Telehealth Delivery of Outpatient Pediatric Surgical Care in Hawai‘i: An Opportunity Analysis

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Abstract

In the state of Hawai‘i, nearly all pediatric surgical care is delivered on the main island of O‘ahu at the state’s primary tertiary children’s hospital. Outpatient clinic visits require patients and families to travel to O‘ahu. The direct and opportunity costs of this can be significant. The objective of this study was to characterize potential telehealth candidates to estimate the opportunity for telehealth delivery of outpatient pediatric surgical care. A retrospective chart review including all patients transported from neighbor islands for outpatient consultation with a pediatric surgeon on O‘ahu over a 4-year period was performed. Each patient visit was examined to determine if the visit was eligible for telehealth services using stringent criteria. Direct, insurance-based costs of the travel necessary were then determined. Demographic data was used to characterize the patients potentially affected. A total of 1081 neighbor island patients were seen in the pediatric surgery clinic over 4 years. Thirty-one percent of these patients met criteria as candidates for telehealth visits. The majority of patients came from Hawai‘i and Maui. Most patients were identified as Native Hawaiian or Asian. The average cost per trip was $112.53 per person, leading to a potential direct cost savings of $37,697 over 4 years. Over 30% of outpatient pediatric surgical encounters met stringent criteria as candidates for telehealth delivery of care. Given the significant number of patients that met our criteria, we believe there is an opportunity for direct, travel-based cost savings with the implementation of telehealth delivery of outpatient pediatric surgical care in Hawai‘i.

Keywords

Telehealth, Pediatric Surgery, Hawai‘i, Telemedicine, Telecare

Abbreviations

HMSA = Hawaii Medical Service Association
IRB = Institutional Review Board

Introduction

The unique geography of the Hawaiian Islands presents several challenges in terms of access to healthcare. All neighbor islands are considered rural and there are notable disparities in the health care that is available, depending on the island.[1] Furthermore, the Native Hawaiian and Pacific Islander populations represent higher percentages of the local population on the islands of Maui and Hawai‘i compared to O‘ahu, compounding the access to care issues for these traditionally underserved groups.[2] Currently, there are no pediatric surgical providers on islands other than O‘ahu. The majority of pediatric specialists practice at the state’s primary tertiary children’s hospital on O‘ahu. The general pediatric surgeons do not travel to the neighbor islands to see patients and all surgeries are completed on O‘ahu. Outpatient clinic visits to specialists, therefore, require patients and a respective parent or legal guardian to travel to O‘ahu, which could amount to a full day of travel for a relatively quick clinic visit. The cost of this travel (ie, airfare, car transportation, opportunity costs, etc) can be significant. Opportunity costs include those unseen costs such as missed days of school for the child and lost wages from missing work for their legal guardian. Telehealth delivery of outpatient pediatric surgical care has the potential to provide cost effective and convenient care to populations that have traditionally had limited access.

Over the last 5 years, there has been a statewide initiative to develop telehealth programs in Hawai‘i. To date, the body of literature surrounding the efficacy of telehealth delivery of pediatric surgical care has been limited. One group found that less than 15% of telehealth consultation were in pediatrics.[3] Early studies have demonstrated cost benefits in pediatric burn medicine, pediatric urology, and child psychiatry.[4-6] Studies in Canada have shown that telehealth is acceptable with good patient and family satisfaction for cases such as hernias, gastroesophageal reflux disease, soft tissue masses, skin lesions, gastrostomy care, constipation, and other pre-surgery work-up visits and post-operative care visits.[7-9] While the results of these studies are promising, it is unclear whether these findings can be extrapolated to the unique population and geographic constraints of Hawai‘i.

The objective of this study was to identify the number of patients coming from another Hawaiian island to O‘ahu for an outpatient visit. Clinical criteria were then applied to identify the subset of patients who may be managed via telehealth. Cost data provided by Hawaii Medical Service Association (HMSA), Hawai‘i’s predominant medical insurance provider, was used to calculate potential savings to the Hawai‘i health system that can be realized through a telehealth pediatric surgery outpatient clinic.

