AFHCAN TELEHEALTH

ALASKA NATIVE TRIBAL HEALTH CONSORTIUM

# IMPACT OF STORE-AND-FORWARD TELEHEALTH IN ALASKA:

# A SEVEN YEAR RETROSPECTIVE

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## IMPACT AND EXPERIENCES FROM SEVEN YEARS OF UTILIZATION WITHIN THE AFHCAN SYSTEM


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# COMMONLY USED ACRONYMS

The following are acronyms used throughout this report

| | |
|---|---|
| **AFHCAN** | Alaska Federal Health Care Access Network |
| **AFHCP** | Alaska Federal Health Care Partnership |
| **ANMC** | Alaska Native Medical Center |
| **ANTHC** | Alaska Native Tribal Health Consortium |
| **ATHS** | Alaska Tribal Health System |
| **CHA/P** | Community Health Aide / Practitioner |
| **IHS** | Indian Health Service |
| **S&F** | Store-and-forward [telehealth] |
| **USCG** | United States Coast Guard |
| **VA** | Veterans Administration |
| **VTC** | Video teleconference |

# EXECUTIVE SUMMARY

Store-and-forward (S & F) telehealth is used heavily in Alaska for primary care, otolaryngology, dermatology and other specialty consultations. The AFHCAN telehealth system provided care to more than 27,000 patients throughout Alaska from 2001-2007. This resulted from the direct involvement of 1,300 different providers that created or consulted on more than 50,000 telehealth cases.

Most of these cases (38,000) involved primary care issues for which the telehealth system prevented patient travel in 1 out of 5 cases. Approximately 11,000 other cases were referred to specialists and resulted in travel savings for 3 out of 4 patients seen. The overall travel savings generated by the use of AFHCAN telehealth during these years amounted to approximately $14 million for 15,600 patient encounters. Annual travel savings are now estimated to amount to $3.5m/ year (based on 2007 data).

Store-and-forward telehealth has been shown to increase access to care and provide quality diagnosis and treatment, satisfying both patients and providers. Patients are being seen in a more timely manner as indicated by the rapidity with which specialty consults are provided (65% within the same working day, and 50% of these within 1 hour). Disease states are also being diagnosed and triaged at an earlier stage. In 8% of all telehealth cases, travel was caused rather than avoided as previously unsuspected problems were diagnosed resulting in early intervention with all the concomitant benefits.

Store-and-forward telehealth is an efficient way for organizations to handle referrals because specialists can take on a certain amount of workload during their unscheduled "down times." Consultants need a relatively small amount of time per case to respond to an telehealth consultation. If the case is well documented, then the consultant can take minutes to evaluate the history and data and keyboard a response for treatment and other recommendations.

Store-and-forward telehealth has been shown to be an effective presurgical tool for accurately estimating operative times for patients needing surgery. The expert triage model provides a needed consultation service in those areas without access to particular specialties. Store-and-forward telehealth helps match need with capacity. It helps level health disparities by providing an outlet for specialty care in the rural and remote locations and by providing a mechanism to meet a standard of care. Using these new innovations, health disparities for Alaska Natives are being addressed with specific interventions in the areas of skin disease, respiratory illness and ear disease. Secondary benefits to S & F telehealth include effective triage so that wait times for appointments with specialists are reduced as are the appointment backlogs for specialty clinics. Access for specialty care is thereby improved. Additional benefits include better documentation, archiving, and educational opportunities. Store-and-forward telehealth decreases patient travel, and annual savings from reduced air travel in Alaska is approximately $3.5 million per year. These are conservative estimates, and do not factor in the additional cost savings from avoided travel lodging and food costs, time lost from work or school, etc. An immediate electronic survey at the point of care, following an S & F telehealth

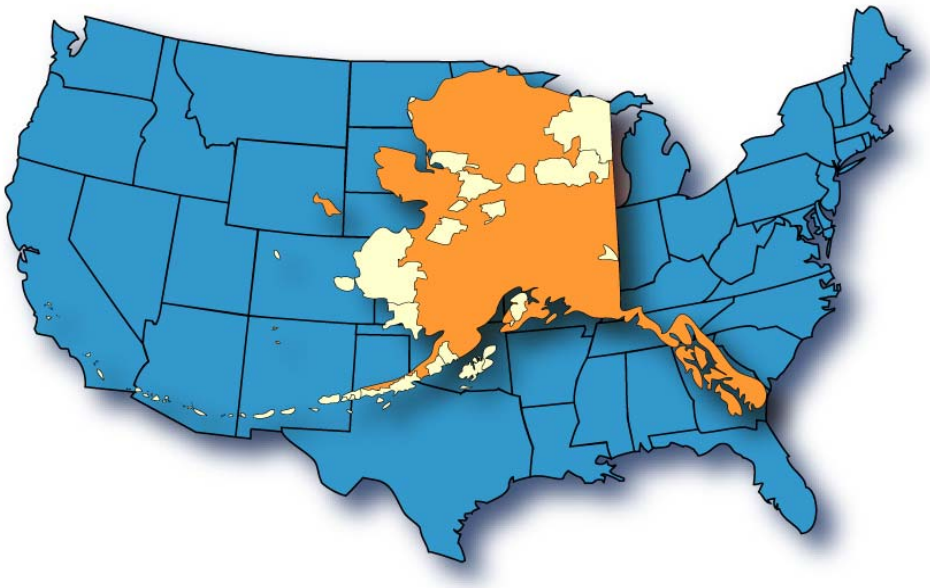
encounter shows that providers are comfortable creating cases, view the system as a communication tool, are satisfied with the equipment and think it is easy to use. They believe it improves patient satisfaction, makes their job more fun and helps them educate their patients. There is no documented evidence of fraud and abuse using the AFHCAN S & F telehealth system.

There are some disincentives and barriers to the adoption of S & F telehealth. The sending site incurs much of the equipment expense and manpower to create an S & F telehealth case. Yet, there is no reimbursement for the sending (referring) site; there is no financial incentive for the sending clinician to take the time to create and send the S & F telehealth case. Store-and-forward telehealth creates a unique situation where the consulting provider is faced with registering the patient at the same time or after she is caring for and creating an electronic consult for the patient. Store-and-forward telehealth results in lower level E & M codes for the receiving site. Store-and-forward reimbursement does not include a facility fee.

# INTRODUCTION

Alaska is remote and rural – it covers 586,400 square miles and has a population of 626,932. More caribou than people reside in Alaska. Alaska is vast with approximately 100,000 glaciers, three million lakes, 33,000 miles of coastline and 19 peaks over 14,000 feet. It is a land of extremes. Alaska has 40 active volcanoes. Of the ten strongest earthquakes ever recorded in the world, three have occurred in Alaska. The most recent high damage earthquake was magnitude 9.2 and occurred in 1964. Temperatures have ranged from a low of -83° F at Prospect Creek in 1973 to a high of 100 ° F at Fort Yukon in 1915.

*Figure* **1** ***Size Of Alaska Relative to the Continental U.S***



It is readily apparent why Alaska needs telehealth capabilities. Alaska is 1st of 50 states in land mass, but is 47th of 50 states in road miles. It is 48th of 50 in doctors to persons ratio. While approximately half of the Alaska population lives in the Anchorage and Mat-Su region, the rest of the population is scattered across a large area.

