Learning Points

- Telemedicine is defined as the remote delivery of healthcare services through audio-visual telecommunication systems. Telehealth also uses artificial intelligence, wearable technologies, and alternative strategies to enhance and personalize care.
- Telehealth promises many benefits, and the market for these services is expanding worldwide.
- While anesthesia staff have pioneered telehealth programs in perioperative settings, proper technical equipment, enhanced training, evolution of medical licensure and changes in reimbursement policy are necessary to expand telehealth in the practice of Anesthesiology.

Telemedicine Definition and Market Overview

According to the American Telemedicine Association (ATA), telemedicine is defined as the remote delivery of health care services and clinical information using telecommunications technology. Its close synonym and more current terminology, telehealth, also describes efforts to deliver health care services that utilize artificial intelligence (AI), virtual reality and behavioral economics in new and exciting ways [1]. As the Internet evolves and high-speed cable networks become more available, healthcare providers are exploring new mechanisms to accelerate care pathways, decentralize highly congested clinical environments, and reach more patients in remote areas. Certain specialties, like radiology, primary care, emergency medicine, and neurology have been practicing (and getting reimbursed for) telemedicine services for years. Other specialties, like dermatology and anesthesiology, are now venturing into these efforts as well. Using technology to expand capacity, patient access, and creative problem-solving is extremely important, especially as part of efforts to control pandemic infections like COVID-19.

Telehealth promises many benefits, including improved access, cost efficiencies, higher quality, and a better ability to address consumer demand. Regarding access, technology can bring together patients and providers across small and long distances, across urban and remote areas, and better match patients suffering from unique problems with world-class specialists that focus on their disease process. Telehealth has large potential to reduce the overall cost of healthcare, improve management of patients with chronic disease, create shared staffing models, and decrease time to travel between home and care locations.
Considering how patients perceive the quality of telehealth services, a growing number of studies have shown equivalency between telehealth and in-person health visits, and in some cases, such as mental health and Intensive Care Unit (ICU) care, telemedicine may show superior patient satisfaction and outcomes [1].

And finally, consumers continue to demand products or services that make it easier to manage their healthcare. Telemedicine allows patients to stay in their homes when they have an appointment, or place a video call on their lunchbreak from work, minimizing disruptions in their everyday lives. Patients can avoid the stressors of negotiating time off from their employer, arguing with other drivers in heavy traffic, or finding parking near their busy urban clinic.

Healthcare workers provide telehealth through a variety of services. Live videoconferencing describes a synchronous encounter where, for example, a patient is able to live-stream a conversation with a healthcare provider through the use of an application that is compliant with the Health Insurance Portability and Accountability Act (HIPAA) of 1996. Alternatively, a primary care provider may videoconference with a cardiology specialist in a different part of town or across the country. Store and forward services describe an asynchronous transfer of information, often digital images. For example, computed tomography (CT) or magnetic resonance imaging (MRI) scans can be captured and then sent to another provider for diagnosis or additional consultation. Remote patient monitoring is a telehealth service that uses wearable, implantable or other devices in close proximity to the patient to collect and transmit data to another location for evaluation. The pacemaker industry has utilized this service for years, but now new devices can measure continuous blood glucose [2] or capture simplified electrocardiogram (EKG) rhythm strips [3] and send them to healthcare professionals if patients opt-in to this service.

While the business market for telehealth is growing rapidly, the exact size is difficult to quantify. Of the data available, the ATA estimates that 200 telehealth networks exist in the United States (US), directly linking tertiary care centers with rural or suburban sites, across a total of nearly 3000 locations [1]. Meanwhile, the American Hospital Association (AHA) conducts annual surveys of its member institutions, including an assessment of their Information Technology (IT) systems. According to a 2019 AHA Fact Sheet on telehealth, the percent of US hospitals that had implemented a computerized telehealth system grew from 35% in 2010 to 76% in 2017 (Fig. 9.1) [4]. In addition, among US hospitals, use of remote patient monitoring has grown rapidly from 43.1% in 2015 to 61.2% in 2017 (Fig. 9.2) [4].
One of the main drivers of this increase in telehealth opportunities is the growing use of personal cellular devices, particularly smart phones (and tablet computers), which enable video-chat consultations to a much wider population of patients. Based on a 2019 survey conducted by the Pew Research Center, 96% of Americans own some form of a personal cell phone, and 81% of those are smartphones (assuming live video streaming capabilities) [5]. According to this same survey, while 53% of respondents over age 65 owned smart phones, 79% of respondents ages 50–64 owned them, pointing towards an increasing prevalence of smart phones as the 50–64 year-olds age into their Medicare-eligible years.

