Fiscal Impact of AB 415:
Potential Cost Savings from Expansion of Telehealth

Prepared for

Center for Connected Health Policy

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Executive Summary

The use of information and communication technologies to deliver health care remotely, referred to as telehealth, has been reimbursable under California law since 1996. However, telehealth technologies and applications have advanced over the last decade and a half, leaving the current reimbursement laws outdated. In fact, the law now often serves as a hindrance to further adoption of telehealth. As such, Assembly Bill 415 (AB 415) has been introduced in the California Legislature to modernize reimbursement law, and to help clear the path for the increased use of telehealth in California.

The purpose of this report is to analyze the fiscal impact of AB 415 on the State of California, primarily focusing on the Medi-Cal program. In addition, we describe the fiscal effects that expanded use of telehealth (as envisioned by AB 415) could bring to other health services payers in California. Given this focus, the report does not address what are some of the primary benefits of telehealth, such as improved patient satisfaction, reduced patient travel times and costs, and other patient benefits. It does, however, draw upon the academic literature to qualitatively summarize how California could experience cost savings through less costly interventions, better care, and increased access to timely, cost-saving interventions.

This study also attempts to provide a quantitative estimate of the cost savings that California could experience, to the extent that telehealth is adopted more broadly, consistent with the goals of AB 415. Given that the majority of the research on telehealth has sought to establish its clinical effectiveness, and not its cost-effectiveness, as well as the fact that telehealth technology and practice are evolving rapidly, there is not a way to estimate conclusively the fiscal impact on a health care system that has completely integrated telehealth. However, we utilize current published research to identify areas where telehealth has the potential to save money, and then model the potential savings for the State of California should telehealth be more fully adopted in these areas.

AB 415 does not specify which areas of telehealth should be promoted (nor does it require adoption in any particular area); however, we believe the health care marketplace will encourage development of telehealth primarily in areas where cost advantages can be demonstrated. Thus, we have estimated the potential savings from telehealth in areas that have current demonstrated cost savings based on published studies; other areas are likely to show cost savings as they are more thoroughly investigated, and the technology and practice advance.

According to our analysis of the existing published telehealth literature, home monitoring for chronic diseases is one of the areas where telehealth has the greatest potential to reduce health care costs. By applying the findings from several published studies of the impact of telehealth for home monitoring of patients with heart failure and diabetes, we estimate that telehealth has the potential to produce savings to the Medi-Cal program of as much as several hundred million dollars annually. These estimates cover just one area of potential telehealth expansion. Additional savings are possible from other areas of telehealth, such as reduced need for costly

medical transports or more timely access to specialists. Therefore, while evidence for the cost-effectiveness of telehealth continues to emerge, existing studies do point to the potential for telehealth to produce savings.

Introduction: What is Telehealth?

Telehealth is a mode of delivering health care services that utilizes information and communication technologies to enable the diagnosis, consultation, treatment, education, care management, and self-management of patients at a distance from health providers.[1] Telehealth can be delivered synchronously via videoconferencing technologies – where patients and providers interact with each other simultaneously – and asynchronously via store and forward technologies – when information such as X-rays or photographs are collected and transmitted, to be analyzed at a later time. Applications of telehealth are diverse, ranging from home monitoring for chronic diseases to specialty consultations with rural clinic patients to time-sensitive assessments in an emergency room or intensive care unit (ICU). Telehealth can utilize a variety of technologies, including digital cameras, video cameras, structured online questionnaires, telephone call centers, measurement devices, and movement sensors. These technologies are often combined, and their costs can differ greatly. Thus, while many speak of three specific types of telehealth – home monitoring, videoconferencing, and store and forward – in reality, telehealth can and does incorporate a variety of communication technologies that are continually advancing and becoming less costly.[2]

Although many telehealth projects and initiatives have been undertaken, barriers exist to widespread adoption and integration into routine health care. These include process issues, such as technology purchase, integration, training, and maintenance; legal issues, such as networking with practitioners with out-of-state licensure, confidentiality, and liability; and financial issues, due to restrictive and non-standardized reimbursement policies by public and private insurers.

Telehealth in California

Telehealth is already covered by public and private payers – to a degree – in California. A 1996 law set forth rules for telehealth reimbursement by both Medi-Cal and commercial payers. In addition, federal legislation has enabled Medicare to reimburse for certain telehealth activities. However, both the state and federal laws circumscribe the types of telehealth that can be reimbursed. Below, we examine how current law enables Medi-Cal, Medicare, and commercial payers to reimburse for telehealth.

Medi-Cal currently reimburses videoconferencing and some store and forward services for patients with a barrier to in-person care. Store and forward is limited to teleophthalmology, teledermatology, and teleoptometry. These services are only allowed to be used in physician or practitioner offices, Critical Access Hospitals (CAHs), Rural Health Clinics (RHCs), and Federally Qualified Health Clinics (FQHCs). Medi-Cal does not pay for consultation provided by telephone or email. Moreover, providers have additional paperwork to file if they utilize

[1] Center for Connected Health Policy, "Advancing California's Leadership in Telehealth Policy: A Telehealth Model Statute and Other Policy Recommendations", February 2011.
[2] María E. Dávalos et al., "Economic Evaluation of Telemedicine: Review of the Literature and Research Guidelines for Benefit–Cost Analysis," *Telemedicine and e-Health* 15, no. 10 (December 2009): 933-948.

telemedicine: they must document the barrier to in-person care and obtain written proof of a patient's informed consent.