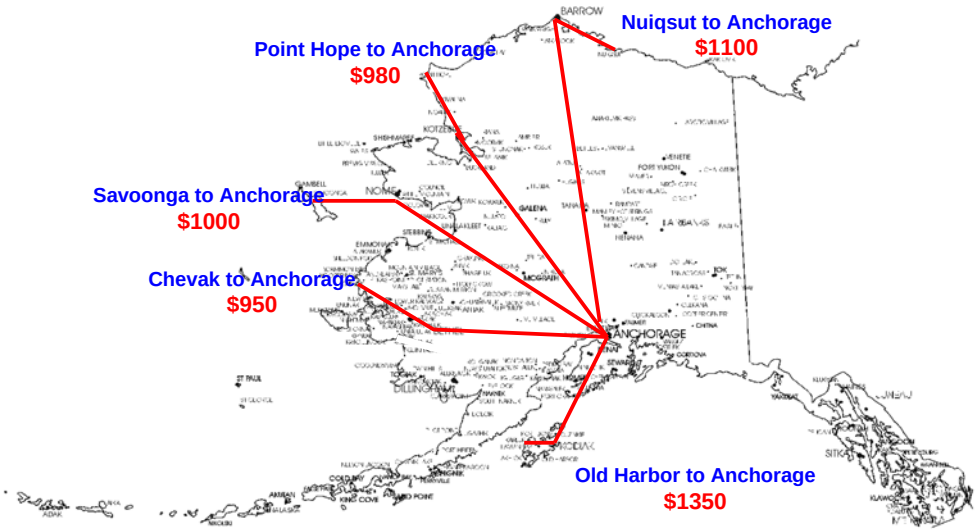
The lack of connecting road systems results in 75% of Alaskan communities and 25% of Alaska residents being unconnected by road to a hospital. These communities must depend on other modes of transport, such as plane, boat, and snow machine to access basic medical services. Although close to half of Alaska's population is concentrated in the Anchorage region, the State's largest metropolitan area, 25% of all Alaskans, and 46% of Alaska Natives, live in communities of less than 1,000 people.

In many cases, patients and providers must travel in order to receive needed medical services, but that travel is much more treacherous, complicated, and expensive than in

most states. Since Alaska's road system covers only a small part of the state, many communities are completely isolated from traditional methods of transportation.

*Figure*
**2**

## *Typical Round Trip Airfares to Anchorage*




While travel from Alaska to the 'lower-48' for sub-specialty and rehabilitative services may not present difficulties logistically, the associated travel costs are tremendous. In some cases, the travel budgets for rural clinics are larger than staffing budgets. Figure 2 indicates typical roundtrip airfares from some remote locations to Anchorage – the location of most specialty healthcare. Medical evacuations are much more expensive.

## AFHCAN

The Alaska Federal Healthcare Access Network (AFHCAN) telehealth project set out to help address these problems. Through the use of telehealth technology, the expertise of a physician can be extended across these complex geographical barriers. In many cases, it allows the physician to be brought "virtually" to the patient, rather than bringing the patient to the physician – a situation that is both more convenient and cost-effective.

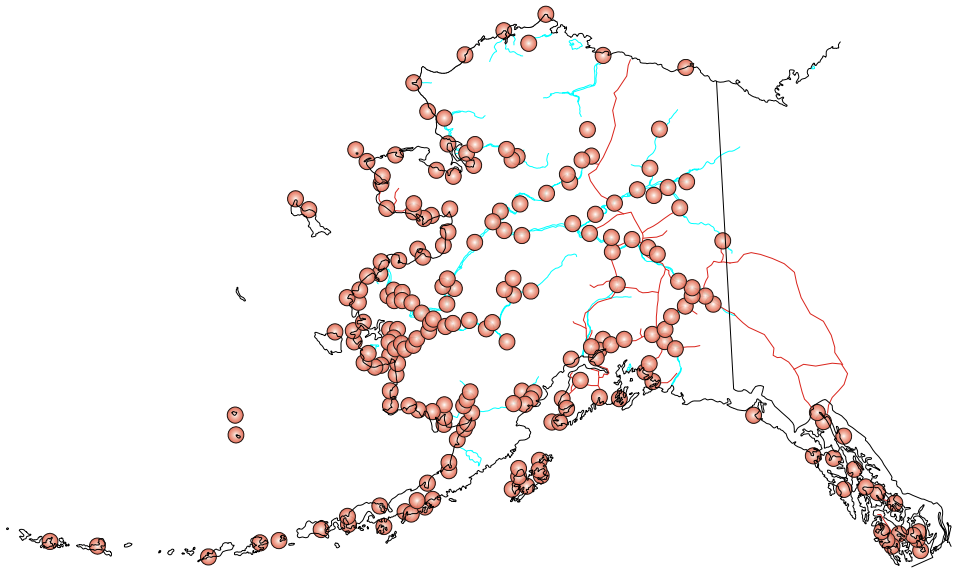
AFHCAN is a federally funded, tribal operated telehealth program providing telehealth software, hardware, network and business solutions to medical facilities serving federal beneficiaries in Alaska.

The AFHCAN project was designed to provide telehealth solutions to 248 sites throughout Alaska represented by 43 autonomous organizations (Figure 3). These sites

provide direct care to beneficiaries of IHS and tribal organizations, the Department of Defense, U.S. Coast Guard, and the VA. The project also provides benefits to state Public Health Nursing (PHN) offices. In total, the beneficiaries served by the AFHCAN sites represent approximately half of the state's total population.

*Figure*
**3**

## *AFHCAN Sites in Alaska*



The remoteness of AFHCAN sites is shown in Table 1. Note that only 3% of AFHCAN sites are accessible by road. Almost 74% require a small plane to access the site. The sites labeled "extremely remote" have limited or infrequent air access, sometime provided by helicopter or ski planes.

*Table*
**1**

## *Access to 248 AFHCAN Sites*

| Access Mode | Percent |
|---|---|
| **Highway** | 3% |
| **Highway and jet** | 8% |
| **Jet only** | 11% |
| **Jet then small plane** | 6% |
| **Small plane** | 60% |
| **Limited road and small plane** | 8% |
| **Extremely Remote (Infrequent plane)** | 3% |

A broad range of providers staff the 248 AFHCAN sites (Table 2). The remote areas of Alaska have village clinics managed by the Indian Health Service or tribal health corporations which provide the only source of local medical care. These tribal village clinics are staffed primarily by Community Health Aide/Practitioners (CHA/Ps) rather than physicians or mid-level practitioners – and account for 66% of the 248 AFHCAN sites.

*Table* **2**

### *Staffing at 248 AFHCAN Sites*

| Provider Level | Percent |
|---|---|
| **Physician (MD)** | 13% |
| **PA / Nurse Practitioner** | 10% |
| **Public Health Nurse** | 10% |
| **Community Health Aide/Practitioner** | 66% |

AFHCAN staff work with all levels of providers throughout the system to develop and improve telehealth solutions. Noting the predominance of sites staffed by CHA/Ps, AFHCAN has long worked closely with the Alaska Community Health Aide Program to make sure that the solution meets the needs of local care providers.

The origins of the Community Health Aide Program go back to the 1950s in response to the tuberculosis epidemic and high infant mortality. Known as the Sanitation Aide Program, this provided rural health care by training local people to dispense medicines and serve as local health providers. Over time, the mission and training was refined and in 1968, the Community Health Aide Program received formal recognition and congressional funding.

Most CHA/Ps are nominated to the position by their village council and receive 16 weeks of basic medical training. Training includes advanced first aid, CPR, and a combination of didactic and clinical instruction in other areas of primary care. There are four sessions of CHA/P training; each lasts about one month. The CHA/Ps work within the guidelines of the 2006 Alaska Community Health Aide/Practitioner Manual in conjunction with a supervising physician. Today, there are approximately 579 CHA/Ps serving in nearly 200 villages throughout Alaska, and they provide nearly ½ million encounters each year.

