Commentary

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Assessing the costs and savings of telemedicine: Insights from the consolidated framework for implementation research

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Abstract

Cost reduction is an often-cited reason to use telemedicine. In assessing telemedicine's cost and value, providers often turn to published cost analyses in the scientific literature for guidance. In this commentary on existing telemedicine cost analysis literature, we discuss the generalizability of these analyses and identify the Consolidated Framework for Implementation Research framework to help assess the applicability of a given cost analysis using inner- and outer-setting constructs. Outer-setting factors—location, practice type, and specialty—can substantially affect telemedicine cost and value, as can the implementation setting. While the body of evidence shows telemedicine may often reduce costs, there is still a need for robust cost analyses to guide implementation decisions as telemedicine becomes a mainstay of healthcare provision. Along with a call for more cost research, we ultimately argue that providers should consider a more holistic, value-based approach to determining when and how telemedicine implementation could benefit healthcare delivery.

Keywords

telemedicine, cost

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Introduction

"Cost-effectiveness" is a common reason healthcare providers use telemedicine, and for the purposes of this commentary, we primarily focus on the health professionals who make workflow decisions on behalf of their practice. When health professionals consider cost, the initial telemedicine implementation and ongoing use may require additional expenditures and may not always reduce a practice's costs. This can pose a barrier to adoption for some settings. For example, a rural emergency department (ED) in the U.S. may want to adopt telemedicine for acute stroke care to decrease patient transfers and increase revenue but may be unable to afford the initial costs for hardware, software, and specialty assistance required to offer such a service.[1,2] On the other hand, there are cost benefits and opportunities to improve clinical outcomes that can outweigh initial startup costs. For example, a recent study found health systems in the U.S. that used more telemedicine increased office visits, care continuity, and medication adherence.[3] They observed decreased ED visits compared to health systems that used telemedicine less, though they noted a slight increase in expenditures in the health systems that had increased the use of telemedicine.[3]

The process of planning, implementing, and evaluating a telemedicine intervention can be a time-consuming process (see Figure 1). Here, we focus on how a provider may set up the process of planning a successful implementation by exploring factors affecting telemedicine costs and value (i.e., the quality, experience, and actual cost of healthcare),[4] as the basis for better assessing the applicability of published cost analyses to prospective telemedicine implementations. We suggest the use of the Consolidated Framework for Implementation Research (CFIR), a popular implementation framework with many unrestricted resources, as a