Further evidence is readily available to support the predicted growth of telehealth in the US and worldwide. In a 2016 Cable News Network (CNN) article, Mercy Hospital in St. Louis, MO, announced the opening of a $54-million facility, with 330 employees and no physical hospital beds [6]. The strategy of the Mercy’s Virtual Care Center was to provide all eligible patients with Apple iPads, conduct live video consultations with patients, and review certain patients’ vital signs and other physiologic activities with remote monitoring. This was part of a major initiative to personalize care for some of the health system’s sickest patients in their own homes, in hopes to reduce rates of costly re-admissions. Several other health systems have also invested significant funds in telehealth ventures across the US and the globe. In addition, according to a 2018 analysis by Deloitte, consumers report that their #1 priority in healthcare is personalization of their care [7]. Telehealth is identified as a primary strategy for hospitals to achieve this goal, and to enhance the patient experience. This translates into wanting more transparency of patient data (e.g. lab results), easier ability to schedule live in-person visits with their providers when necessary, as well as more convenient patient-provider interactions like telehealth. This trend is also growing outside the US, as the international telemedicine industry is expected to exceed $40 billion by 2021 [8].

### Examples of Telemedicine in Anesthesia: Intensive Care Unit, Pre-op, Intra-op, Post-op

Given the potential benefits of telehealth opportunities, it is appropriate to review how telehealth has been used to-date in Anesthesiology and Critical Care. Many studies claim improvements in overall survival outcomes, lower complication rates, and shorter length of stay (LOS) after implementing telemedicine programs. In a 2017 study, the authors described how implementing a telemedicine program in an ICU impacted their financial outcomes [9]. Researchers compared the baseline ICU patient group with a telemedicine-supported group, and later with a logistics center-supported group (supported by telehealth, as well as enhanced communication and standardized treatment protocols). By adding telemedicine and then a logistics center, this ICU was able to increase patient volume, decrease ICU LOS, and increase per case revenue relative to direct cost. Although the authors acknowledge that improvements in profitability seen in this study may be challenging to reproduce to the same degree after the implementation of the Affordable Care Act (ACA), they reported a $52.7 million improvement in total direct contribution margin. Even though the institution made an initial investment of $7.12 million to upgrade their IT infrastructure in the ICUs, they calculated that this amount was recouped in 2.75 months after ICU telemedicine was implemented.

While telehealth has gained momentum in ICU settings in the last 10–20 years, researchers from University Health Network in Toronto, Canada, were among the first to use telemedicine to perform pre-anesthesia assessments [10]. Authors stated that a significant percentage of Canadian patients (nearly 15%) live in remote areas far from tertiary care centers. Telemedicine showed promise to improve patient access to the healthcare system and reduce travel costs. As such, researchers then performed live video consultations on an initial ten patients. From a technical standpoint, live videoconference technology was installed at both the remote (patient) site and
the consultation (anesthesia preadmission clinic) site (Fig. 9.3), and the remote site also included a digital stethoscope to perform cardiac and pulmonary exams on the patient. The telecommunications network used for this study was operating with a bandwidth of 384 kilobytes per second (kbps). An anesthesiologist conducted the interview from the preadmission clinic, while the patient answered questions and underwent a stethoscope exam with a nurse’s assistance at the remote site. The mean time needed to conduct the telemedicine consultation was 31 ± 7 min. While nine out of ten patients stated they were highly satisfied with the experience, eight out of ten anesthesiologists were also highly satisfied. Patients also reported happiness in avoiding time and cost that would have been associated with an in-person visit.

In a more recent 2018 study, researchers from Philadelphia, PA were concerned about extremely long times that patients spent in their preadmission testing center (PAT) [11]. A subset of 361 patients (out of 7803 total patients) were selected to receive a telemedicine screening visit, prior to their PAT appointment. Authors reported a statistically significant decrease in mean time spent in PAT from 121 ± 41 min to 72 ± 24 min for patients that underwent a telemedicine screen prior to their scheduled PAT appointment. In addition, the patients pre-screened by telemedicine reported extremely high levels of satisfaction and reported no surgical case cancellations. Currently, a handful of healthcare institutions have already pioneered or are currently investigating telehealth consults to entirely replace in-person visits for pre-anesthesia assessments in select patient populations.