Clinical care within the Alaska Tribal Health System (ATHS) is typically comprised of 3 levels of care. Village clinics, staffed by CHA/Ps, typically work closely with a regional hospital facility staffed with licensed Family Practice Physicians. The regional hospital facilities work closely with the specialist at the Alaska Native Medical Center (Figure 4) for most specialty consults and transfers of care. While this is far from a complete description of the clinical pathways in Alaska, it is a simple and fairly complete model to understand the majority of telehealth care within Alaska.

*Figure*
**4**

## *Telehealth Workflow*

*A Telehealth case created in a village clinic (shown below) …*

*… might end up being reviewed by a specialist at ANMC (shown below).*

The Alaska Native Medical Center (ANMC) is a tertiary referral center in Anchorage, Alaska providing specialty care for the 150,000 Native Alaskans located throughout the state. Approximately 20 specialty departments at ANMC accept cases and offer consultations - specialties which include Otolaryngology, Dermatology, Cardiology, Endocrinology, Podiatry, Dental and General Surgery.

## Store-and-forward Telehealth (Electronic Consultation)

The term "store-and-forward" (S&F), when used to describe telehealth, refers to the concept that data (such as images) can be stored electronically and retrieved at a later time (and possibly distant location) by another health care provider. This is occasionally referred to as "asynchronous" telehealth because the provider that generates the data does not need to synchronize this activity with a remote provider. The term "store and retrieve" is also used – perhaps more accurately - when the data does not traverse any distance but simply remains on a server to be retrieved at a later time by another provider. These concepts may be compared to live video teleconferencing (VTC), or synchronous telehealth, whereby both providers need to coordinate a live interaction with each other.

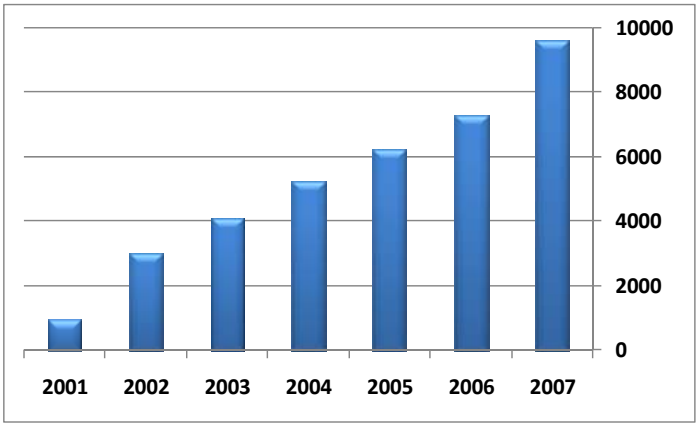
The AFHCAN system was initially designed to provide S&F telehealth. This decision was based on multiple reasons – including significant previous experience with this technology and limited bandwidth connecting the AFHCAN sites. Perhaps the most compelling reason was, however, based on the distributed nature of health care delivery in Alaska and the inclusion of many health care organizations in the AFHCAN plan. S&F telehealth more easily supports the ability to move data between organizations with disparate networks, and more readily adapts to physician schedules that vary greatly from one organization to another.

Many of the organizations involved in AFHCAN have embraced VTC technologies and teleradiology as separate projects with a common goal of improving health care delivery. AFHCAN also currently supports statewide VTC for purposes of clinical care, education, and administration. These activities are not part of this report – as this report is strictly focused on S&F telehealth. It should also be noted that S&F telehealth – in the context of this report – does not include single value data transmission (such as lab values) home health technologies, or consumer to provider communications. Rather, it is an asynchronous communication between providers that encompasses a wide breadth of health care and multimedia data sets.

# TELEHEALTH UTILIZATION

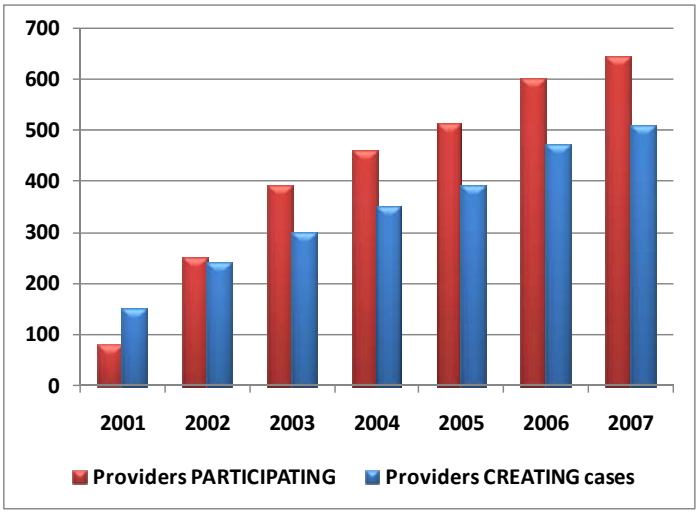
A total of 36,323 patients had care provided through the AFHCAN telehealth system from 2001 to 2007 (the latest full year for which data is available). The annual growth in patients seen through this system is shown in Figure 5. The growth in 2007 meant that 9,595 unique patients were seen through telehealth.

*Figure* **5** ***Patients Involved in AFHCAN Telehealth***




Similarly, the number of unique providers per calendar year actively participating in using the AFHCAN telehealth has grown since 2001 (Figure 6). In 2007, a total of 643 providers were actively engaged in telehealth (create or consult on cases), of which 509 (79%) were actively involved in creating telehealth cases.

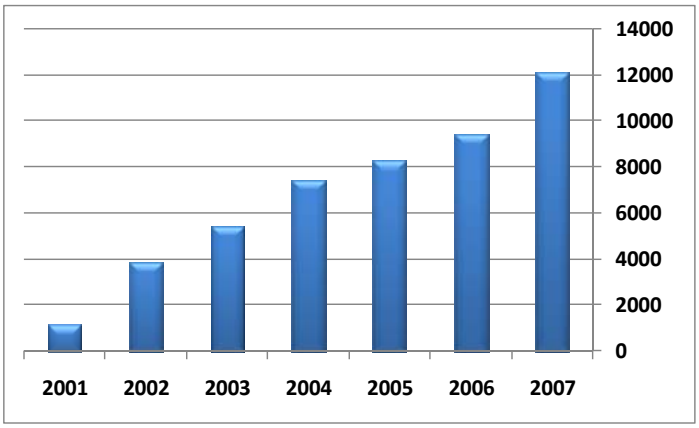
*Figure* **6** ***Providers Involved in AFHCAN Telehealth***



A related statistic is the number of actual telehealth "cases" (or "encounter") created in the AFHCAN system (Figure 7). Since 2001, the AFHCAN system has been used for more than 50,000 store-and-forward clinical cases with a current rate of 12,000 cases per year (Figure 7). While the use of telehealth, as expected, grew in some regions faster than others and was embraced by some physicians and specialties more than others, overall usage has shown steady growth since 2001.

*Figure* **7**

## *AFHCAN Usage in Alaska: Annual Case Creation*




Telehealth is now considered an integral part of the day to day health care delivery system in the Alaska Tribal Health Systems (ATHS). Accordingly, considerable experience with S&F telehealth has been gained and a large volume of data accumulated. Several studies have also been designed and completed to answer specific questions regarding the use and effect of S&F telehealth.