Medicare has similarly restrictive reimbursement policies. Medicare allows payment of videoconferencing for *rural* Medicare beneficiaries; these beneficiaries must seek care in a rural Health Professional Shortage Area or in a county outside of a Metropolitan Statistical Area. Relative to Medi-Cal, a broader range of originating sites is allowed; this includes physician or practitioner offices, hospitals, Critical Access Hospitals (CAH), Rural Health Clinics (RHCs), Federally Qualified Health Centers (FQHCs), Skilled Nursing Facilities (SNFs), hospital-based renal dialysis centers, and community mental health centers.[3] However, Medicare does not explicitly allow for store and forward technology except in demonstration programs in Alaska and Hawaii. Yet, Medicare allows payment for some services provided through a manner similar to store and forward, such as radiology, pathology, cardiology, physician team consultations, and other services.[4]

Finally, commercial payers are required to cover telehealth when it's "appropriately provided." The 1996 California law that authorized Medi-Cal reimbursement also required that commercial payers shall not require "face-to-face contact between a health care provider and a patient for services appropriately provided through telemedicine."[5] Given the flexibility of the language, some commercial providers have adopted Medicare's telehealth restrictions, limiting coverage to rural areas or to be provided in the limited list of originating sites.[6] In addition, like Medi-Cal, private plans do not have to pay for consultations provided by telephone or email, and doctors are required to obtain verbal and written informed consent from the patient.

The impact of these reimbursement policies has been to limit telehealth to certain technologies and patient populations. For example, advances in technology (such as iPads and smart phones) blur the distinctions among email, telephone and videoconferencing, but the law still lives by the old boundaries. In addition, home monitoring of chronic diseases has been shown to be an effective intervention, but would not be reimbursed under current law, because the practice does not originate at one of the approved originating sites, and often uses technologies and services not explicitly allowed. Finally, only patient populations that have a barrier to care qualify for telehealth services, even though telehealth may be able to offer less costly care to populations that do not have trouble accessing health care services. The same goes for using telehealth in traditional locations such as community hospitals and nursing homes, as well as untraditional sites, such as schools, for which Medi-Cal does not currently reimburse.

[3] Department of Health and Human Services, Centers for Medicare & Medicaid Services, "Telehealth Services", March 2011, https://www.cms.gov/MLNProducts/downloads/TelehealthSrvcsfctsht.pdf.
[4] Center for Connected Health Policy, "Advancing California's Leadership in Telehealth Policy: A Telehealth Model Statute and Other Policy Recommendations."
[5] California Health and Safety Code Section 1374.13.
[6] Center for Connected Health Policy, "Advancing California's Leadership in Telehealth Policy: A Telehealth Model Statute and Other Policy Recommendations."

AB 415: Reducing Barriers to Telehealth Reimbursement

AB 415 updates Medi-Cal and private payer reimbursement rules so that telehealth services are treated as equal to in-person services, regardless of service purpose, location, or type of patient. The law does not mandate specific reimbursement rates, thereby allowing payers to determine the relative value of telehealth in comparison to traditional care, and to encourage or discourage telehealth adoption, depending on where they determine that cost savings or other factors warrant. Generally, AB 415 allows payers to figure out where telehealth offers the most promise, and to adapt as technology changes. Below, we indicate the specific changes to current law that are made by AB 415, and briefly highlight their impacts. AB 415:

- Updates the term "telemedicine" used in current law to "telehealth" to reflect changes in technologies, settings, and applications, for medical and other purposes;
- Includes the asynchronous (store and forward) application of technologies in the definition of telehealth, and removes the 2013 sunset date for Medi-Cal reimbursement of teledermatology and teleophthalmalogy services;
- Removes restrictions in current law that prohibit telehealth services provided via email and telephone;
- Specifies that any service otherwise covered under standard contract terms (e.g., covered benefit, medically necessary) must be covered, whether provided in-person or via telehealth;
- Eliminates the current Medi-Cal requirement to document a barrier to an in person visit for coverage of services provided using telehealth;
- Requires private health care payers and Medi-Cal to cover encounters between licensed health practitioners and enrollees irrespective of the setting of the enrollee and provider(s);
- Removes the current requirement necessitating an additional written informed consent waiver be obtained prior to any telehealth service being rendered.

Currently, telehealth must overcome several obstacles in order to provoke widespread payer reimbursement. Yet, without widespread demand for telehealth from providers and patients, payers have little incentive to revisit existing reimbursement policies. Thus, what AB 415 essentially does is break what William Leach, writing for the California Telemedicine and eHealth Center, calls "the self-reinforcing relationship between telemedicine reimbursement and adoption by physicians and patients."[7]

[7] William D. Leach, "If You Bill It, They Will Come: A Literature Review on Clinical Outcomes, Cost-Effectiveness, and Reimbursement for Telemedicine" (California Telemedicine and eHealth Center, January 2009), http://www.cteconline.org/_pdf/Literature-Review.pdf.

How Telehealth Can Save Money

Expanded use of telehealth has the potential to reduce health care costs in three principal ways. The first is by producing the same medical results through a less costly medical interaction. For example, a patient receives care via videoconferencing in an emergency room, and avoids a transfer to another hospital, which has the needed specialist available, thereby saving the transportation costs. The second is by producing better patient outcomes than traditional care. For example, home monitoring of a chronic disease can lead to decreased hospitalizations. Finally, telehealth can increase access to care and lower long run health care costs. For example, telehealth can provide rural residents with timely stroke care that can decrease disability and its associated life-long health care, income support, and other related costs.

