Financial and Temporal Advantages of Virtual Consultation in Veterans Requiring Specialty Care

Daniel E. Abbott, MD*†; Ryan A. Macke, MD†; Jodi Kurtz, DNP, RN, NP-C*; Nasia Safdar, MD, PhD*‡; Caprice C. Greenberg, MD, MPH†; Sharon M. Weber, MD*†; Corrine I. Voils, PhD*†; Deborah A. Fisher, MD, MHS§¶; James D. Maloney, MD*†

ABSTRACT  Background: Access to specialty health care in the Veterans Affairs (VA) system continues to be problematic. Given the potential temporal and fiscal benefits of telehealth, the Madison VA developed a virtual consultation (VC) mechanism to expedite diagnostic and therapeutic interventions for Veterans with incidentally discovered pulmonary nodules. Materials and Methods: VC, a remote encounter between referring provider and thoracic surgeon for incidentally discovered pulmonary nodules, was implemented at the Madison VA between 2009 and 2011. Time from request to completion of consultation, hospital cost, and travel costs were determined for 157 veterans. These endpoints were then compared with in-person consultations over a concurrent 6-mo period. Results: For the entire study cohort, the mean time to completion of VC was 3.2 d (SD ± 4.4 d). For the 6-mo period of first VC availability, the mean time to VC completion versus in-person consultation was 2.8 d (SD ± 2.8 d) and 20.5 d (SD ± 15.6 d), respectively (p < 0.05). Following initial VC, 84 (53%) veterans were scheduled for virtual follow-up alone; no veteran required an additional office visit before further diagnostic or therapeutic intervention. VA hospital cost was $228 per in-person consultation versus $120 per episode for VC—a 47.4% decrease. The average distance form veteran home to center was 86 miles, with an average travel reimbursement of $112 per in-person consultation, versus no travel cost associated with VC. Conclusions: VC for incidentally discovered pulmonary nodules significantly decreases time to consultation completion, hospital cost, and veteran travel cost. These data suggest that a significant opportunity exists for expansion of telehealth into additional practice settings within the VA system.

INTRODUCTION
Lung cancer remains the most common cause of cancer-related death in both men and women in the USA.1 Active military personnel and the veteran population, in particular, have been shown to have a higher prevalence of tobacco abuse than their civilian counterparts.2 Furthermore, veterans accessing the Veterans Affairs (VA) health system have, on average, fewer resources and a lower mean income.3 Thus, there is an identifiable patient population that is at high risk for poor lung cancer-related outcomes by virtue of the clear link between smoking and lung cancer, as well as patient-specific behavior and socioeconomic factors.

Such an at-risk patient population would benefit from innovative health care delivery models to address access and outcome disparities across the VA population. Telehealth – remote encounters between providers, or patients and providers, through audio and/or video technology – can expedite specialty input, improve patient care, and reduce costs.4–6 Among other strengths, telehealth enables patients and primary care providers (PCPs) to interact with specialty care providers that time limitations, travel costs, or convenience may otherwise restrict, especially for patients with disabilities.

Individual patient and provider benefits from telehealth implementation have become evident from initial reports of its use.7,8 Patients benefit from increased access with less travel time and missed work, while health systems can contain costs by limiting redundancy of specialist (high dollar) personnel within the system while still providing expertise to primary care providers and patients.9,10 Furthermore, the availability of remote encounters with either providers and/or patients may allow for specialists to perform consultations outside of regularly scheduled clinic hours, reserving clinic time and space for patients requiring in-person examination and discussion.

Telehealth is particularly suited for single-payer, capitated health systems that also possess a shared electronic medical record (e.g., European nations).11 Recognizing this, the Department of Veterans Affairs has been proactive in incorporating telehealth into their infrastructure, mandating that telehealth capacity be available at every VA hospital (VAH) and community-based outpatient clinic. Outlined in their Blueprint of Excellence, the VA has made a priority of leveraging information technology and analytics as one of their essential strategies, capitalizing on its unique medical record system (Computerized Patient Record System locally
and Vista web nationally) and its dedication to vulnerable veterans. As there is immediate access to all health care documentation, test results, and radiographic imaging within the VA system, virtual consultation (VC) – a remote interaction between referring physician and specialist – can be performed as a comprehensive review of the medical record followed by direct recommendation.