*Table* **3**

## *Numbers of Telehealth Cases – by Purpose*

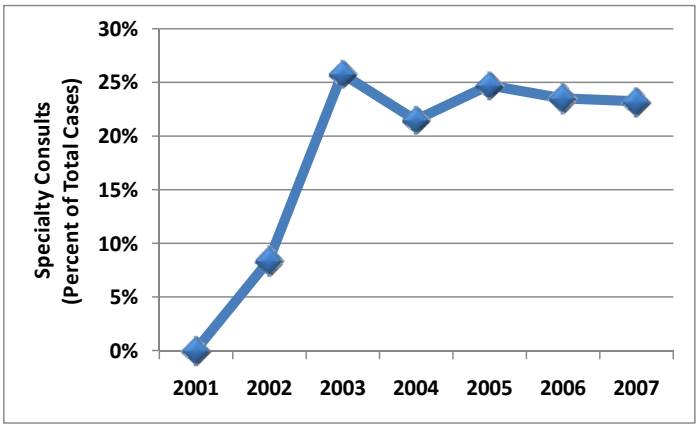
| | | |
|---|---|---|
| **PRIMARY CARE** | *Created within Regional Health Corporation and not sent to tertiary care facility.* | **38,061** |
| **SPECIALTY CONSULT** | *Created within Regional Health Corporation and sent to tertiary care facility.* | **10,685** |
| **DOCUMENTATION** | *Created at tertiary care facility for documentation purposes only.* | **3,161** |
| **TOTAL** | | **51,907** |

Usage patterns vary widely among the organizations that participate in AFHCAN telehealth in Alaska (Table 3). Many organizations depend mostly on the system for communicating between village clinics and a regional hospital; these cases are "primary care" telehealth cases. Typically these are created by a CHA/P and sent to a family

physician. Others rely on the system for obtaining specialty consults from ANMC. The temporal variation of this pattern is shown in Figure 8. Following an initial climb in the use of specialty consults, the system is now stabilized statewide at a level of 24% of all cases created at a regional health corporation being specialty consultation requests.

*Figure*
**8**

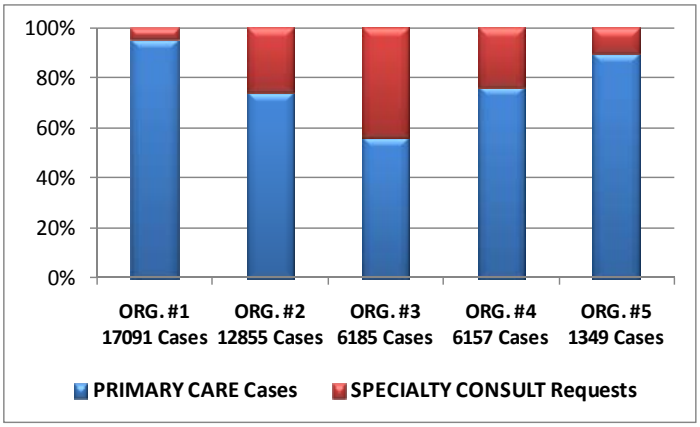
## *Specialty Consults as a Percent of Total Cases*




Organizations utilize S&F telehealth mostly for primary care consultation. Organizations vary in how often they send S&F cases for specialty care. Not surprisingly, this number varies greatly between organizations. Figure 9 shows this variation between 5 different Alaskan organizations.

*Figure*
**9**

## *Variations In Organizational Usage Patterns*




The total number of cases created by each organization is included with the label on the horizontal axis. The differences are quite dramatic – Organization 3 has 44.1% of all telehealth cases sent for Specialty consults, whereas Organization #1 only has 4.4%.

Organizations #2 and #4 are similar in having 23-25% of all telehealth cases be specialty consults.

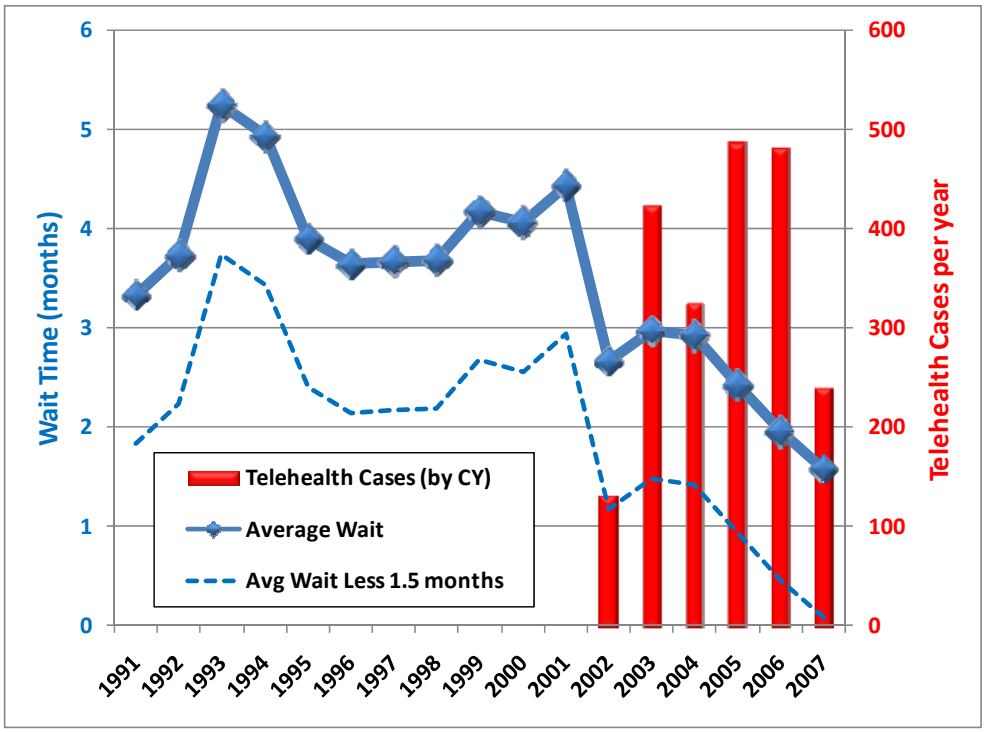
# IMPROVES ACCESS TO CARE

Access to care is a major issue in the Alaska Native health system as well as nationally. The National Institute of Medicine identifies access to care as a critical element in its Aims of Improvement, citing the need for both equitable and timely care. In Alaska, it is not uncommon for a patient in a remote village to wait for several months to see a specialist, and physicians recall scenarios where poor outcomes resulted from untimely care or lack of access for the most appropriate care. Generally speaking, poor access and longer waiting times result in more complex care, more visits, higher costs, and poorer patient outcomes.

## Access to Specialty Clinics

Figure 10 provides the evidence of the dramatic impact of telehealth to reduce waiting times for specialty consults as demonstrated by Phil Hofstetter, an audiologist working at Norton Sound Regional Hospital (NSRH). Telehealth was implemented in 2001 (as shown by the red bars) and led to an almost immediate drop in the waiting time for specialty consults.