What the Academic Literature Says

A significant body of academic literature has developed on telehealth. Indeed, literally hundreds of studies have been published. Reflecting the nature of the issue, however, this literature is rapidly evolving, complicating its careful study. In most instances, the literature is focused on evaluating how telehealth outcomes compared to those from traditional care. And, many studies have concluded that telehealth outcomes are in fact equivalent or superior to outcomes from traditional care. Rigorous economic evaluation of telehealth programs, however, remains relatively less common.[8] One major reason for the relative lack of conclusive research is that the cost side of the equation continues to evolve rapidly, with equipment costs steadily on the decline. Thus, what was not cost-effective in the past may well become cost-effective in the near future.[9] In addition, the way in which cost outcomes are studied has not been standardized, so that cost findings are not comprehensive, and therefore often not directly comparable. Moreover, most studies cover relatively short periods (generally one year), essentially only measuring short-term cost findings, while ignoring longer-term effects. Further complicating matters, most of the available literature compares telehealth to traditional medicine, rather than to a no treatment alternative. Consequently, instances where telehealth's benefits stem from increased access to care are not well studied.[10]

Despite these issues, some research has emerged which supports the idea that telehealth can reduce health care costs by providing more efficient care, by achieving better patient outcomes, or by providing care in a more timely manner. Thus, while there is not yet a consensus among researchers that telehealth, taken as a whole, saves money, there is evidence to support the claim that expanded use of telehealth can lead to cost savings.

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[8] Leach, William D. et. al., "If You Bill It, They Will Come: A Literature Review of Clinical Outcomes, Cost-Effectiveness, and Reimbursement for Telemedicine." California Telemedicine and eHealth Center (January 2009) p. 3.

[9] Dávalos et al., "Economic Evaluation of Telemedicine."

[10] Leach, "If You Bill It, They Will Come: A Literature Review on Clinical Outcomes, Cost-Effectiveness, and Reimbursement for Telemedicine."

Efficiency Outcomes

Telehealth can lower health care costs by delivering the same level of care more efficiently. One way in which telehealth can be more efficient is through a decrease in unnecessary laboratory tests. For example, Maria Davalos and her colleagues found that most studies agree that telemedicine reduces the use of unnecessary services, such as laboratory tests.[11] Moreover, Eric Pan and his colleagues at the Center for Informational Technology Leadership theorize that telehealth can be more efficient due to "bi-directional information sharing," a term that describes the early involvement of specialists, and their ability to order targeted testing for their patient's condition, or to review results ordered by the primary care provider. This can result in improved outcomes or lower cost, relative to a traditional in-person consultation.[12]

Another efficiency gain can be found through decreased consultation times. For example, a physician's review of store and forward information takes less time than an in-person consultation. Similarly, a follow-up videoconference in a patient's home takes less time than a follow-up in-person visit.[13,14] The largest efficiency gains, however, may come from a reduction in unnecessary patient transports. Studies on telehealth interventions in pediatric cardiology, trauma, stroke, and burn care show that telehealth interventions in acute care settings like emergency rooms can remove the need to have some patients transferred to receive specialty care in other hospitals. For example, Victoria Wade and her colleagues at the University of Adelaide found that a majority of studies on telehealth for rural inpatient care found cost savings due to reduced transports and reduced time of transport.[15] Similarly, Jeffrey Saffle and his colleagues at the University of Utah's Intermountain Burn Center found that some acute burn victims studied had air transportation charges in excess of their hospital charges, and concluded that use of telehealth could avoid the need for costly transports.[16] In addition, remote visits to patients in skilled nursing facilities, for wound care for example, can result in avoided transport costs. For example, in their review of 53 geriatric applications of telehealth in the *Journal of Telemedicine and Telecare*, P. Jennett and his fellow researchers wrote that the results indicated that telephone consultation for the provision of medical advice to geriatric patients and video consultations regarding chronic wounds can be cost-saving because they reduce the use of hospital/nursing home services, and limit the need for patients to be transported.[17] A study by Ratliff and Forch at the University of Virginia Health System found that a telehealth intervention in a long-term community care setting replaced patient transport to a local wound care clinic.[18] Finally, use of telehealth can avoid the need for providers to travel to remote patients, either at their homes or at

[11] Dávalos et al., "Economic Evaluation of Telemedicine."
[12] Eric Pan et al., "The value of provider-to-provider telehealth," *Telemedicine Journal and E-Health: The Official Journal of the American Telemedicine Association* 14, no. 5 (June 2008): 446-453.
[13] Dávalos et al., "Economic Evaluation of Telemedicine."
[14] Lanis L Hicks, David A Fleming, and Adam Desaulnier, "The application of remote monitoring to improve health outcomes to a rural area," *Telemedicine Journal and E-Health: The Official Journal of the American Telemedicine Association* 15, no. 7 (September 2009): 664-671.
[15] Victoria A Wade et al., "A systematic review of economic analyses of telehealth services using real time video communication," *BMC Health Services Research* 10 (2010): 233.
[16] Jeffrey R Saffle, Linda Edelman, and Stephen E Morris, "Regional air transport of burn patients: a case for telemedicine?," *The Journal of Trauma* 57, no. 1 (July 2004): 57-64; discussion 64.
[17] P A Jennett et al., "The socio-economic impact of telehealth: a systematic review," *Journal of Telemedicine and Telecare* 9, no. 6 (2003): 311-320.
[18] Catherine R Ratliff and Windy Forch, "Telehealth for wound management in long-term care," *Ostomy/Wound Management* 51, no. 9 (September 2005): 40-45.

other health facilities. For example, research on a telehealth intervention utilized by a home health agency found that telehealth reduced the number of home visits by nurses from 8.2 to 5.8 per month.[19]

Effectiveness Outcomes

Another way in which telehealth can produce cost savings is through the provision of better care, which reduces the amount or cost of subsequent health care services. In this case, telehealth provides care that decreases the need for services such as hospitalizations, emergency room visits, and outpatient visits. For example, Guy Pare et. al.'s review in the *Journal of the American Medical Informatics Association* of studies on chronic disease home telemonitoring found that the majority of the studies involving patients with pulmonary and cardiac diseases demonstrated a significant decrease in hospital admissions, emergency department visits, and hospital length of stay.[20] A study of home care for indigent diabetic patients found that diabetes-related outpatient visits decreased by 49 percent.[21] In addition, telehealth is being investigated as a way to keep elderly patients in their homes longer prior to transfer to long-term care or skilled nursing facilities, thereby reducing long-term care costs. For example, the Veterans Health Administration has systematically implemented home monitoring of elderly patients with chronic conditions, and views it as a way to delay transfers into skilled nursing facilities.[22]