One of the most widely-referenced studies on telemedicine in anesthesia was published in 2009 [12]. Authors from Children’s Hospital of Pennsylvania (CHOP) in Philadelphia, PA partnered with colleagues from Bangalore, India to provide live telemedicine consultation during two separate pediatric liver transplantations. Despite differences in time zones, anesthesiology staff members at CHOP provided consultation to the team in India during both the preoperative and intraoperative phases of care. Video cameras placed on surgeons’ heads and lights above the surgical field allowed CHOP physicians to view key stages of the procedure in real time. Simultaneously, as vital signs and lab results became available in India, CHOP anesthesia staff recorded trends in Excel spreadsheets in Philadelphia. While both medical teams felt they benefited from this pioneering experience, authors stated that these live-streaming consultations raised significant concerns that could challenge the expansion of this technology in the medical field, and specifically in Anesthesiology. The technical aspects of live telecommunication across vast distances need to be tested in advance of the live consultation, and backup systems must be prepared. When a telemedicine consultation is completed, should the medical professional be licensed in her/his home US state, the state or country where the surgical procedure is being performed, or both? As part of this study, the hospitals in Philadelphia, PA and Bangalore, India had a pre-standing agreement that required the
Indian facility to take full responsibility of liability, but this topic is still hotly debated in the US today.

Regarding telemedicine use in the post-operative phase of care, authors from a 2017 study implemented a telemedicine model in the post-anesthesia care unit (PACU) during ICU surge levels [13]. Clinicians created a 4-bed virtual ICU (VICU), upgraded patient monitoring hardware, and increased nursing ratios (1 nurse per 2 VICU patients) in their PACU suite. During the 3.5-year study period (from 1 January 2008 to 31 July 2011), the ICU team cared for 1037 VICU patients, 28% of whom transitioned to the SICU for further critical care needs. Meanwhile, the large majority (72%) of VICU patients transitioned directly to floor unit beds, thereby decongesting the ICU beds for truly the highest acuity patients. Authors emphasized that appropriate patient selection for VICU assignment was critical to ensure patient safety and increase overall ICU care volume.

**Equipment, Technical Support and Training**

While the full technical requirements needed to implement a telehealth program are beyond the scope of this chapter, a 2019 textbook (hardcopy or online) called *Telemedicine in the ICU* [14] provides an expanded discussion on operational models for tele-ICU care, staff role definitions, and requirements for hardware and software. In general, a typical tele-ICU workstation would include a primary computer with telehealth software installed, a video camera, and several monitors for physiologic data (vital signs), access to radiologic imaging, and direct interface with the electronic medical record. A telehealth workstation for anesthesia use could be as complex as a tele-ICU system, or it could be scaled down for more basic usage.

In addition, as broad-band telecommunication networks evolve across the world, data is being transferred faster and in greater quantities than ever before. Video applications (such as Zoom, GoToMeeting, etc.) are becoming more prevalent, more accessible to the general population from desktop or mobile devices, and more HIPAA-compliant. These video applications open the door to telehealth opportunities for anesthesia providers. Again, to cite a 2009 study by Fiadjoe and colleagues [12], it is important to test backup communication systems prior implementing telemedicine programs. And on-call technical support needs to be available on a 24-h, 7-day-a-week basis, such as “share my screen” sessions between clinical and support staff.

With the expected increase in demand for telehealth services, some academic institutions have started formal training programs for telehealth. Regarding workflows to train an anesthetic pre-procedure evaluation, telehealth programs should define pathways to identify which patients are appropriate for telehealth or in-person consultations. Pre-implementation analysis should also include a review of hardware, software, data storage and data sharing policies. Finally, simulation of telehealth visits could yield high value to test the existing telecommunication network, provider workflows and other unknown factors, all without risk to actual patients.