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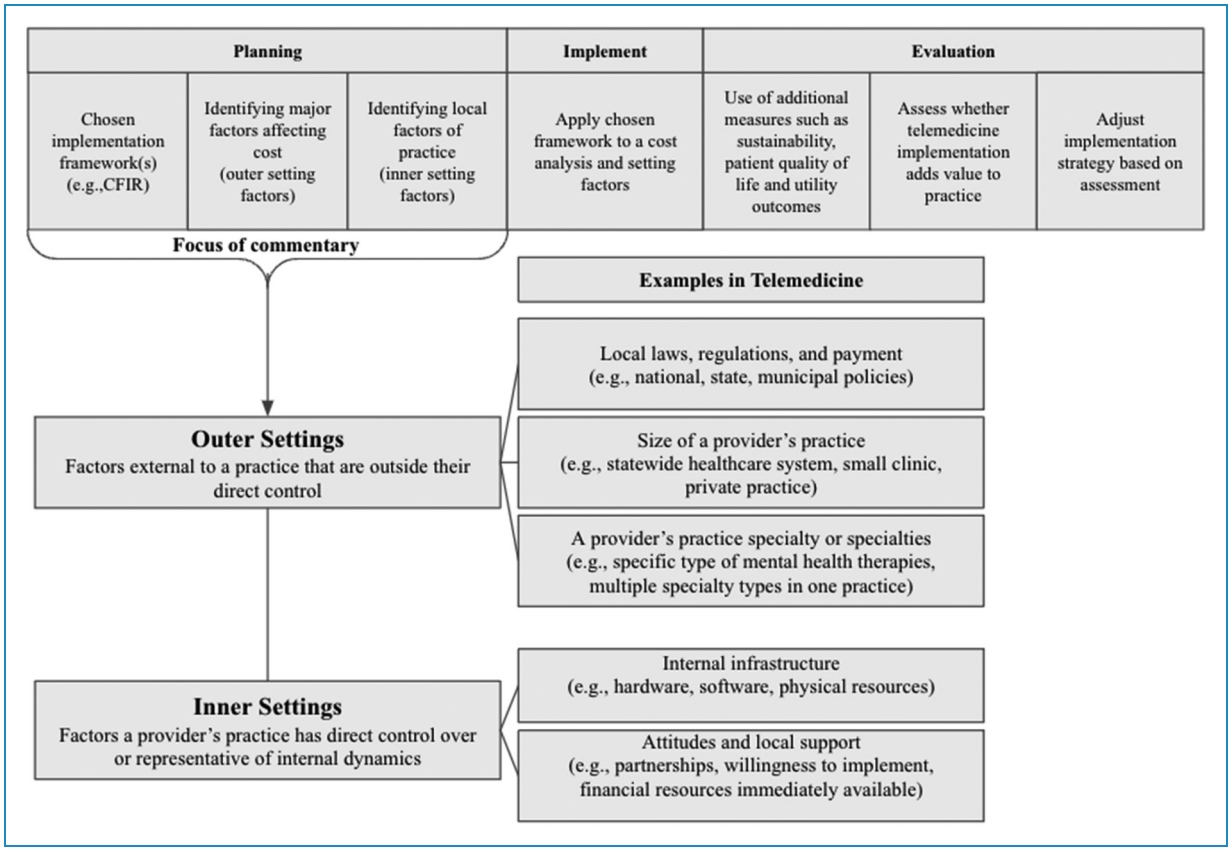

Figure 1. An overview of a successful telemedicine intervention implementation strategy.

way to operationalize provider decision-making as to whether telemedicine implementation can be done successfully and cost-effectively.[5,6] Consolidated Framework for Implementation Research application to telemedicine has shown that multidomain factors need to be considered in order to increase telemedicine implementation success. Even though CFIR implementation literature, at this time, does not approach cost—a construct of the innovation domain that is affected by outer and inner settings—as a predominant focus, providers benefit from using CFIR because it requires consideration of greater factors affecting cost than direct expenditure.[5,6] Additionally, CFIR is one of the most widely used and understood frameworks available: providers have free access to multiple resources that can aid them in their cost analysis assessments. While we focus on a handful of outer and inner setting factors here, providers have access to the full list of factors, the definitions, and the interworkings of the framework through CFIR's updated resources.[6] We argue that providers should utilize an implementation framework, such as CFIR, to (1) help them understand whether telemedicine will provide added value to their practice and (2) be mindful of major factors that directly affect provider costs. Ultimately, we discuss how providers in the U.S. can have a meaningful discussion regarding the cost of telemedicine that duly considers its clinical value and socioeconomic benefit.

Factors affecting telemedicine cost and value. A systematic review of general telemedicine cost analyses conducted globally between 2008 and 2018 determined that of the 156 relevant studies, 53.21% reported telemedicine as less costly, 19.23% as equivalent, and 27.56% as more costly.[7] This review captured formal cost studies and categorized them by their specific focus (e.g., chronic, mental, cardiac, respiratory conditions), type of economic evaluations (i.e., cost-effectiveness analysis, cost-minimization, and cost–benefit), and other quantitative indicators (e.g., the relative cost of telemedicine, publication year, indicators of quality).[7] Interestingly, the review reported that as the quality of the studies increased, their results became less definitive in demonstrating telemedicine efficacy and cost reductions.[7] The review showcases a dearth of cost analyses for telemedicine implementation but also a need for a method of identifying analyses' applicability to varying scenarios.[7]