Finally, telehealth can provide quicker access to needed care, perhaps preventing adverse outcomes. For example, a review of teledermatology studies in the *Journal of the American Academy of Dermatology* by Erin Warshaw and her fellow researchers found that time to dermatology opinion was significantly shorter in the telehealth groups as compared to those that received traditional care, thereby accelerating time to biopsy, time to surgery or time to other definitive interventions.[23] As Davalos et al. write, this timely diagnosis and treatment can indirectly lead to reduced transfers or referrals, fewer physicians office visits, reduced hospitalization rates, or fewer emergency room visits.[24]

Access Outcomes

By increasing access to care, particularly in rural areas, telehealth has the potential to lower long-term health care costs. For example, access to rehabilitation services is more difficult for rural residents due to distance to facilities, transportation problems, rural poverty, and lack of rural

[19] Sue Myers et al., "Impact of Home-Based Monitoring on the Care of Patients with Congestive Heart Failure," *Home Health Care Management & Practice* 18, no. 6 (October 1, 2006): 444 -451.
[20] Guy Paré, Mirou Jaana, and Claude Sicotte, "Systematic review of home telemonitoring for chronic diseases: the evidence base," *Journal of the American Medical Informatics Association: JAMIA* 14, no. 3 (June 2007): 269-277.
[21] Julie Cheitlin Cherry et al., "Diabetes disease management program for an indigent population empowered by telemedicine technology," *Diabetes Technology & Therapeutics* 4, no. 6 (2002): 783-791.
[22] Adam Darkins et al., "Care Coordination/Home Telehealth: the systematic implementation of health informatics, home telehealth, and disease management to support the care of veteran patients with chronic conditions," *Telemedicine Journal and E-Health: The Official Journal of the American Telemedicine Association* 14, no. 10 (December 2008): 1118-1126.
[23] Erin M Warshaw et al., "Teledermatology for diagnosis and management of skin conditions: a systematic review," *Journal of the American Academy of Dermatology* 64, no. 4 (April 2011): 759-772.
[24] Dávalos et al., "Economic Evaluation of Telemedicine."

service providers. This lack of access to specialty services and new technologies prevents rural patients from receiving the appropriate level of care. Now, tele-rehabilitation programs for stroke, brain injuries, cardiac procedures, and spinal cord injuries have the potential to increase access to appropriate care.[25,26] In the long run, proper treatment could lessen disability and its associated medical costs. For example, two studies on tele-stroke care found long-term cost savings due to decreased nursing home and rehabilitation costs.[27,28,29]

A study of the impact of telehealth in a federally funded demonstration project also found that telehealth has the potential to lower health care costs.[30] In this project, a network was developed that linked three hospitals, a federally qualified health care clinic, a county dental clinic, and patient homes. The project reported outcomes for congestive heart failure, diabetes, and tele-dental health, concluding that "the diabetes disease management program increased the number of diabetics who brought their blood sugar under control… [and that] the national cost of care for CHF hospitalizations could be reduced from 8 billion dollars to 4.2 billion dollars."

Increased access also has the potential to result in lower costs for other state programs outside of Medi-Cal. For example, a study conducted by the Blue Sky Consulting Group for the California Health Care Foundation on tele-ophthalmology demonstrated that, for each diabetic patient examined for retinopathy via store and forward telemedicine, state cost savings would total nearly $2,500 over the patient's lifetime relative to the no treatment case due to early detection of retinopathy and reduced disabling blindness. Savings would stem from decreased use of Medi-Cal, State Supplemental Payment, In-Home Supportive Services, Cash Assistance Program for Immigrants, and blindness rehabilitation provided through the state Department of Rehabilitation.

Specific Examples of Demonstrated Cost Savings

While no consensus among researchers has yet emerged with respect to the cost-effectiveness of telehealth overall, two areas have emerged with the strongest evidence of overall cost savings: home monitoring and acute care telemedicine. For example, in their 2010 systematic review of economic evaluations of videoconferencing, Wade et al. concluded that "synchronous video delivery is cost-effective for home care, and for on-call hospital specialists, and it can be cost-

[25] George Demiris, Cheryl L. Shigaki, and Laura H. Schopp, "An Evaluation Framework for a Rural Home-Based Telerehabilitation Network," *Journal of Medical Systems* 29, no. 6 (December 2005): 595-603.
[26] Dahlia Kairy et al., "A systematic review of clinical outcomes, clinical process, healthcare utilization and costs associated with telerehabilitation," *Disability & Rehabilitation* 31, no. 6 (January 2009): 427-447.
[27] Bart M Demaerschalk, Ha-Mill Hwang, and Grace Leung, "Cost analysis review of stroke centers, telestroke, and rt-PA," *The American Journal of Managed Care* 16, no. 7 (July 2010): 537-544.
[28] Lars Ehlers et al., "National use of thrombolysis with alteplase for acute ischaemic stroke via telemedicine in Denmark: a model of budgetary impact and cost effectiveness," *CNS Drugs* 22, no. 1 (2008): 73-81.
[29] Here we note that relatively little research on the effects of telehealth on the long-term cost savings of increased access has been done. In general, studies compare telehealth to usual care, not to "no care." In addition, most of the studies we identified tended to investigate short-run outcomes.
[30] Dimmick, SL, et. al., "Outcomes of an integrated telehealth network demonstration project," *Telemed J E Health*. 2003 Spring;9(1):13-23.

effective for regional and rural health care, depending upon the particular circumstances of the service."[31]

