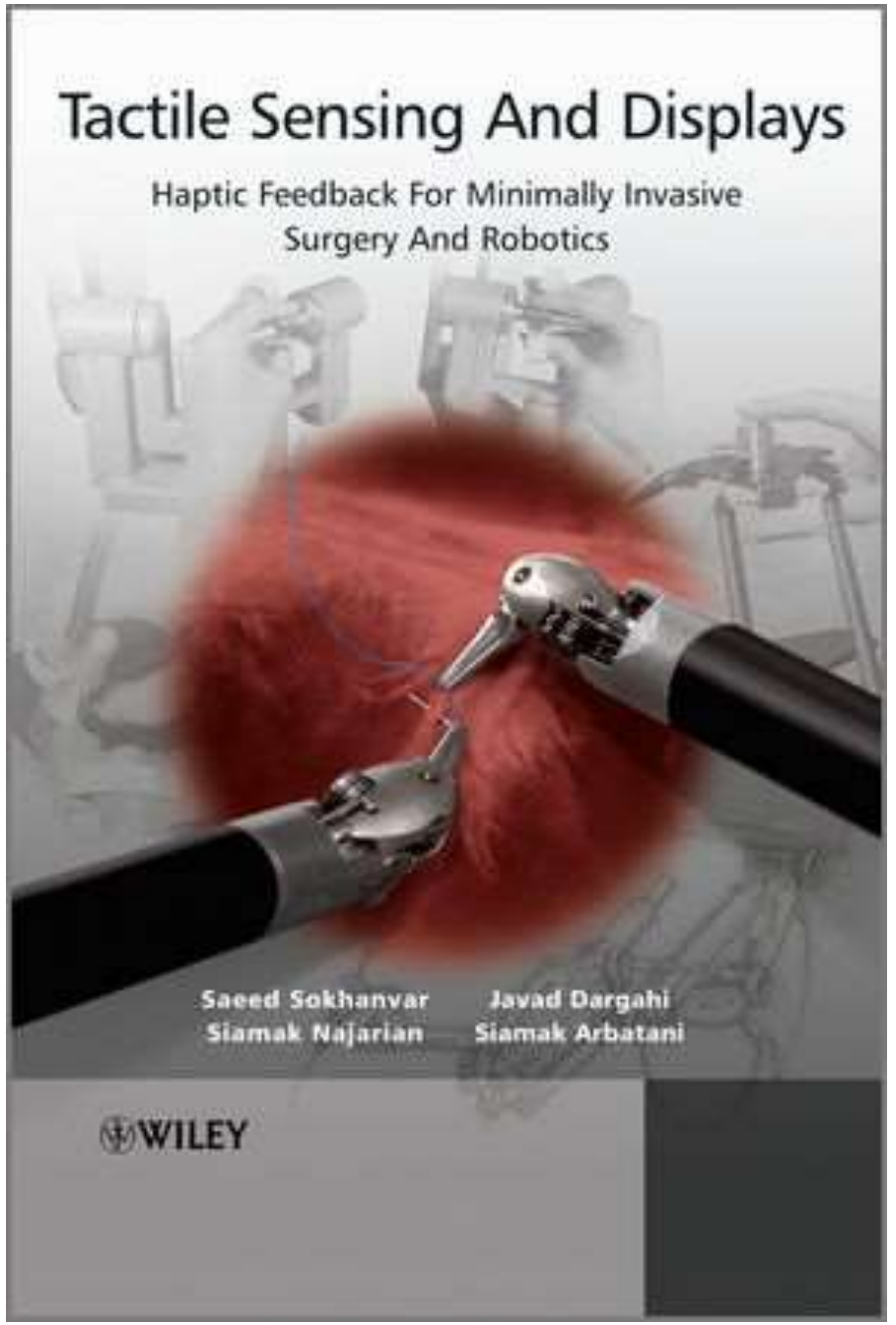


Choi P J, Oskouian R J, Tubbs R (May 31, 2018) Telesurgery: Past, Present, and Future. Cureus 10(5): e2716. DOI 10.7759/cureus.2716

Telesurgery

- Haptic Feedback

enables the operator to feel the consistency of the tissue and the tension within the sutures, prevents damage to the fragile tissues or tearing of the sutures during the operation, and improves the operator's confidence during surgery



Telesurgery

- The first telesurgery prototype that implemented haptic feedback technology was Telelap Alf-x (SOFAR S.p.A., ALF-X Surgical Robotics Department, Trezzano Rosa, Milan, Italy), which was introduced in 2015 Telelap Alf-x, by providing a haptic feedback to the surgeon, successfully reduced the average time of experimental cholecystectomy by 60 minutes.