**Medical Licensure and Liability**

Regarding their relevance to telehealth, medical licensure and liability are hotly debated topics among today’s medical professional societies, governmental policy makers and health insurance leaders. By current law, each state issues its own medical license to practice within state boundaries. Does the provider’s license cover telehealth services if these services are provided across state lines? If not, does the provider need to obtain licensure in the patient’s state? The answer depends on each state’s law. To address this issue, several state medical boards have joined together to form the Interstate Medical Licensure Compact (IMLC) [15]. As of March 25, 2020, 29 states, the District of Columbia (D.C.), and Guam have agreed allow licensed physicians practice across state lines within the IMLC if physicians meet the eligibility requirements, which is true for at least 80% of recent applicants [15].
shows the current status of participation in the IMLC, broken down by state. Once a physician submits an application in her/his state of primary licensure (SPL), a new background check will be performed. A new qualified physician may then practice across state lines in any or all IMLC-participating states.

Unfortunately, telehealth liability is still contested in many medico-legal forums [16]. Who is responsible for managing a bad care outcome or medical error that results from a telehealth visit? If a plaintiff opens a legal suit, would both the local and remote providers be at risk of litigation? Does physician malpractice insurance cover telehealth services, and specifically if these services are delivered across state or national boundaries? The answers to these questions vary by state, by country, and by insurance provider. The key is to ask your group or institution’s legal counsel to identify these answers in your practice jurisdiction.

Reimbursement for Telehealth

Do Medicare and Medicaid pay for telehealth services? Prior to COVID-19 exceptions, the answer is yes, in certain situations. The Center for Medicare & Medicaid Services (CMS) does reimburse for some current procedural terminology (CPT) codes for telehealth services in radiology, pathology and some cardiology [1]. Medicare Advantage (managed care) patients can use telehealth options if they are available from their practitioners. The Medicare Program, however, has very specific requirements that must be
met in order to qualify for reimbursement of telehealth services [17]. In general, the originating site (patient location) must be in a county outside a Metropolitan Statistical Area (MSA), or the physician office address must fall within a Health Professional Shortage Area (HPSA). Patients or physicians can see if Medicare is likely to offer telehealth reimbursement by entering the physician office address into the Medicare Telehealth Payment Eligibility Analyzer [18]: https://data.hrsa.gov/tools/medicare/telehealth.

In addition, while Medicaid programs in all 50 states and Washington D.C. provide some form of reimbursement for telehealth services, most commonly live-video, the full range of covered services vary greatly by state [19]. An excellent resource that reviews Medicare reimbursement for telehealth services, including current telehealth-related CPT codes, is the Medicare Learning Network Booklet on “Telehealth Services,” most recently updated in March 2020 [17]. Another valuable resource is the Fall 2019 report by the Center for Connected Health Policy (CCHP), entitled “State Telehealth Laws & Reimbursement Policies” [19]. At the current time, unfortunately, there are no CPT codes specific to Anesthesia Telehealth services that qualify for CMS reimbursement. Moreover, very little additional information exists regarding private insurance coverage for Anesthesia Telehealth services.

The pre-surgical clinic, however, does represent an opportunity to expand anesthesia telehealth services. If pre-surgical clinics are supervised by Internal Medicine or Primary Care physicians, CMS will reimburse for some Part B services via telemedicine. This would provide funding to pay for direct and indirect costs associated with a pre-surgical clinic. Under current reimbursement regulations, unfortunately, if Anesthesia staff members complete pre-procedure consultations in a pre-surgery clinic, they cannot bill separately from the global Anesthesia fees that are charged on the day of surgery. Despite this obstacle, the value provided from an Anesthesia-supervised pre-surgical clinic may offset other institutional costs. An Anesthesia Telehealth consultation may be used as part of a strategy to enhance more personalized care, increase patient satisfaction scores, or decrease same-day surgical cancellation rates.

Now that we have reviewed the history of telehealth, its potential applications in Anesthesiology, medical licensure and liability, as well as current reimbursement policies, isn’t it time for Anesthesiology practitioners to step forward and lobby for reimbursement for Anesthesia Telehealth services?

### Key Telehealth Resources

Finally, several resources exist to provide education on telehealth issues. Table 9.1 contains current websites for several organizations or documents on telehealth.