Chronic Disease Home Monitoring

In addition to the Wade et. al. meta analysis, several systematic reviews of the literature on chronic disease home monitoring have found that it produces cost savings to the health payer. For example, a 2008 meta-analysis of home monitoring in *Telemedicine Journal and e-Health* by Vergara Rojas and Marie-Pierre Gagnon found that it was the cost-effective alternative in 21 out of 23 studies, the vast majority of which focused on chronic disease care.[32] In addition, they found that the main benefits from monitoring programs were decreased hospital utilization, improved patient compliance with treatment plans, improved patient satisfaction with health services, and improved quality of life. A 2008 review of economic data on telemonitoring for heart failure by Emily Seto found that all nine studies identified cost reductions from telemonitoring compared to usual care, with savings ranging between 1.6 percent and 68.3 percent. These cost savings were mainly attributed to a reduction in the high re-hospitalization rates from heart failure.[33]

Two other meta-analyses found less robust findings on costs, but still concluded that evidence is emerging on the promise of home monitoring for specific chronic diseases. Most recently, a 2011 meta-analysis of congestive heart failure telemonitoring studies found that of the six studies that evaluated costs, four of them concluded that costs were reduced, while two found no significant difference compared to usual care.[34] Secondly, a 2009 review of studies on home monitoring for chronic respiratory conditions found that "despite minimal existing evidence at this level, preliminary analyses showed promising results and affordability of this approach, especially with technology advancement and decreased cost over the years."[35]

Other meta-analyses, while not conclusively demonstrating cost savings, nevertheless suggest that home monitoring is a potentially promising area. For example, Pare et. al.'s meta-analysis on chronic disease telemonitoring found the quality and rigor of the analyses reviewed limited, but nevertheless labels chronic disease monitoring as a "promising patient management approach that produces accurate and reliable data, empowers patients, influences their attitudes and behaviors, and potentially improves their medical conditions."[36]

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[31] Victoria A Wade et al., "A systematic review of economic analyses of telehealth services using real time video communication," *BMC Health Services Research* 10 (2010): 233.
[32] Stephanie Vergara Rojas and Marie-Pierre Gagnon, "A systematic review of the key indicators for assessing telehomecare cost-effectiveness," *Telemedicine Journal and E-Health: The Official Journal of the American Telemedicine Association* 14, no. 9 (November 2008): 896-904.
[33] Emily Seto, "Cost comparison between telemonitoring and usual care of heart failure: a systematic review," *Telemedicine Journal and E-Health: The Official Journal of the American Telemedicine Association* 14, no. 7 (September 2008): 679-686.
[34] Malcolm Clarke, Anila Shah, and Urvashi Sharma, "Systematic review of studies on telemonitoring of patients with congestive heart failure: a meta-analysis," *Journal of Telemedicine and Telecare* 17, no. 1 (2011): 7-14.
[35] Mirou Jaana, Guy Paré, and Claude Sicotte, "Home telemonitoring for respiratory conditions: a systematic review," *The American Journal of Managed Care* 15, no. 5 (May 2009): 313-320.
[36] Paré, Jaana, and Sicotte, "Systematic review of home telemonitoring for chronic diseases."

A study of a home monitoring in a public program setting also found convincing evidence of cost effectiveness. In this study, 17,025 participants in the Veterans Health Administration used an electronic messaging device to communicate with care coordinators who remotely monitored their condition. The study found that inpatient hospital admissions fell by 19.7 percent and inpatient hospital days fell by 25.3 percent.[37]

Acute Care Telehealth

The inability of local hospitals to provide specialist care for certain acute care patients, such as a stroke or head trauma victims, often leads to transfers to hospitals with the appropriate specialists. A reduction in these and other types of medical transports can mean significant savings. In fact, a study by Rifat Latifi and his colleagues at the University of Arizona found that the savings from one avoided transport alone can cover the cost of establishing a telehealth system.[38] In this 2009 study, researchers found that the around-the-clock trauma and emergency management telemedicine network prevented 17 unnecessary transfers and saved an estimated $104,852 in transfer costs alone. The model built by Pan et. al. estimated that a national expansion of telehealth could save $537 million annually by avoiding such emergency transports.[39]

A 2010 review of acute stroke telemedicine in the *International Journal of Technology Assessment in Health Care* by Tim Johansson and Claudia Wild found that telehealth likely saved money through the increase of rt-PA interventions, which decreased long-term nursing home and rehabilitation costs.[40,41] They also found that 12 of 18 studies reported the system's impact on patient transport even if they did not provide cost information. Of these, half of the studies showed a decrease in patient transport while the other half showed the same level of transfer. Often in tele-stroke, hospitals will still transport patients to a stroke center after they have been given the rt-PA intervention.

An Estimate of Savings from AB 415

The broadest application of telehealth likely comes from home monitoring for chronic diseases. And while there is not yet a consensus among researchers that telehealth is generally cost-effective, published research does suggest that use of telehealth in this area has the potential to generate significant cost savings. In order to provide policy makers with an estimate of the potential savings that could result from more widespread use of telehealth, we used results from

[37] AHRQ, "Care Coordinators Remotely Monitor Chronically Ill Veterans via Messaging Device, Leading to Lower Inpatient Utilization and Costs," http://www.innovations.ahrq.gov/content.aspx?id=3006.
[38] Rifat Latifi et al., "Initial experiences and outcomes of telepresence in the management of trauma and emergency surgical patients," *The American Journal of Surgery* 198, no. 6 (December 2009): 905-910.
[39] Eric Pan et al., "The value of provider-to-provider telehealth," *Telemedicine Journal and E-Health: The Official Journal of the American Telemedicine Association* 14, no. 5 (June 2008): 446-453.
[40] Tim Johansson and Claudia Wild, "Telemedicine in Acute Stroke Management: Systematic Review," *International Journal of Technology Assessment in Health Care* 26, no. 2 (2010): 149-155.
[41] The intravenous infusion of recombinant tissue plasminogen activator, or rt-PA, is the only treatment approved by the US Food and Drug Administration for acute ischemic stroke. It is a thrombolytic used to improve neurologic recovery and reduce the incidence of disability.

the published literature to estimate the savings that would accrue to the Medi-Cal program if telehealth was adopted for home monitoring of two chronic conditions: heart failure and diabetes. Although we specifically estimate the savings for the Medi-Cal program, the cost reductions presented would apply to other health care payers as well.