*Figure* **10** ***Impact of Telehealth on Specialty Clinics Backlog***



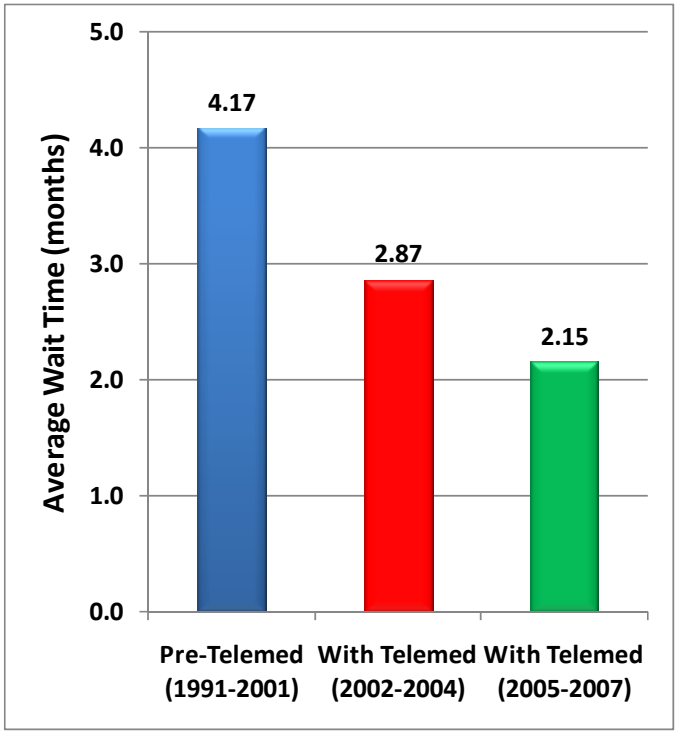

The solid blue line indicates the average wait from for patients to be seen at an ENT specialty clinic which occurred every 3 months. Even under perfect circumstances, patients would normally see a wait for such clinics but it could be expected to be reduced

to about half the interval between clinics (or 1.5 months average wait in a perfect system). Note that the dotted blue line – which removes this 1.5 month dead band from the actual data – suggests the system achieved the optimal results in 2007 when the wait was reduced to 1.5 months.

Prior to telehealth, a total of 1,216 patients were seen from 1991 to 2001. Following the introduction of telehealth, 276 patients were seen in specialty clinics from 2002-2004 and 210 were seen from 2005-2007. The "post-telehealth" patients are split in this manner as this allows us to view the data separately during the transition years (that inherit the previous backlog) from the stable or mature telehealth years.

The average wait time prior to telehealth was 4.17 months – which then reduced to 2.87 months immediately after the introduction of telehealth and then down to 2.15 months in the more stable or mature years (Figure 11)

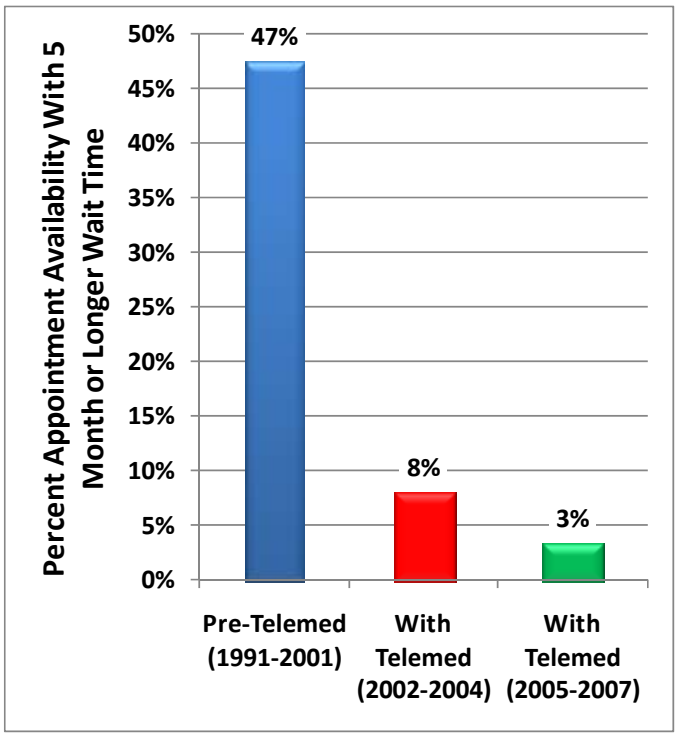
*Figure* **11** | ***Average Wait Times for Specialty Clinic***




The average wait time is an important statistic – but it does not provide a sense of the number of patients that are waiting excessively long times to see a specialist. The percent of patients that waited more than 5 months or more to get an appointment was close to 50% prior to telehealth – but was reduced to 8% within 3 years of telehealth and then down to 3% in the subsequent years (Figure 12).

*Figure*
**12**

## *Impact of Telehealth on Access Time*



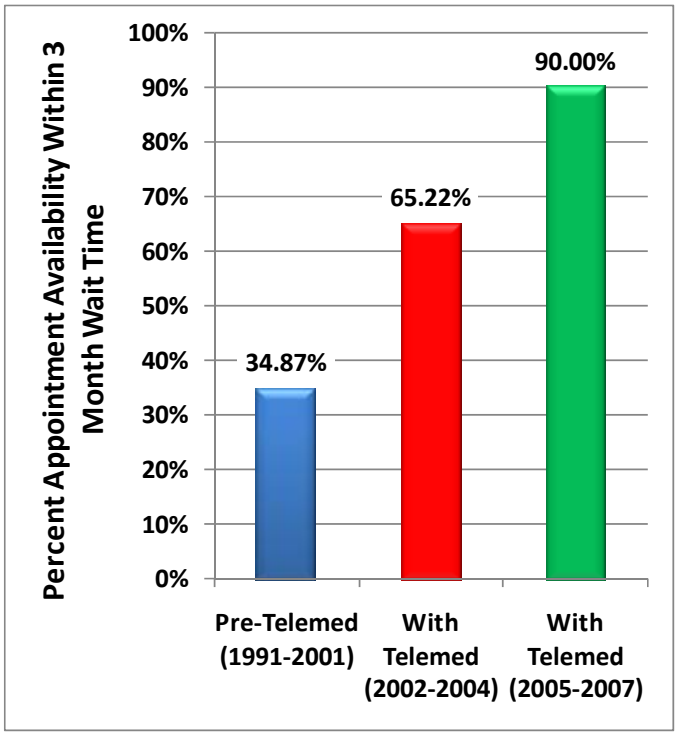

This may be one of the best examples of the effect of S&F telehealth on access. The review of 20 years of appointment data for ENT specialty clinic revealed what had long been suspected: Patients waited a very long time for their consultations with the specialist. After S&F telehealth was introduced and became the primary means by which the providers at Norton Sound obtained the initial ENT consultation, wait times for an in person appointments dropped to 1-2 months and were determined more by the frequency of the outreach clinic than by the size of the backlog. This is akin to providing an immediate and inexpensive way to increase capacity as more ENT appointment slots open.

Since 2001, the audiologist at NSRH have conducted 2,080 telehealth consults – of which only 10.18% still needed to see a specialist. Telehealth is used as a tool to provide a triage mechanism for the patients. While 225 still needed to see specialist, a total of 1,855 patients did not need to see a specialist in-person.

As the use of telehealth grew at NSHC, the request for in-person consultations decreased and overall access improved. An important lesson from the NSHC experience was that *all* patients benefited from the institution of telehealth, not just those whose particular problem was amenable to a telehealth intervention. That is, telehealth serves patients and removes those patients from regularly scheduled in-person appointments. By reducing the backlog of patients, the patient requiring an outpatient evaluation or procedure gains access to the specialist much sooner; there is a shorter wait in the queue.

This provides other benefits to patients. Scheduled slots in future specialty clinics are not filled – which allows those patients that need to see a specialist in person earlier access to an appointment. Figure 13 shows that the 90% of all patients are now able to obtain an appointment within 3 months, compared to 35% prior to telehealth.

*Figure* **13** ***Impact of Telehealth on Access Time***




Currently at NSHC, a consult that can be accomplished with telehealth is completed within 24 hours; an in-person consult within 0-3 months. This represents a vast improvement from the situation that prevailed for the years prior to telehealth. Telehealth has a "trickle down" effect that improves specialty access for all patients even if their problems are not addressable by telehealth. This means that telehealth affects all the patients in a system, and the more it is used, the bigger the overall effect.