### COVID-19 Exceptions for Telehealth

As a response to the COVID-19 pandemic in March 2020, the US Department of Health and Human Services (HHS) is allowing physicians and other health care workers to practice across state lines [17]. This exception applies to the temporary reciprocity of medical licensure across state lines (even prior to full acceptance of IMLC participation by all 50 states). In addition, Medicare and Medicaid have also agreed to pay for an expanded list of telehealth services during the time of COVID-19 and social distancing practices [17]. Currently, this does not include additional approval to reimburse for Anesthesia Telehealth consultations or other services, but this may change as the public health response to COVID-19 evolves.

### Funding and Conflict of Interest

None

| Table 9.1 Telehealth Resources |
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| American Telemedicine Association | https://www.americantelemed.org |
| Center for Connected Health Policy | https://www.cchpca.org |
| International Society for Telemedicine and eHealth | https://www.isfteh.org |
| Center for Telehealth & eHealth Law | http://ctel.org |
References

1. American Telemedicine Association. Telehealth basics. https://www.americantelemed.org/resource/why-telemedicine/. Accessed 17 March 2020.
2. Dexcom Continuous Glucose Monitoring. https://www.dexcom.com/g6-cgm-system. Accessed 18 March 2020.
3. AliveCor KardiaMobile. https://www.alivecor.com/kardiamobile. Accessed 18 March 2020.
4. American Hospital Association. Fact Sheet: Telehealth (Feb 2019). https://www.aha.org/system/files/2019-02/fact-sheet-telehealth-2-4-19.pdf. Accessed 20 March 2020.
5. Pew Research Center. Mobile Fact Sheet (12 June 2019). https://www.pewresearch.org/internet/fact-sheet/mobile/. Accessed 20 March 2020.
6. Julianne Pepitone. The $54 million hospital without any beds (13 September 2016). https://money.cnn.com/2016/09/12/technology/mercy-hospital-virtual-care/. Accessed 20 March 2020.
7. Deloitte. 2018 Global Healthcare Outlook: The evolution of smart healthcare. https://www2.deloitte.com/content/dam/Deloitte/global/Documents/Life-Sciences-Health-Care/gx-lshc-hc-outlook-2018.pdf. Accessed 20 March 2020.
8. The Future of Healthcare: How Healthcare Mobile App Trends are Changing in 2019. https://www.solutionbuilt.com/healthcare-mobile-apps/. Accessed 20 March 2020.
9. Lilly CM, Motzkus C, Rincon T, et al. ICU telemedicine financial outcomes. Chest. 2017;151(2):286–97.
10. Wong DT, Kamming D, Salenieks ME, et al. Preadmission anesthesia consultation using telemedicine technology: a pilot study. Anesthesiology. 2004;100:1605–7.
11. Mullen-Fortino M, Rising KL, Duckworth J, et al. Presurgical assessment using telemedicine technology: impact on patient efficiency, effectiveness, and patient experience of care. Telemed e-Health. 2019;25(2):137–42.
12. Fiadjoe J, Gurnaney H, Muralidhar K, et al. Anesth Analag. 2009;108(4):1212–4.
13. Collins TA, Robertson MP, Sicoutris CP, et al. Telemedicine coverage for post-op ICU patients. J Telemed Telecare. 2017;23(2):360–4.
14. Koenig M. Telemedicine in the ICU. Cham, Switzerland: Springer; 2019.
15. Interstate Medical Licensure Compact. https://imlcc.org. Accessed 25 March 2020.
16. Galvez JA, Rehman MA. Telemedicine in anesthesia. Curr Opin Anaesthesiol. 2011;24(4):459–62.
17. Centers for Medicare & Medicaid Services. Medicare Learning Network Booklet: Telehealth Services. https://www.cms.gov/Outreach-and-Education/Medicare-Learning-Network-MLN/MLNProducts/downloads/TelehealthSrvcsfctsht.pdf. Accessed 25 March 2020.
18. Health Resources & Services Administration. Medicare Telehealth Payment Eligibility Analyzer. https://data.hrsa.gov/tools/medicare/telehealth Accessed 25 March 2020.
19. Center for Connected Health Policy. State Telehealth Laws & Reimbursement Policies (Fall 2019). https://www.cchpca.org/sites/default/files/2019-10/50%20State%20Telehealth%20Laws%20and%20Reimbursement%20Policies%20Report%20Fall%202019%20FINAL.pdf. Accessed 25 March 2020.