An implementation framework for identifying factors that influence cost. The CFIR is a comprehensive implementation framework that can help identify key factors influencing the costs of an innovation (i.e., telemedicine).[5,6] We will focus on the impact that outer and inner setting (see Figure 1 for inner and outer setting definitions) domains have on telemedicine cost, part of the innovation domain. Telemedicine cost is dependent on the inner-setting

domain where telemedicine is directly implemented. Constructs, or factors, within the inner setting, include funding, internal infrastructures, communications, and shared values and beliefs.[6] Consolidated Framework for Implementation Research also outlines the outer-setting domain that influences the effectiveness of implementation, including attitudes, local conditions, partnerships, and external pressures.[6] By applying an evidence-driven framework such as CFIR, stakeholders may not only be able to identify the most applicable published cost analyses for their situation but also determine how to adopt and sustain telemedicine in their practice. We highlight key outer and inner constructs providers should include in their assessment as to whether a published cost analysis is applicable to their practice situation.

Outer-setting constructs of local laws and payment. Outer-setting factors, such as national laws and regulations, have a direct effect on the results of telemedicine cost analyses. Two outer-setting factors that stakeholders should always consider are the national or state location of the telemedicine implementation and the healthcare practice and specialty type involved. Each country's healthcare system incorporates and defines telemedicine differently within its policies, laws, and regulations. A cost analysis done in Germany may not be generalizable to those done in Australia or Greece.[8] For example, telemedicine reimbursement—and consequently cost—varies greatly due to differences in telemedicine eligibility for receiving payment: France reimburses provider expenditures for digital health tools, but Poland does not have a formal reimbursement process for such digital health tools.[9] Providers in both nations are able to implement telemedicine, but the pathway to reimbursement could affect the cost of telemedicine use in practice.[9] While there is a body of telemedicine cost-analysis research, the results may not necessarily apply to a specific country or scenario.

Additionally, regional guidelines or protocols for telemedicine, such as those from the French National Authority for Health and the United Kingdom Critical Appraisals Skills Programme, may affect cost analyses as they directly affect a provider's method of telemedicine implementation.[10,11] The regional limitation is even more evident as there have been so many changes to telemedicine laws and regulations within countries and international organizations/forums.[12] Even within the U.S., studies in different states may not be applicable as state laws affect coverage and payment reimbursement for telemedicine visits.[13] With all these complexities, a U.S. study's findings may not apply to different geographical areas within the U.S. Further exacerbating the difficulty for providers to apply outcomes of cost analyses to their situation, the U.S. is not a single-payer health care system. While there is specific, federally available coverage through Medicare and Medicaid, private coverage may also cause differences in reimbursement.

Outer-setting constructs of practice and specialty type. Other outer-setting factors influencing the applicability of telemedicine cost analyses include practice and specialty types. A large, statewide healthcare institution, such as the University of California Health, will require a different implementation strategy for telemedicine than a small clinic or private practice.[14] In this instance, telemedicine includes multiple specialties and service types, including follow-up care after a procedure and specialty telemedicine consultations.[14] Furthermore, such large systems would have varying initial startup costs for telemedicine introduction, including hardware, software, and technology services. Meanwhile, a solo practitioner in behavioral health may use telemedicine solely for the type of therapy they provide. The implementation for each scenario includes varying levels of complexity regarding workflows, software, and hardware needs. Thus, the practice and specialty type significantly affect telemedicine costs. As a result, these outer-setting constructs can make specialty telemedicine cost analyses moot if attempting to apply to a different-sized health practice or specialty type.