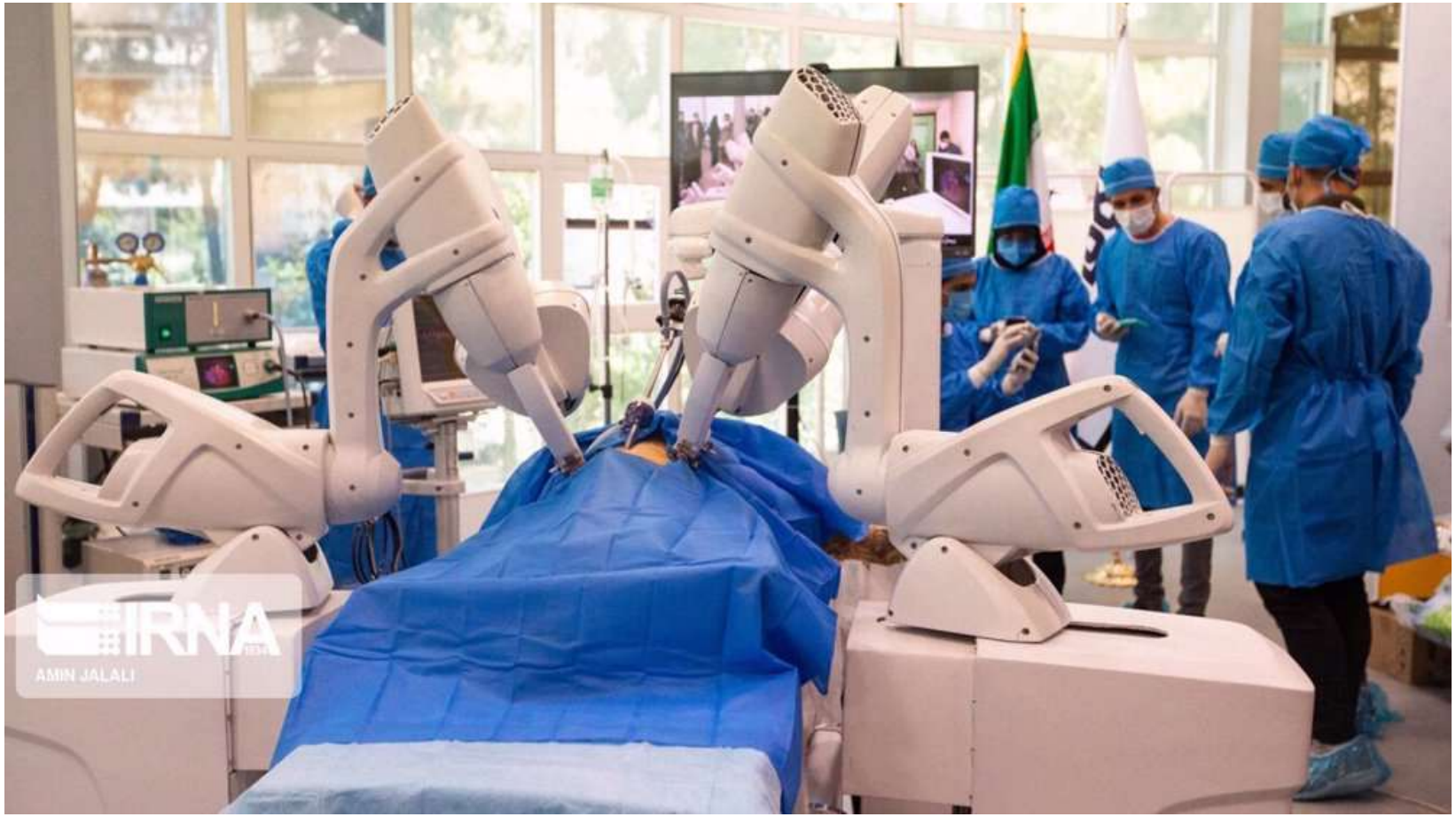
Choi P J, Oskouian R J, Tubbs R (May 31, 2018) Telesurgery: Past, Present, and Future. Cureus 10(5): e2716. DOI 10.7759/cureus.2716