Despite the potential benefits of telehealth application, broad adoption has been slow. Outside the veteran population, logistic limitations have included scope and referral patterns limited by electronic medical record compatibility, Health Insurance Portability and Accountability Act concerns, and the inability to effectively bill for these services. The VA, however, with its built-in advantages to overcome these hurdles, is ripe for the study and implementation of VC. The William S. Middleton Memorial Veterans Administration Hospital (Madison, WI) has established a system of VC for thoracic surgery as a local initiative to improve cancer-related care. Specifically, efforts have focused on the evaluation of undiagnosed lung nodules in the veteran population. This report details the Madison VA experience with VC with respect to timeliness of care and economic impact.

METHODS

Study Design

This study was conducted and approved as a quality improvement initiative and was determined to be an exempt from Institutional Review Board review. We retrospectively reviewed the medical records of 157 veterans, between 2009 and 2011, who were found to have incidental pulmonary radiographic abnormalities on either plain X-rays or three-dimensional imaging, and who subsequently underwent VC. The primary endpoint was time from request to completion of either in-person facility consultation (between patient and thoracic surgeon, comparator group) or for VC (between referring provider and thoracic surgeon), reported as mean and SD. Secondary endpoints included costs of either a VC or in-person veteran-provider visit from the VA perspective or travel reimbursement for veterans.

VC and Referral System

VC was established in 2009 at the William S. Middleton VA to aid timely consultation between referring providers and specialists. VC, in this context, was performed with a thoracic surgeon sitting at a dedicated workstation, complete with audio and visual hardware, communicating directly with a referring provider (with similar audio/visual functional capacity) either at a different VAH or at a community-based outpatient clinic (the patient was not present during VC).

A system was developed within Computerized Patient Record System for systematized alerts to be sent to PCPs, which prompted an order for computed tomography if chest radiography was abnormal. This safeguard was intended to decrease delays in obtaining additional diagnostic imaging and limit “lost in follow-up” veterans (Fig. 1). Before the initiation of VC in September 2009, a web-based guideline was developed for PCPs that included a risk calculator for pulmonary malignancy. In addition, a direct education campaign with PCPs expected to use the VC service was implemented with

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**FIGURE 1.** Algorithm for VC referral.
site visits and didactic sessions by the primary subspecialist (J.D.M.). Referring providers were empowered to select between VC and standard clinic visit requests, and VC requests were made electronically through the Computerized Patient Record System ordering system. There was no difference in the mechanism of request for VC or in-person clinic visits at the Madison VA.

VC was initially offered to a limited number of local practitioners. Once proven to be an effective communication tool (validation of small-group success was performed by an informal survey during additional didactic and discussion sessions), VC was offered more broadly to referring physicians throughout Veterans Integrated Service Network 12 (in which the Madison VA belongs) and even nationally, in select circumstances. Data were collected on consecutive veterans since program initiation. Time intervals were calculated from referral to consult completion, comparing VC with standard clinic facility visit over two fiscal years (FY). Data regarding recommendations for veterans evaluated by VC were also recorded, as was the need for additional facility visits or virtual follow-up regarding their reason for referral to a thoracic surgeon. Statistical analyses were performed with Microsoft Excel software (Seattle, WA); a p-value <0.05 was defined as significant.

Cost Analysis
Cost analysis was performed based on VAH standard Decision Support System (DSS) cost calculation, with comparisons made between VC and in-person facility visit. Cost, defined as costs incurred by the hospital, encompassed direct costs (those associated with actual care of the veteran), indirect costs (e.g., housekeeping and maintenance services), and travel costs (reimbursed to veterans based on patient service eligibility, income, and resources). Travel reimbursement, not included in DSS cost analysis, was assessed as an average based on patient volume, means testing, and facility totals. Overall costs were also compared among Thoracic Surgical Service encounters at the Madison VA, in our region (Veterans Integrated Service Network 12), nationally, and at VAH that perform surgical procedures of similar complexity (complex, level IB designation in the VA system).