## Response Time

Providers within the AFHCAN system have documented case studies where hearing or vision were lost as disease processes reached an irreversible state before the patient made their way to the specialist. Poor access to care and the backlogs and wait states that result lead to other problems in addition to poor clinical outcomes. From an efficiency standpoint, patients waiting in a queue to see a specialist generate increased primary care visits, require ongoing administrative management and often require a more complex level of care when eventually presenting to the specialist than would have been required

had they presented at an earlier stage. Poor access is not only bad for patients; it causes problems throughout a health care system.

ANMC now provides consultations from approximately 20 different specialty departments. Most departments are able to offer a 24 hour turnaround time, which varies depending on staffing level of the department, travel schedules, and other issues such as the complexity of the case.

A survey of 4,457 consult requests received at ANMC from September 2006 to September 2008 revealed that ANMC provides same day turnaround time on 65% of all telehealth cases, and completes 84% of all telehealth cases by the next business day (Table 4).

*Table* **4**

### *Telehealth Service Delivery at ANMC*

| | |
|---|---|
| **Number of Cases** | **4,457** |
| **Number of Organizations Sending cases to ANMC** | **30** |
| **Average Time to First Review** | **0.78 Workdays** |
| **Average Turnaround Time** | **0.96 Workdays** |
| **% Cases Responded in Same Workday** | **65%** |
| **% Cases Responded by Next Workday** | **84%** |
| **% Cases Responded within 2 Workdays** | **91%** |
| **Average Turnaround Time for Cases Responded in Same Workday** | **2.5 hours** |
| **Median Turnaround Time for Cases Responded in Same Workday** | **1 hour** |

Perhaps what is most surprising is the rapidity with which consult requests are completed during the same day turnaround time. The average response rate for "same day" turnaround is 2.5 hours, with a median time of 1 hour. This means that half of all cases being turned around in one day are actually turned around in 1 hour.

## Dermatology

Alaska's shortage of medical specialties is exemplified by dermatology. Around the year 2000, Alaska had the lowest concentration of dermatologists of 0.81 compared with Connecticut that had the highest at 4.43, per 100,000 population. What is probably more important is the prominent maldistribution of these already low numbers of dermatologists. Almost all of Alaska's dermatologists are located in Anchorage that still has a low concentration of dermatologists when compared with cities of similar populations in other states. The concentration of dermatologists varies by region of the state. In Alaska, the dermatologist concentration varies from 0 to 2.5, compared to California with 0 to 10 and New York with 0 to 30, dermatologists per 100,000 population. In summary, Alaska has a vast expansive landscape with pockets of populations that have no access to dermatology services.

Access to dermatology services is now made available through S&F telehealth. Primary care clinicians treat most simple skin diseases, but often times encounter diagnostic challenges, treatment failures, and serious skin maladies. These clinicians now take a photograph of the patient's lesions, write a history and create a telehealth case which is then sent to a dermatologist.

# DECREASES COSTS

## Preventing Patient Travel

In Alaska, several analyses have demonstrated that for a high percentage of cases, S&F telehealth removes the need to see a specialist in person. While one could assume that each telehealth encounter removes the need to see a specialist, the situation is more complicated. Studies were conducted to more accurately gauge the percentage of cases where a visit to the consulting doctor was definitely averted. These percentages are a more conservative view of cost avoidance compared with studies that assume 100% savings from each telehealth encounter.

Providers are surveyed with single questions during the process of consulting on a case. (Details are provided in Appendix C). The consultant is asked:

> *Did viewing this telemedicine case/image affect PATIENT TRAVEL for diagnosis or treatment of this case (compared to a phone consult)?*

The allowable options are: "It prevented patient travel", "It caused patient travel", or "It had no effect". The answers are collated from the responding consultants at all of the participating organizations, matched back to the originating server, and analyzed for their impact on patient travel.

*Figure* **14**

***Impact of Telehealth on Preventing Patient Travel***

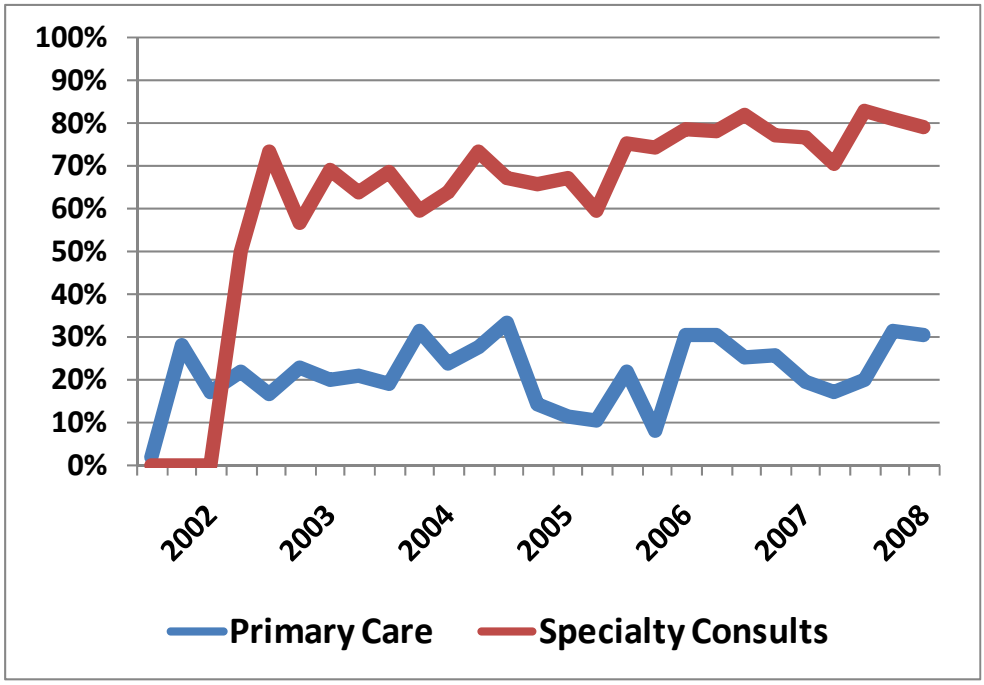


Figure 14 shows the variations over time for the responses that indicated that telehealth prevented patient travel. Note the differences between cases that are strictly primary care cases – which prevent travel significantly less than specialty consults. There is a slight increase over time for the specialty consults to prevent travel.

Overall, patient travel is prevented for almost 80% of all specialty consults, whereas travel is prevented for about 20% of all primary care cases. This is summarized in Table 5. Responses were received to the travel question on 13,510 cases – but clearly not all cases received an answer from providers as they have the option to skip the question. For the purposes of this report, we assume that the answers that are received are reflective of the general impact of telehealth on travel and can be extrapolated to the all cases.

*Table* **5**

### *Impact of Preventing Patient Travel*

| | Primary Care | | Specialty Consults | |
|---|---|---|---|---|
| | Annual (2007) | TOTAL | Annual (2007) | TOTAL |
| Number of Cases | 8614 | 38,061 | 2605 | 10,685 |
| % Preventing Travel | 20.5% | 20.7% | 77.8% | 72.5% |
| Number of Patients Avoiding Travel | 1763 | 7884 | 2026 | 7743 |
| Savings | $0.79 m | $3.55 m | $2.73 m | $10.45 m |

The overall travel savings generated by the use of AFHCAN telehealth amounts to approximately $14 million for 15,600 encounters for which travel was avoided. This assumes that 50% of all patients require a parent or guardian to travel (and doubling the costs), and that travel to a regional facility for primary care requires a $300 airfare whereas travel to Anchorage requires a $900 airfare. Annual travel savings, based on 2007 data, is approximately $3.5 million. Anecdotal evidence suggests that S&F telehealth also prevents the occasional medical evacuation air flight – at a savings of $10,000 to $30,000 per incident.