To estimate the potential savings from broader application of telehealth, we searched the published academic literature for meta-analyses on home monitoring cost outcomes. We then reviewed and catalogued the cost findings from the included studies, as well as more recent non-meta studies, which were not published in time for inclusion in a meta-review. In total, we catalogued 42 studies on chronic disease home monitoring.

To model the savings we estimated the decrease in health care costs based on the literature. We then used administrative and survey data to estimate what the current Medi-Cal costs for a population comparable to the subjects of the included studies. Next, we combined these two data points to produce an estimate of Medi-Cal savings.

Chronic Disease Savings

The literature on chronic disease telehealth is extremely diverse and has hindered meta-analyzers in their efforts to estimate an average savings associated with use of telehealth for a specific disease, let alone across various chronic diseases. Studies differ in how the intervention is managed; for example, in telehealth technology, monitoring frequency, and educational components. Different studies also compare telehealth to different types of "usual care," which can be a specific disease management program, home health care, scheduled clinic visits, or unstandardized physician care. Moreover, studies measure costs in different ways. Some only look at the costs for specific outcomes such as hospitalizations, while others look at costs more broadly. Not all studies take into consideration the cost of the intervention itself, but instead rely just on changes in the outcomes measured.

Given that the majority of chronic disease patients receive care for their illnesses at clinics, hospitals, or other outpatient facilities (in addition to hospital inpatient care), we decided to focus on savings to this population (i.e., we excluded studies that examined changes in home health care costs). Therefore, we looked for studies that compared home monitoring to standard outpatient chronic disease care. Of 18 studies we identified that examined chronic diseases and reported cost findings, 11 of them compared telehealth to chronic disease care that was not provided via a home health agency.[42]

In addition, because telehealth can have a complex impact on health care utilization (for example, in the short run, outpatient costs may increase while inpatient hospital costs decrease[43]), we sought to measure the overall decrease in health care costs from an intervention, including both inpatient and outpatient care. Most studies, however, looked at a subset of cost outcomes. For example, seven studies looked only at hospitalization and/or emergency room

[42] Of the 42 catalogued studies, eighteen were deemed qualified because they had a usable cost outcome, reported on an intervention that qualified as telehealth, and studied one the primary chronic diseases.
[43] Barbara Johnston et al., "Outcomes of the Kaiser Permanente Tele-Home Health Research Project," *Arch Fam Med* 9, no. 1 (January 1, 2000): 40-45.

costs. Ultimately, we identified three studies of chronic disease home monitoring that reported broad-based measures of health care cost, including inpatient and outpatient costs. Two of them reported overall cost savings for congestive heart failure, while the remaining study focused on diabetes.

In the sections that follow, we present the results of estimation models for chronic disease monitoring for these two conditions. These models present the savings that California could experience to the extent that telehealth home monitoring for Medi-Cal patients with heart failure and diabetes becomes widely adopted.

Heart Failure

To estimate the impact of more widespread use of telehealth for home monitoring of heart failure patients, we relied on published research to estimate the percentage reduction in overall health care costs, and then applied these reductions to estimates of the size and costs associated with the Medi-Cal population of patients with heart failure.

Multiple studies have found savings associated with application of telehealth for home monitoring of heart failure patients. For example, we identified seven studies that compared telehealth to traditional outpatient care, with savings estimates ranging from 17 percent to 75 percent.[44,45,46,47,48,49,50] On average, these studies reported a 42 percent reduction in measured costs.

As noted previously, we sought to rely on studies with broad-based measures of cost, including both inpatient and outpatient costs. We identified two studies with such a broad-based measure. The first, by Paul Heidenrich of the Cardiology Section of the Department of the Veterans Affairs Medical Center in Palo Alto and his colleagues examined the impact of a telephone-based home monitoring and patient education intervention. Each patient in the study group received a digital scale and an automatic blood pressure cuff. Each day the enrolled patients called an automated phone system and entered blood pressure, pulse, weight, and any symptoms. If values were outside of established ranges, the phone system called a nurse and appropriate

[44] Mary Bondmass, Nadine Bolger, and Gerard Castro, "The Effect of Physiologic Home Monitoring and Telemanagement on Chronic Heart Failure Outcomes.," *The Internet Journal of Advanced Nursing Practice* 3, no. 2 (1999).
[45] Jerome Vaccaro et al., "Utilization Reduction, Cost Savings, and Return on Investment for the PacifiCare Chronic Heart Failure Program, 'Taking Charge of Your Heart Health'," *Disease Management* 4, no. 3 (September 2001): 131-142.
[46] Carmela Maiolo et al., "Home telemonitoring for patients with severe respiratory illness: the Italian experience," *Journal of Telemedicine and Telecare* 9, no. 2 (2003): 67-71.
[47] S Scalvini et al., "Effect of home-based telecardiology on chronic heart failure: costs and outcomes," *Journal of Telemedicine and Telecare* 11 Suppl 1 (2005): 16-18.
[48] Daniel Benatar et al., "Outcomes of chronic heart failure," *Archives of Internal Medicine* 163, no. 3 (February 10, 2003): 347-352.
[49] Barbara H Southard, Douglas R Southard, and James Nuckolls, "Clinical trial of an Internet-based case management system for secondary prevention of heart disease," *Journal of Cardiopulmonary Rehabilitation* 23, no. 5 (October 2003): 341-348.
[50] A Giordano et al., "Multicenter randomised trial on home-based telemanagement to prevent hospital readmission of patients with chronic heart failure," *International Journal of Cardiology* 131, no. 2 (January 9, 2009): 192-199.