Methods

This study was a retrospective chart review that analyzed all patients that were transferred from other Hawaiian islands for consultation with a pediatric surgeon over a 4-year period from September 1, 2013–August 31, 2017. All patients who traveled from a neighbor island to O‘ahu and were seen in the pediatric

surgery clinic by 1 of 3 board certified general pediatric surgeons at the state's primary children's hospital were included in the study. Demographic data was used to characterize the origin island of the patient as well as the child's ethnic makeup. The reason for the outpatient visit as well as the primary patient diagnoses were also recorded. Clinical elements of each patient visit were then examined to determine if that visit could have been conducted via telehealth. Inpatient admission after the visit, need for surgery or any invasive procedures within 24 hours, need for additional subspecialty consultations or examinations, and need for emergency room evaluation within 30 days of seeing the surgeon for that same problem disqualified encounters as potential telehealth visits. HMSA administrative cost data was then used to determine the potential cost savings via telehealth versus traveling to Oʻahu. HMSA was able to provide the cost of the flight from the neighbor islands to Oʻahu. This cost was then multiplied by the number of telehealth candidates to estimate cost savings. The study protocol was approved by the Hawaiʻi Pacific Health Research Institute Institutional Review Board (IRB).

Results

There were 1081 patients seen in the pediatric surgery clinic from other Hawaiian islands over the 4-year period. Seven visits were excluded from the study for the following reasons: the patient lived on Oʻahu at the time of the visit, the visit was already a telehealth visit (n=2), the visit was outside of the date range, or because the visits were procedural and were seen by another provider other than the 3 pediatric surgeons. Of the 1081 patients, 335 (31%) of patients were deemed appropriate candidates for telehealth visits. There were various reasons why patients were deemed inappropriate telehealth candidates; the most common reason was that the patient had a pre-operative visit prior to surgery (Table 1). These patients were categorized based on the author's discretion as to which criteria was the most relevant to the patient's overall care. For example, if a patient was seen by another provider such as the pediatric gastroenterologist or the pediatric urologist, but also required operative intervention for a post-operative complication, they were placed in the "complications requiring surgery" category.

From a demographic standpoint, 45% of patients from the neighbor islands came from the island of Hawaiʻi, 31% from Maui, 17% from Kauaʻi, 5% from Molokaʻi, and 2% from Lanaʻi. The percentage of patients deemed appropriate telehealth candidates were proportional to these numbers, with 44% of telehealth candidates coming from Hawaiʻi, 29% from Maui, 16% from Kauaʻi, 9% from Molokaʻi, and 2% from Lanaʻi (Figure 1). More patients identified as Native Hawaiian compared to any other ethnic group, 46% of the total population and 47% of the potential telehealth population. The next largest ethnic group identified as Asian, which comprised 29% of the total population and 27% of the potential telehealth population (Table 2).

The most common types of visits were follow-up visits and post-operative visits. It is possible that some of the documented follow-up visits could have been post-operative visits, however, we strictly used the limited referral information provided to categorize the visits. Of the telehealth candidates, 37% of visits were coded as follow-up appointments, 33% were coded as post-operative visits, and 31% were coded as initial encounters. The most common pathologies observed for appropriate telehealth candidates were inguinal hernias, stable medically managed hemangiomas, and pectus excavatum followed by umbilical hernias and gastrostomy tube visits that did not require exchange of the feeding tube.

Utilizing data provided from HMSA, the average cost per round trip from a neighboring island was $112.53 per patient, leading to a potential cost savings of $37,697 over 4 years. This cost data included only the cost of plane flights for the patient, not including their family member, and did not include costs for rental car, hotel, opportunity costs, etc.

Table 1. Number of Patients Not Deemed Appropriate Telehealth Candidates by Exclusion Criteria

Exclusion Criteria	Number of Patients (%)
Pre-operative Evaluation	257 (34%)
Feeding Tube Assessment/Exchange	134 (18%)
Burn Wound Care	50 (6.7%)
Wound Care/Small Procedures in Clinic	47 (6.3%)
Referral Required/Saw Another Provider	46 (6.2%)
Anal Dilations (Anal Stricture)	33 (4.4%)
Post-op Complication/Specific Complaint	32 (4.3%)
Physical Therapy/Brace Shop	25 (3.4%)
Hemangioma Work-up/Management	22 (2.9%)
Additional Work-up Needed	21 (2.8%)
Needed Physical Exam	20 (2.7%)
Complex Patient/Visit	18 (2.4%)
Admission/Emergency Room Visit Within 24 hours	15 (2.0%)
Complications Requiring Surgery	11 (1.5%)
Other	9 (1.2%)
Operating Room Within 24 hours	6 (0.8%)
Total	746 (69%)