It was noted in previous section of this report that for patients referred to ENT specialists, only 10% of the 2080 referrals required an in-person exam and therefore travel to see the specialist. Travel cost savings, determined by calculating the air fare that would have been spent to travel the other 90% to see the specialist as required in the non telehealth system was $550,000 since the onset of the process in 2001 and $190,000 for the most recent year with complete data (2006).

## Traveling a Provider

AFHCAN and ANMC jointly conducted a pilot project to fund an audiologist to travel to village clinics to provide clinical care in the patient's location – rather than require the patient to travel to Anchorage or to a Specialty clinic for care. The "Traveling Audiologist" pilot project resulted in 54 trips to 14 different village clinics, with the

result that 1,458 patients received treatment in their village and were triaged for the next level of care (if required). Details are provided in Table 6.

Of the 1,458 patients, a total of 755 (including 502 minors) had travel prevented. The avoided travel costs resulting from providing the needed services in the patients' villages rather than requiring travel to see the specialist were estimated at $310,000, over twice what it cost ($141,000) to fund the project.

*Table* **6**

### *Impact of Travelling Audiologist Program*

| | |
|---|---|
| **Number of Village Clinic Trips** | **54** |
| **Number of Unique Villages** | **14** |
| **Patients Seen** | **1,458** |
| **Patients with Travel Prevented** | **755** |
| **Adults Patients with Travel Prevented** | **253** |
| **Child Patients with Travel Prevented** | **502** |
| **Cost for Program** | **$141,000** |
| **Travel Savings** | **$310,000** |
| **ROI** | **$169,000 (120%)** |

It should be noted that these costs are simply based on airfare costs – and do not include lodging or per diem. Nor does this include the societal costs such as time lost from work, childcare costs, or school lost.

## Lower Reimbursement Costs

Experiences in Alaska indicate that telehealth lowers the cost for delivering health care through a variety of mechanisms. These include: lower billing levels due to the reduced data sets involved in telehealth, the removal of an "all inclusive fee" that would exist if the patient traveled to see a specialist, shifts to using mid-level providers in lieu of specialists to see patients, and reductions in tests. Each of these mechanisms is described in this section.

When a specialist reviews a telehealth case, he or she codes the encounter one or two levels less than what they would have typically coded for an in-person visit. A review of 7,389 billable telehealth encounters at ANMC found that 42% of the encounters were billed as Level 1 Consultations (CPT 99241). This is related to coding logic; the telehealth encounter does not include the higher number of body systems reviewed in the physical examination, the number of questions asked in the review of systems, etc. The end result is lower reimbursement rates than if the patient were seen in-person by the same physician. From the payer's perspective, this reduced reimbursement saves money.

With S&F telehealth, coding and billing does not include a facility fee. The impact of this is significant given that 80%-90% of all telehealth specialty consults in Alaska obviate the need for an in-person visit. Removal of this facility fee is substantial and

may in fact be a disincentive to telehealth for some providers and organizations. It is unclear if the "all-inclusive" OMB rate applies to telehealth encounters. Assuming it does not, removal of this reimbursement is also substantial and may be a further disincentive to telehealth. Form a strictly economic perspective, it makes more economic sense for an organization to have the patient walk through the door for an examination, no matter the inconvenience or cost to the patient, so that a facility fee or all-inclusive rate can be billed and collected. From the payer's perspective, this reduced reimbursement saves money.

Using telehealth allows for more encounters to be retained by mid-level providers such as CHA/Ps, audiologists, physician assistants, and advanced nurse practitioners. By encouraging patient care at the level of these alternate providers, the higher salaries or reimbursement rates of physicians is somewhat avoided.

Telehealth reduces the need for re-tests as existing test data is readily attached to cases through scanned documents or electronic forms or direct interfaces to devices, and can be re-accessed at multiple times and places. "Lost" documents or data sets simply do not occur.

It is unknown what savings have been gained from earlier diagnosis and more appropriate and timely management of disease states in Alaska over the past eight years using S&F telehealth. Outcomes are difficult to measure and have been beyond the scope of this operational program. However, there are multiple signs and anecdotal information that points to improved quality (See Quality Section). Telehealth can help identify referral mistakes at an earlier and less costly time as shown in the traveling audiology study.

## Cost Models

In an effort to more clearly understand what factors were most critical in determining the comparable costs in delivering health care in the existing referral system in the Alaska Native health care system as compared to a S&F telehealth system, over 10 years of data was analyzed and a "costing model" developed. In this model, over 300 factors were considered that determine the cost of delivering care to a patient in a rural location, factors ranging from travel distance to the nearest provider to the historic "no-show" rates for a given region. This model showed the two most important factors determining whether telehealth would provide significant cost savings over the traditional system were the expense of travel in a region and how effective a telehealth encounter was in reducing or replacing the need for an in-person encounter. These predictions are in keeping with the findings noted in the preceding paragraph. Interestingly, equipment and communications costs are predicted to be less important factors, as long as usage is high.

Store-and-forward telehealth has reduced unnecessary patient appointments in the Alaska Native health care system. It is a common experience in any health care system that some appointments are, in retrospect, unnecessary or unproductive. For example, important records or results may not be available to the provider at the time of the visit, the appointment is used primarily for information exchange that could have been accomplished by other means and prior to the appointment, or the provider may inform the patient that she really needs to see a different provider with different expertise. In the

Alaska Native system, unnecessary appointments come at a high cost; the patients have usually traveled great distances at great expense (to someone) to be put face to face with a provider, and they have taken an appointment slot that could have been used for another patient waiting in the typically long queue to see the specialist.

A more intensive cost model has been developed to help determine the point at which S&F telehealth is economically justifiable. This cost model includes multiple parameters that effect costs and profitability. The cost models validate that the two most critical factors in the cost efficiency of S&F telehealth are (as described earlier in this section)whether the telehealth encounter can:

- Minimize the need for in-person specialty consultation
- Provide care at the patient's location (minimize patient travel).

Both points are critical to understand when designing a telehealth program. S&F telehealth should be implemented for clinical services that are most likely to minimize exist in-person visits, and provide the greatest opportunity to minimize patient travel.

## Comparisons Between S&F and VTC

Store-and-forward telehealth can be used for a subset of patient encounters for which video teleconferencing can also be utilized. It is important to identify which aspects of health care can be provided through S&F telehealth because it is more efficient and less expensive than videoconferencing encounters in several ways.

*Table* **7**

### *Differences Between S&F and VTC Technologies*

| | *VTC* | *S&F* |
|---|---|---|
| **Requires scheduler** | **Yes** | **No** |
| **Requires in-person presenter and or on-site technical facilitator** | **Usually** | **No** |
| **Requires specific specialist clinic time** | **Yes** | **No** |
| **May result in a "no-show" DNKA = did not keep appointment** | **Yes** | **No** |
| **Requires equipment investment, maintenance, and training** | **Yes** | **Yes** |
| **Requires higher network bandwidth** | **Yes** | **No** |

S&F telehealth is different from videoconferencing in that there is no need for scheduling an in-person presenter or a definite time for the consultant availability (Table 7). Both technologies require an infusion of capital expenditures, which may in fact be higher for S&F telehealth depending on the specific application. But it is possible that the ongoing operational costs and connectivity costs are lower with S&F telehealth.