follow-up care was pursued. Patients also participated in a patient education program. The study measured the impact of the program on a comprehensive measure of overall health care costs, including both inpatient and outpatient care for the treatment and a matched control group over a two year period.[51] According to the study results, medical claims for the treatment group decreased from an average of $8,500 in the year prior to the intervention, to $7,400 during the year of the telehealth intervention; claims for the control group increased from an average of $9,200 to $18,800. By adjusting for the costs of the telehealth program and differences in the initial level of average claims, we calculate that the treatment group had average total claims that were 30 percent less than those for the control group that relied on usual physician care.

The second study we relied upon was written by Jeremy Nobel and Gordon Norman of the Harvard School of Public Health. They reported the results of a telehealth-based disease management program aimed at reducing costs for heart failure patients. Patients in the study utilized an electronic, home-based weight measurement device linked to a care coordination center used by a large managed care plan. When unexpected weight changes or symptoms were reported, patients were urged to seek same day or emergency care. In addition to the telehealth home monitoring, nurses assessed patients' understanding of their condition and treatment, self-care skills, diet, and medication compliance.

The researchers found that average per member per month costs decreased by 44 percent for patients over 65 and by 27 percent for patients under 65, compared to a control group.[52] Because patients over 65 are likely to be covered by Medicare, we relied upon the lower 27 percent figure. When averaged with the previous study's finding, we calculate that average patient costs would decrease by 28 percent as a result of the implementation of a telehealth-based home monitoring program.

To apply this cost-savings estimate to Medi-Cal, we estimated the percent of the Medi-Cal population that has heart failure using data from the 2009 California Health Interview Survey (CHIS). According to CHIS, approximately 1.75 percent of the Medi-Cal population has heart failure. However, a large fraction of these recipients are non-citizens, who likely would be eligible for emergency services only and so would not qualify to receive a home monitoring telehealth intervention. Adjusting the population from the CHIS data to count just the Medi-Cal enrolled citizens with heart failure resulted in an estimate of 1.4 percent.[53]

Next, we estimated the amount of total claims for our population of interest. First, we estimated the average annual expenditure for a Medi-Cal beneficiary by dividing annual Medi-Cal expenditures by average enrollment.[54,55,56] Because heart failure patients are more expensive to

[51] As the researchers note, rather than relying on heart failure claims alone, the cost of all claims was used "because of inaccuracies in coding of diagnoses." The result is a comprehensive measure of healthcare costs suitable for our analysis.

[52] Jeremy J Nobel and Gordon K Norman, "Emerging information management technologies and the future of disease management," *Disease Management: DM* 6, no. 4 (2003): 219-231.

[53] *California Health Interview Survey 2009* (UCLA Center for Health Policy Research, May 2011).

[54] To account for fluctuations in the Medi-Cal budget, we relied on annual averages over the previous several years for both expenditures and enrollment. Budget data from California Department of Finance, *Governor's Proposed Budget: Department of Health Care Services Budget 2009-10 through 2011-12*.

care for than the average patient, we adjusted the per beneficiary average using an analysis of annual health care costs per capita for chronic disease patients prepared by the California HealthCare Foundation.[57] This analysis utilized data from the Medical Expenditure Panel Survey (MEPS) and found that heart disease patients had an annual cost per capita that was five times higher than average. While heart disease is a larger category of diagnosis that contains heart failure, the average should be representative of heart failure cost, based on a review of the data compiled by the American Heart Association.[58,59] Consequently, we adjusted the Medi-Cal per beneficiary average expenditure by the amount indicated from the California HealthCare Foundation report.

Applying the average cost reduction finding from the research, we calculate that telehealth for home monitoring of heart failure patients has the potential to produce savings in the Medi-Cal program of up to $929 million annually. Since the state is only responsible for approximately 31 percent of Medi-Cal expenditures (with the federal government paying the remaining share), we estimate that the total general fund savings could total up to $281 million annually, to the extent that this type of telehealth home monitoring was widely adopted.[60] While the extent to which telehealth will be adopted depends on a host of factors, the potential exists for Medi-Cal to save approximately $8,600 per beneficiary annually for many of the estimated 107,000 Medi-Cal beneficiaries with heart failure.

Diabetes

To estimate the potential impact of home monitoring for diabetes patients, we followed an approach similar to the one used for our heart failure estimates. Specifically, we estimated the extent of the potential savings based on the published literature. Then, we applied these savings to Medi-Cal expenditures for a comparable population.

In a study entitled "Diabetes Disease Management Program for an Indigent Population Empowered by Telemedicine Technology," Julie Cherry and her colleagues examined the impact of a home monitoring system used with a population of indigent or economically disadvantaged adults with diabetes.[61] Study participants were given a blood glucose monitor as well as a small

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[55] We note that the amount budgeted for Medi-Cal may contain expenditures that are not directly for patients such as county administration.

[56] California Department of Health Care Services, *Trend in Medi-Cal Program Enrollment - Most Recent 24 Months, 2009-08 - 2011-07* (July 2011).

[57] California HealthCare Foundation, "Chronic Disease in California: Facts and Figures," California HealthCare Foundation (2006).

[58] A review of cost and prevalence data on heart diseases compiled by the American Heart Association showed that heart failure's per person average was higher than the average for total cardiovascular disease and equal to coronary heart disease.

[59] Donald Lloyd-Jones et al., "Heart disease and stroke statistics--2009 update: a report from the American Heart Association Statistics Committee and Stroke Statistics Subcommittee," *Circulation* 119, no. 3 (January 27, 2009): 480-486.