Telesurgery

Factors that limit Telesurgery's Clinical Translation
Lack of fully developed training programs and standard operating protocols (including that for equipment maintenance)
The difficulty of the acquisition of equipment
Need for development of a global network
Billing issue on distributing operation fee and facility fee among the participating medical centers
Funding issues
Legal issues, which vary across state and country borders

Sina
https://sinamed.ir/

Iran becomes 2nd country to successfully conduct robotic telesurgery



Wednesday, 23 June 2021

Telesurgery

- The operation was conducted at Tehran's Imam Khomeini Hospital, using a domestically-built robosurgeon on a dog.
- The surgeon handling the machine was based seven kilometers (four miles) away at the capital's Sina Hospital.
- The robot is outfitted with two mechanical arms. The arms are connected to a distant control panel manned by the human surgeon.

Telesurgery

Telemedicine

ICT PSP – Empowering patients and supporting widespread deployment of telemedicine services

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European Momentum for Mainstreaming Telemedicine Deployment in Daily Practice
(Grant Agreement No 297320)

List of critical success factors
dated 6th May 2014

Telemedicine

- By analysing recent telemedicine practices, experts from across Europe found these **18 critical success factors** for deploying telemedicine:

Telemedicine

- Check that there is cultural readiness towards telemedicine;
- Ensure leadership through a champion;
- Identify a compelling need;
- Put together the resources needed for deployment and sustainability;
- Address the needs of the primary client(s);
- Involve healthcare professionals and decision makers;
- Prepare and implement a business plan;
- Prepare and implement a change management plan;
- Put the patient at the centre of the service;

Telemedicine

- Establish that the service is legal;
- Ask advice from legal, ethical, privacy and security experts;
- Apply relevant legal and security guidelines;
- Ensure that telemedicine doers and users have "privacy awareness";
- Ensure that the IT and eHealth infrastructures needed are in place;
- Ensure that the technology is user-friendly;
- Monitor the service;
- Maintain good practices in vendor relations;
- Guarantee that the technology has the potential for scale-up (i.e., "think big").

18 critical success factors in Telemedicine

1. **Check that there is cultural readiness towards telemedicine**

Cultural readiness within a healthcare system/organisation is a set of beliefs and perceptions that influence establishment of priorities; attitudes that determine behaviour including decisions, ideas and practices that determine how a person, organisation, society will respond to the environment; and challenges that determine whether telemedicine will be viewed positively or negatively, and will be embraced, rejected or just ignored.

18 critical success factors in Telemedicine

2. Ensure leadership through a champion

A champion is a person who is committed to the telemedicine idea/initiative/service and is willing to put himself/herself on the line to make it happen, has the ability to enlist others to the cause, can secure the commitment of the leadership (of the organisation or the system), and has the ability to mobilise resources to make it happen including other people who can be operational leaders.

18 critical success factors in Telemedicine

3. Identify a compelling need

A compelling need is a sufficiently high level "problem" (i.e., shortage of healthcare professionals, excessive use of resources, wastage, or other) for which a telemedicine service can supply a solution. There may be a single compelling need or there may be a set or combination of compelling needs.

18 critical success factors in Telemedicine

4. Put together the resources needed for deployment and sustainability

Resources refer to the means needed to develop and deploy the telemedicine service, as well as to ensure its sustainability. There are essentially four major types of resources:

- Financing at a sufficient level to develop and support the service (which may include, grants, investments subsidies, or income from the sale of services).
- People/human resources with specific attributes and expertise (ideas, concepts and know-how), in appropriate positions who have the appropriate availability, and/or people with potential who can achieve the requisite level of know-how with appropriate training.
- Information (e.g., on what is going on politically, socially, organisationally, technologically, including business intelligence).
- Time (having the time to do it; at the right time) or making time available to/for the critical people involved by establishing priorities, setting deadlines, appropriate phasing and staging.

18 critical success factors in Telemedicine

5. Address the needs of the primary client(s)

A primary client is a person, specialty group or organisation who has clear incentive(s) to set up the service.