Inner-setting constructs of local practice conditions. Even as outer-setting factors influence the applicability of cost analyses, we should also be mindful of inner-setting factors influencing cost. The effectiveness of telemedicine implementation within a practice has immediate implications for healthcare value—a measure of improvement of patient outcomes given the cost to achieve it.[4,15] Consolidated Framework for Implementation Research provides a thorough overview of such factors, including internal infrastructures, communications, and shared values and beliefs—known as inner-setting factors.[6] Consolidated Framework for Implementation Research additionally outlines the inner settings that influence the effectiveness of implementation, including attitudes, local conditions, and partnerships.[6] These inner-setting constructs, especially external pressures, can play a significant role in telemedicine value as they directly relate to the willingness and support of implementation from all stakeholders.[5] In one CFIR study looking at telestroke adoption throughout 107 community hospitals, researchers found hospitals were significantly more likely to have adopted telestroke when nearby hospitals had already adopted the program.[16] Telestroke adoption was also significantly associated with hospitals' patient volume, profitability, and payer mix.[16] The study highlights that while telestroke adoption may be beneficial and potentially cost-effective for a community, its implementation may be hindered by access to initial financial resources.[16] Inner-setting factors should always be considered when looking at telemedicine cost and value as they provide context and depth of understanding of the results of cost analyses.

Types of telemedicine cost analyses and benefits of using an implementation framework. Traditional cost analyses measure expenditures and savings, but newer methods also consider the cost relationship with the clinical outcomes.[15]

These new methods better fit into the value-based healthcare framework focusing on maximizing outcomes per dollar spent and cost transparency for stakeholders.[17] These cost analyses incorporate more factors into their assessments, making a provider's use of an implementation framework even more strategic. Cost-effectiveness analysis, a common method in healthcare, focuses on identifying the least costly option to achieve a specific health outcome. Meanwhile, cost—benefit analysis takes a broader view by incorporating societal benefits, such as increased worker productivity, alongside the financial costs, thus making it valuable for assessing the overall value proposition of interventions.[7,18] These value-driven analyses consider the clinical outcomes realized at a given cost.[17] Value-based healthcare frameworks such as the Value-Driven Outcomes are especially useful in telemedicine applications because they were developed with implementation strategy in mind.[17,19] While these frameworks can be used with the purpose of effective implementation of telemedicine in a practice setting, current literature focuses more narrowly on how to apply broadly value-based healthcare interventions in larger health systems such as hospitals.[17,19,20] There is a dearth of evidence regarding costs in value-based approaches in the implementation of telemedicine, especially in smaller healthcare settings. There is a need for research on how to apply value-based frameworks for successful, sustainable implementation of telemedicine pathways in a variety of inner- and outer-setting constructs.[18]

Conclusion

Research shows telemedicine can reduce costs in many situations. However, cost is only one aspect of adequate healthcare. By using proven implementation frameworks in combination with value-based approaches as guides to understanding and estimating costs, providers will better understand what types of costs are associated with telemedicine implementation in their specific practice and garner a better idea of how they can positively affect patient and community outcomes with their decision-making. After all, patient outcomes and access are critical factors in determining the value of a process or tool. Commonly, the discussion of cost revolves around direct expenditures and savings. Cost reduction, for providers or patients,[21] alone is not a sufficient reason to use telemedicine as a mode of healthcare delivery. Clinical and financial aspects of telemedicine must be jointly considered, and individual practices can use published cost and value analyses to inform and guide their own considerations of benefit, by looking for examples that align with their own practice's characteristics.[22]

The CFIR can account for the entirety of a practice's situation; however, other implementation frameworks exist that could be equally useful or even used in tandem with CFIR for implementation insights. As a recent review showed, CFIR may be especially useful in highlighting how the Inner Setting domain helps to determine implementation success.[5] The same review noted that implementation studies found the Outer Setting—including laws and regulations—affected telemedicine success less so than the Inner Setting domains.[5] Ultimately, providers who choose to use CFIR or other implementation frameworks would gain a better understanding of the multidimensional aspects of running a practice with telemedicine successfully. Unfortunately, providers would have to engage in a multistep process to effectively use a framework for an economic cost analysis; however, providers may find this process to be more streamlined by using a widely known and supported framework, such as CFIR. Though it may be more time-consuming to apply an implementation framework initially, providers would have a better grasp of their own practice and their patient community (inner- and outer-setting constructs through CFIR) and an idea of whether they can bring positive, value-based changes through a telemedicine intervention.

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