[60] The state share of 30 percent is a four year average of the ratio of general fund to total funding for Medi-Cal from: California Department of Finance, *Governor's Proposed Budget: Department of Health Care Services Budget 2009-10 through 2011-12*.

[61] Cherry et al., "Diabetes disease management program for an indigent population empowered by telemedicine technology."

appliance called a "Health Buddy," which has a large screen and four buttons which patients use to answer personalized daily health questions. Responses were sent via telephone line to a data center, where case managers were alerted and responded as needed.

The researchers measured each patient's utilization of health care services, including inpatient admissions, emergency room visits, post-discharge care visits, and outpatient visits, as well as total diabetes-related charges for health care services. According to their analysis, the telehealth intervention resulted in a reduction in diabetes-related charges of 9 percent.

To apply this cost-savings estimate to the Medi-Cal population, we estimated the fraction of the Medi-Cal population that has diabetes, again using 2009 CHIS data. As with the heart failure population, we again adjusted the results to include just citizens. According to the CHIS data, approximately 6 percent of Medi-Cal beneficiaries have been diagnosed with diabetes.[62,63]

Next, we estimated total diabetes-related claims for these beneficiaries, by calculating the average per-beneficiary expenditures and adjusting the result to account for the higher-than-average costs associated with caring for a patient with diabetes. As with the heart failure calculations, we relied on the California HealthCare Foundation analysis of the MEPS data to estimate the cost differential between a patient with diabetes and the average patient. This analysis found that diabetes patients had an annual cost per capita that was three times higher than average. In addition, because the cost measure used in the Cherry study was diabetes-related claims (as opposed to all claims), we needed to estimate the fraction of these annual costs that was related to diabetes. According to the literature, diabetes-related medical problems were responsible for 57 percent of total medical costs incurred by people with diabetes (with the remaining visits being for chief complaints other than diabetes).[64]

Using the average expenditures per beneficiary, the estimated number of beneficiaries, the diabetes cost differential and the fraction of costs for diabetes patients related to their diabetes, we calculated that the average annual Medi-Cal expenditure for diabetes related care was nearly $10,500 per beneficiary. Applying the 9 percent cost reduction finding from the research, we estimate that utilizing home monitoring for diabetes could result in savings for the Medi-Cal program of up to $417 million annually. Since the state is only responsible for 31 percent of Medi-Cal funding, general fund savings could be up to $127 million each year, depending on the extent to which this form of telehealth intervention is adopted, or approximately $939 for each of the estimated 444,000 Medi-Cal recipients with diabetes.[65]

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[62] *California Health Interview Survey 2009*.

[63] We restrict our analysis to citizens, since non-citizens receive only emergency care. If we do not restrict citizenship status, diabetes prevalence increases to 8 percent.

[64] American Diabetes Association, "Economic Costs of Diabetes in the U.S. in 2007," *Diabetes Care* 31, no. 3 (March 2008): 596 -615.

[65] The state share of 30 percent is a four year average of the ratio of general fund to total funding for Medi-Cal from: California Department of Finance, *Governor's Proposed Budget: Department of Health Care Services Budget 2009-10 through 2011-12*.

Summary of Results

Treatment of chronic diseases such as heart failure and diabetes is responsible for a disproportionate share of health care costs. Furthermore, a substantial fraction of the care for these diseases comes from hospital admissions or readmissions, as well as other costly medical interventions that potentially can be avoided through better disease management, such as can be produced with the telehealth-based interventions discussed above.

According to the estimates we developed, based on findings from the published literature, utilizing home monitoring for chronic disease patients could yield substantial savings if fully implemented. We estimate that total general fund savings could total up to $408 million, although the amount of the actual savings would depend on the extent to which telehealth is adopted. It is reasonable to assume that this type of intervention would not be suitable for the entire population of Medi-Cal patients with heart failure or diabetes. However, even if these interventions were instituted with a quarter of the eligible population, annual general fund savings would exceed $102 million a year, according to our application of the published research findings.

The potential savings modeled here present an indication of the potential for telehealth-based home monitoring of just two chronic conditions. Additional savings for patients with chronic obstructive pulmonary disease (COPD) and other chronic diseases may also be achievable. In addition, a growing body of research has shown that telehealth has the potential to reduce costs in several other areas, notably including acute care telehealth.

Conclusion

Although telehealth has been the subject of hundreds of studies, the potential cost savings associated with telehealth have been the subject of less rigorous analysis relative to studies on its medical effectiveness. Analysis of the fiscal effects of telehealth are complicated by the fact that telehealth is a rapidly evolving area of health care, with technological innovations arriving at a rapid pace and technology costs falling as equipment and information transfer costs are lowered throughout the economy.

Given this rapid pace of change, it is not surprising that a consensus has yet to emerge on the cost-effectiveness of telehealth overall. Nevertheless, studies do point to areas of potential cost savings. And, given that AB 415 does not mandate specific reimbursement rates for telehealth services, it is likely that payers will choose to reimburse telehealth services more generously in areas where cost savings can be demonstrated while discouraging expansion of telehealth (via lower reimbursement rates or refusal to pay for technology costs) in areas where it has not proven to be cost-effective.

The analysis of published research findings presented here suggests that broad application of telehealth in the area of home monitoring for congestive heart failure and diabetes has the potential to produce substantial savings for the State of California. In addition, telehealth has the potential to reduce health care costs in many other areas, such as by reducing medical transportation costs, reducing home health care costs, or increasing access to cost-effective

treatments such as retinopathy screening or more timely care for stroke patients. Taken as a whole, the potential cost savings from telehealth could be quite significant. By reducing several of the barriers to more widespread adoption of telehealth, AB 415 can encourage adoption of telehealth in areas where payers, providers, and patients determine that it is effective, cost-effective, and appropriate.

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