6. Involve health care professionals and decision-makers

This is the process of engaging healthcare professionals who are affected by the new telemedicine service. This process includes actions that help healthcare professionals to define and accept modifications in their usual way of delivering care as a result of a new service, and encourages them to act as advocates of the innovation. Depending on the telemedicine service, the targeted healthcare professionals could vary i.e., they could be physicians, nurses, or specific groups of professionals.

18 critical success factors in Telemedicine

7. Prepare and implement a business plan

A business plan is a written document which results from careful analysis of available data. It describes the planned telemedicine service, its sales and marketing strategy, and its financial background. It also contains a projected profit-and-loss statement. A business plan for the new service has to be in place even when the telemedicine service is provided by a non-profit or a governmental organisation.

18 critical success factors in Telemedicine

8. Prepare and implement a change management plan

A change management plan may need to cover various phases of the implementation process that supports the introduction of the telemedicine service. This action may include a range of potential activities, such as:

- Prepare a plan for change management.
- Add extra resources during the initial deployment phase.
- Develop a communications strategy, and explain the reasons for the change taking place.
- Support the telemedicine service to form part of an existing care pathway or counteract any challenges that prevent its seamless implementation into the existing workflow.
- Identify training and capacity-building needs.

18 critical success factors in Telemedicine

9. Put the patient at the centre of the service

Patient-centredness means developing the service with the patients' perspective in mind. It takes into account the values of the culture, the personal and social needs of the users, and the users' comfort level, with the different forms of interaction – face-to-face and virtual. It strengthens the human relationship and does not depersonalise it.

18 critical success factors in Telemedicine

10. Establish that telemedicine is legal

Find out whether either (a) the telemedicine service at stake is authorised by public authorities or (b) the service is authorised by other bodies which have the competence to do this, ensuring that it enables a legitimate way to practise medicine. Make sure that telemedicine is not inhibited by law or is not considered to be in conflict with the requirements for best practice in medicine.

18 critical success factors in Telemedicine

11. Ask advice from legal, ethical, privacy and security experts

Legal, ethical, privacy and security experts should have knowledge of regulations relevant to telemedicine at all levels, internationally, nationally and locally.

12. Apply relevant legal and security guidelines

There are guidelines for specific countries and for professional groups – such as doctors – that codify legislative and security measures as well as ethical and policy considerations.

13. Ensure that telemedicine doers and users have "privacy awareness"

"Privacy awareness" is knowledge about appropriate practice when it comes to privacy and security behaviours. It is based on current ethical and legal principles.

18 critical success factors in Telemedicine

14. Ensure that the IT and eHealth infrastructures needed are in place

This two forms of infrastructure include:

- **IT infrastructure**: An IT infrastructure is in place that ensures successful deployment and good functioning of the telemedicine communication system.
- **eHealth infrastructure**: Health information systems – such as electronic health records and patient health records – are in place that capture, store and distribute clinical data across different levels of care, and among health providers and patients,

Exchanging health data may require interoperable health information systems.

18 critical success factors in Telemedicine

15. Ensure that the technology is user-friendly

Ensure that the technology is simple and user-friendly: think about usability and the actual technology

- Usability: means that the technology must be easy-to-use and have a user-friendly design.
- Technology: means using technology standards and avoiding specific technology dependencies.

18 critical success factors in Telemedicine

16. Monitor the service

Monitor the service operations to ensure that they run smoothly. Consider the needs of the users. Identify possible refinements to the service. Consider outlining specifications for each of these aspects of the service operation.

17. Maintain good practices in vendor relations

The deployment requires a partnership between the doers and the industry at all sorts of phases of the deployment. Good practices in vendor relations are based on a transparent, straightforward service level agreement signed by the contracting parties. Service level agreements and contracts need to be underwritten that clearly define what is expected from both parties, and what are the rights and liabilities of engagement.

18 critical success factors in Telemedicine

18. Guarantee that the technology has the potential for scale-up (i.e., "think big"). Consider that it may be important to grow and extend the telemedicine service to a larger scale. Therefore, choose the appropriate vendor and technology. The potential for scale-up can be achieved by using either standard technologies or technologies that are similar and yet are produced/offered by a range of suppliers.

THANK YOU