Average costs of VCs were compared with average thoracic surgery clinic/facility visit costs. Costs by “Account Report” outline the actual dollars being assigned to each DSS department based on labor and supply mapping distributions. The “Actual Unit Cost Report” for the individual’s facility visit was determined after applying mapping assignments for “Labor and Supplies” and all indirect and direct costs for administrative departments. Travel costs were compared with regional and national average costs provided by the Veterans Administration Central Office.

RESULTS
Between 2009 and 2011, 157 VC were performed for evaluation of undiagnosed thoracic radiographic abnormalities.

For all VC, mean time to completion of consultation was 3.2 d (SD ± 4.4 d; Table 1). Subsequent in-person consultations (n = 28) or VC (n = 41) during the first 6 mo of VC availability occurred within a mean time of 20.5 d (SD ± 15.6 d) and 2.8 d (SD ± 2.8 d), respectively (p < 0.05).

Of the 157 VCs, 53% (n = 84) of veterans were scheduled for virtual follow-up alone (Fig. 2); 19% (n = 30) of veterans were scheduled for in-person clinic visits and 15% (n = 25) scheduled for surgery or other procedures. All veterans scheduled for a surgical procedure under general anesthesia required a facility visit for multidisciplinary pre-operative assessment before the surgical episode of care. However, they did not require a separate facility clinic visit with the thoracic surgeon. Other procedures, such as bronchoscopy or percutaneous biopsy, were discussed with the veteran by telephone but an additional facility visit was not required before the procedure.

Since the beginning of FY2010, the thoracic encounter volume increased over 20% with no change in full-time equivalent or other personnel costs. DSS analysis demonstrated that the average thoracic surgery outpatient facility visit cost was $228 per in-person consultation, whereas the VC cost was $120 per episode – a 47.4% decrease (Fig. 3). The average distance from veteran home to consulting center was 86 (range 0–814) miles, and the average travel reimbursement for veterans meeting criteria was $112 (range $87–$126). With average travel reimbursement, the overall cost was decreased to 64% per veteran encounter with VC (p < 0.05).

CONCLUSIONS
Smoking-related illness has a substantial impact on health care in the USA. According to the National Heart Lung and Blood Institute, the national projected annual cost for chronic obstructive pulmonary disease was $49.9 billion in 2010.13,14 Furthermore, lung cancer contributes approximately 10% to national expenditure for cancer care, which has been over $100 billion annually since 2006 and continues to increase.15–17 Veterans are a particularly high-risk population for lung cancer, in part, because of the high prevalence of past or current smoking. The goal of this initiative was to institute a means of VC to provide rapid access to thoracic specialty care for this at-risk population – in a financially sustainable way.2 At the Madison VA, VC substantially expedited the completion of
a thoracic surgeon consultation for incidentally discovered abnormal chest radiography, at significantly less cost.

In previous studies, the scope of telehealth utilization has been broad, ranging from online patient-directed questions answered in an email format to more complex interactions (such as thorough skin exams via teledermatology).\(^\text{9,18}\) Certain components of telehealth have been shown to be cost-effective, in some disciplines.\(^\text{5,6}\) However, VC – a consultation between referring provider and specialist, potentially eliminating the need for patient travel and in-person office visits – may optimize cost savings by minimizing facility charges, ancillary staff, and travel reimbursement. Previous literature has demonstrated that both primary care providers and specialists have a positive outlook on VC utilization as a tool to provide efficient and quality health care.\(^\text{19–21}\) VC, as described in this article and including comprehensive access to medical information and capability of direct patient contact, has not been extensively studied. The substantial differences in the time required to complete a VC versus a traditional in-person office visit demonstrated here have potentially significant future ramifications, particularly in the VA system.

Delay in treatment at VA facilities is well documented, and timely access to care at the VA continues to be highly publicized.\(^\text{22,23}\) These delays negatively affect not only veterans but also the health care system, as future dates devoted to clinical “catch up” eliminate vacancies for other veterans – an example of the opportunity cost of untimely care. These delays may be mitigated by VC, which rapidly evaluates and triages patients while expediting appropriate additional diagnostics such that treatment can commence. The response time for VC demonstrated in this study – completion of the initial

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**FIGURE 2.** Resultant recommendations following VC.