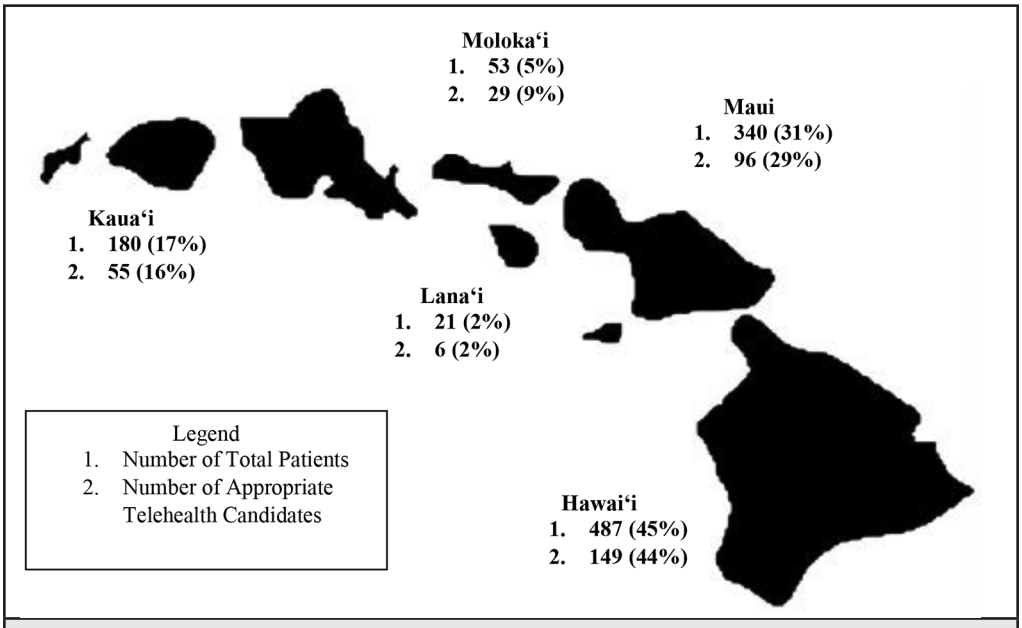

Figure 1. Number and Percentage of Total Patients and Patients Deemed Appropriate Telehealth Candidates by Neighbor Hawaiian Island

Note: The top number is total number of patients from the specific island and bottom number is number of patients deemed appropriate telehealth candidates.

Table 2. Number and Percentage of Total Patients Deemed Appropriate Telehealth Candidates by Race and Ethnicity

Race and Ethnicity	Total Number of Patients (%)	Number of Appropriate Telehealth Candidates (%)
Native Hawaiian	495 (46%)	156 (47%)
African American	6 (0.6%)	3 (0.9%)
American Indian/Alaska Native	15 (1.4%)	7 (2.1%)
Asian	312 (29%)	90 (27%)
Caucasian	187 (17%)	51 (15%)
Hispanic	14 (1.3%)	2 (0.6%)
Other/Unknown	52 (4.8%)	26 (7.8%)

Note: Race and ethnicity were self-reported with the option for other/unknown if the patient did not fit into one category or did not want to report.

Discussion

Multiple studies have shown that telehealth services present several advantages without compromising patient care. A retrospective study in pediatric urology patients compared patients seen post-operatively via telehealth versus an in-office visit. The study found that there were no differences between the groups in terms of post-operative surgical complications. They noted that patients who lived 37 kilometers (23 miles) further away from the hospital were more likely to choose telehealth services than those who lived closer. They ultimately concluded that telehealth could be used post-operatively for both simple and complex surgical cases, resulting in cost savings as well as time savings for both patients and providers.[4]

Additionally, in a recent review of telemedicine for pediatric general surgery post-operative visits, results revealed comparable outcomes between telemedicine and in-person visits. They found a significant decrease in travel cost and time, with no difference in rate of complications.[10,11] Another study found that implementation of telephone post-operative visits for umbilical hernias and laparoscopic cholecystectomies was not associated with an increase in complication rates. In fact, it led to the opening of 110 new clinic locations.[10,12] Additionally urology post-operative visits, including radical prostatectomies, have been facilitated via telehealth with improved patient satisfaction and no urologic complications at 3 months.[10,13] These studies show that telehealth has been successful for both initial visits and post-operative visits, usually in a "hub and spoke" design

with the pediatric surgeon at a tertiary care hospital (hub) and the patient at a remote location (spoke).[10,14-15]