**FIGURE 3.** Comparison of in-person and VC costs, incorporating hospital costs and veteran travel reimbursement.
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treatment, whereas specialist direction in additional testing also results in fewer unnecessary tests and delays.24 The Madison VA experience suggests that VC facilitates planning for multidisciplinary care without requiring redundant resources associated with conventional multidisciplinary facility visits.

The data presented here also show that VC results in considerable cost savings when compared with in-person facility visits as the initial consultation mechanism. The overall travel costs for the Madison VA alone were $3.7 million in FY2014, with a substantial fraction of that sum devoted to reimbursement for veteran travel. In our study, avoiding average travel reimbursement for veterans resulted in VC costing 65% less than an in-person facility visit. Ultimately, 50% of VC did not require in-person facility visits, eliminating veteran out-of-pocket costs associated with lost work time, travel, and/or parking costs.

This report is based on a quality improvement initiative using a pre–post study design; differences between patients at baseline may affect decisions to choose VC versus in-patient consultation. However, we did not collect patient outcomes in this study and our outcomes of system-level change—time and cost specifically at the Madison VA—should not have been affected by patient factors. Second, the VC cohort is influenced by referring provider bias, as referring physicians either unfamiliar with VC or inherently biased against telehealth/VC may skew our findings. However, this experience demonstrates that VC can provide more timely, and much less-expensive, consultations. Although we are unable to define indirect and direct costs for specific encounters due to the de-identified nature of our cohort, differences in encounter costs can be attributed to reduced indirect costs (facility time, ancillary staff, etc.) as the fixed cost of physician time is no different between VC and in-person cohorts. Third, the generalizability of VC cost savings is more easily demonstrated in systems with a fixed budget (such as the VA), and financial benefit to the facility may not be as easily documented in other care delivery models outside our local VAH. From a provider/health system perspective, there is no agreement upon mechanism for reimbursement for VC (or telehealth, in general). Specialty physicians may benefit from increased referrals as a result of a dedicated programmatic telehealth program, and hospitals may indirectly benefit from such increased referral bases, but a loss in revenue generated from in-person facility-related tests and visits may lead to a decrease in reimbursement for the tertiary center.

Looking forward, there are significant advantages of VC specifically and telehealth, in general. Referring physicians and PCPs will have improved and timely access to specialty care. Medical documentation by the specialist can be entered into the legal medical record during the visit, improving efficiency and increasingly avoiding opportunity costs associated with untimely care. VC for pulmonary radiographic abnormalities may only be the beginning of telehealth in the surgical subspecialty setting. Broader application of telehealth, both between providers and between providers and patients, could readily be adapted to other surgical and medical subspecialties. For subsets of cancer patients who frequently require multimodality care—surgical intervention, administration of systemic chemotherapy, and application of radiation therapy—as seen in gastrointestinal malignancies, for example, the complexity of care is particularly well suited for patient-friendly enhancements in efficiency of care delivery.

In summary, we have demonstrated that use of VC in a veteran population with pulmonary radiographic abnormalities can dramatically decrease the time to completion of first consultation and specialty decision-making. Additionally, this process decreases overall cost to the health care system, with lower facility costs and elimination of travel costs. These data provide an opportunity for expansion of our telehealth program, realized by the current addition of virtual clinics for cardiac surgery, urology, infectious disease, rheumatology, and cardiology at the Madison VA. With persistence and prospective study, the goal of patient-centered, resource-wise, application of telehealth has the potential to aid the evolution of modern health care delivery, both within and outside the VA population.

AUTHORS’ CONTRIBUTIONS

Study design, data accrual, and data analysis were conducted by R.A.M., J.K., and J.D.M. Drafting of the manuscript, critical revisions, and final approval of the manuscript were performed by D.E.A., R.A.M., N.S., C.C.G., S.M.W., C.V., D.A.F., and J.D.M. Written permission has been obtained by all authors listed in this acknowledgment section.

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