In Canada, telemedicine services have been utilized in both the adult and pediatric populations with success. An eConsult system has been implemented for adult patients that allows asynchronous consultative provider-to-provider communication, which has improved access to care in the adult population and has high satisfaction ratings by both providers and patients. In a prospective study, this system was applied to the pediatric surgery population in Canada and yielded similar results.[16] The 3 pediatric subspecialties included in the study were general pediatrics, orthopedics, and psychiatry; pediatric surgery was not represented. Responses occurred in 0.9 days on average. The study found almost half (48.4%) of the telemedicine consultations resulted in a change in management of the patient's current plan of care. Additionally, 37% of face-to-face visits were avoided and the time to consult was significantly decreased when compared to a face-to-face visit (1-day vs 132 days; $P<.001$).[16] This study shows that teleconsulting in the pediatric population can increase access to specialists which can change management decisions and prevent unnecessary face-to-face visits. The authors mentioned that this study shows comparable results to the only other pediatric eConsult system (ECHO-Pac) for pediatric asthma patients based out of Tripler Army Medical Center in Hawai'i, which provides medical services to military families.[16]

Our cost data likely underestimate the true cost for a patient to travel to O'ahu each visit as it does not take into consideration member copayments and family member travel, which is required for pediatric patients. It is estimated that in Canada the indirect costs of missing work to travel to healthcare appointment adds up to about $16.6 billion per year.[17] One-third of the families in this study spent at least 4 hours in transit to the appointment and 75% reported that at least one parent missed some amount of work in order to make the appointment.[17] In our study, cost data for transporting a patient from a neighboring island to O'ahu for an outpatient visit was obtained, however, it only included the cost of flight and did not investigate the indirect costs to families and the burden of traveling. It was also specific for HMSA and may be different for other insurance companies. In the future, a prospective study will look at these indirect costs by surveying families who choose traditional in-office visits versus utilization of telehealth services.

For this study in particular, it is important to note that when selecting patients, the authors were very conservative in the criteria used to determine which patients were considered appropriate telehealth candidates. Therefore, it is our belief that this study likely underestimates the actual number of patients who are appropriate candidates for telehealth services. Many pre-operative visits will likely be good telehealth candidates as well, but due to the retrospective nature of this study they were deemed inappropriate telehealth candidates for several reasons. In many cases, the pre-operative visit was likely to be the only clinical encounter prior to surgery. In this scenario, an in-person visit would be required to complete a thorough physical exam prior to proceeding to the operating room. In more complex cases, it is possible the patient would require referral to other providers or further diagnostic work-up with imaging and labs. Our recently IRB-approved prospective study will enable all patients from the neighbor islands to opt into telehealth services for their visit, including pre-operative visits, so travel to O'ahu would only be necessary for the actual surgery. With some training, we believe that other pathologies can be incorporated, to include some minor burn care, wound care, and gastrostomy tube exchanges. The authors based our analysis strictly on the referral data and information that could be gleaned from the encounters themselves. This indicates that there may be a significant amount of patients that may benefit from telehealth services in Hawai'i that were not necessarily captured in this limited retrospective review.

Furthermore, the study only included completed outpatient visits for patients originating from a Hawaiian island other than O'ahu. This does not include any missed or canceled visits. Given the direct and opportunity costs associated with the required travel, it can be postulated that an even higher number of patients may be candidates for telehealth delivery of outpatient pediatric surgical care. Whether telehealth services would improve the access to care, and thereby the visit completion rate for these patients has yet to be determined. Future studies are planned to evaluate cancellation and "no-show" rates for neighbor island patients versus O'ahu patients as well as for telehealth delivery of care.

Lastly, the demographic results of the study demonstrates a higher percentage of neighbor island patients identify as Native Hawaiian compared to O'ahu based patients.[2] Native Hawaiians are a traditionally underserved ethnic population with well-established disparities across multiple health care outcomes.[18] By decreasing direct and opportunity costs, telehealth delivery of outpatient pediatric surgical care has the potential to improve access to care for this disproportionately affected population.

In conclusion, use of telehealth services is reasonable in select pediatric surgical patients and offers a significant cost savings to those traveling from other Hawaiian islands. Over 30% of outpatient pediatric surgical encounters met stringent criteria as candidates for telehealth delivery of care. This represents a significant opportunity for direct, travel-based cost savings as well as opportunity cost savings associated with the implementation of telehealth delivery of outpatient pediatric surgical care in Hawai'i. Further research will investigate the impact of telehealth services and examining patient outcomes.

Conflicts of Interest

None of the authors identify any conflicts of interest.

Disclosure Statement

The views expressed in this manuscript are those of the author(s) and do not reflect the official policy or position of the Department of the Army, Department of Defense, or the US Government.

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