Perhaps a surprising result is that AFHCAN experiences suggest that S&F is more "instantaneous" than videoconferencing – because it removes simultaneous availability requirements for patient and provider. Removing the need to schedule both patient and

provider allows specialty consults to be provided within the same day (see previous section) and within 1 hour in many cases. A videoconferencing model would require a second appointment to be scheduled unless the specialist happened to be available at the time the patient first presents. This, coupled with the fact that there are no "did not keep appointment" (DNKA) no-shows with S&F telehealth, leads to the argument that S&F telehealth is the more efficient telehealth technology for specific clinical issues.

# IMPROVES EFFICIENCY OF HEALTH CARE DELIVERY

Store-and-forward telehealth leads to efficiency in health care delivery by maximizing specialty provider productivity, reducing the need for patient travel, and eliminating unnecessary appointments.

## Maximizing Specialist Productivity

The need to maximize the productivity of specialty physicians is critical in situations where specialists are in short supply and cannot offer the level of service needed to meet demand. This situation prevails in the IHS and in Alaska where for years specialists have been difficult to recruit and retain. In the majority of instances, a S&F telehealth case presents to the specialist the clinical information needed to make a clinical decision, and in general this can be done in a very rapid fashion.

The median time a specialist spends reviewing a telehealth consult in the AFHCAN system is 6 minutes (Table 8), based on an analysis of 8,464 S&F telehealth cases sent to ANMC from 26 different organizations between 8/02 and 4/07. This is a fraction of the time that would be spent during an in-person encounter. Since S&F telehealth is "asynchronous", and the consulting provider is in general free to review the case at a time most advantageous to his or her particular schedule, case reviews can be done to fill in the otherwise unproductive times in a physician's day (patient cancellations, delays for starting procedures, waiting for test results).

*Table* **8**

***Statistics for Time Involved in a Specialty Consult***

| | Create Case | Provide Consult | Review Consult |
|---|---|---|---|
| Average Time per Case (min) | 28.3 | 11.3 | 6.1 |
| Std. Dev (min) | 26.5 | 16.3 | 14.0 |
| Median Time per Case (min) | 18.4 | 6.0 | 1.5 |
| Total Time on All Cases (Days) | 487 | 198 | 101 |

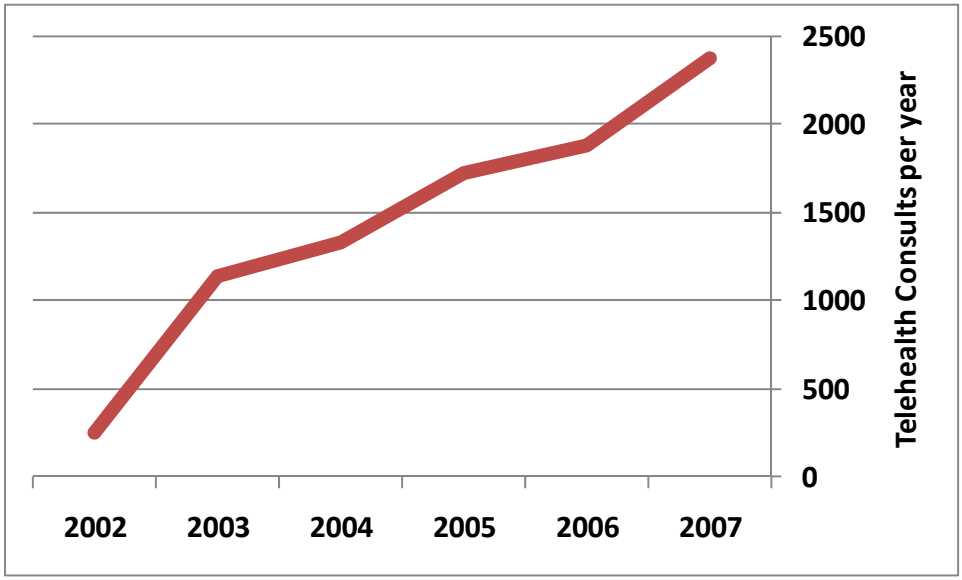
Usage data collected from the dermatology and ENT departments at ANMC indicate that these specialists were able to consult on an average of 350 cases per year per specialist without specifically dedicating time to telehealth in their schedules.

Accordingly, in the ENT department 6 physicians review telehealth cases with a 24 hour turn around (in most cases) and currently provide over 2000 reviews per year.

The critical issue is that S&F telehealth, as it is used by these physicians, creates an immediately accessible "basket" of work that can used to fill in the unavoidable and otherwise unproductive "dead space" in a physician schedule. The ANMC experience has been that this leads to a remarkable "boost" in specialist productivity.

Due to the efficiencies of S&F telehealth, ANMC is now able to provide approximately 2,400 telehealth consults annually (Figure 15). These consults are provided at no additional expense in manpower or resources at ANMC – yet provide access to more than 2,000 patients from 17 different organizations, access for specialty consultation that would not otherwise exist.

*Figure* **15** | ***ANMC Consultation Workload***

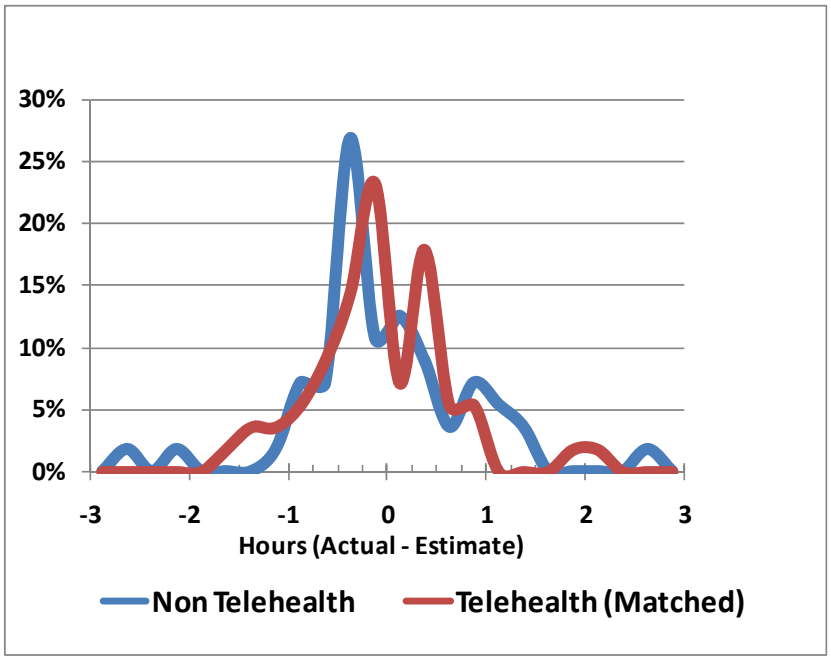



## Pre-Surgical Planning

Pre-surgical planning requires an examination of the patient so that the clinically appropriate procedure can be chosen and operating room time can be accurately scheduled. In a study comparing major ear surgery recommended and scheduled solely by means of a S&F telehealth encounter with those scheduled after a more traditional in-person encounter, no difference was found in the ability to accurately schedule surgery or in the predicted operative times (Figure 16). As a result of this experience, it is now common practice to schedule an elective surgery directly from a telehealth case and see the patient for the first time on the day prior to surgery during the pre operative examination.

While this approach is primarily used to schedule straight forward surgery (repairing a hole in the ear drum, placing ear tubes in a child), it has eliminated the need for many appointments; the initial face to face consultation with the surgeon is not required. This is a more efficient approach both for the patient as well as the surgeon. While patients are always given the option of requesting the in-person consultation, few do so preferring the more streamlined process which involves less travel, loss of time from work and other inconveniences.

*Figure* **16** | ***Errors in Predicting Operative Time***




## Follow Up Care

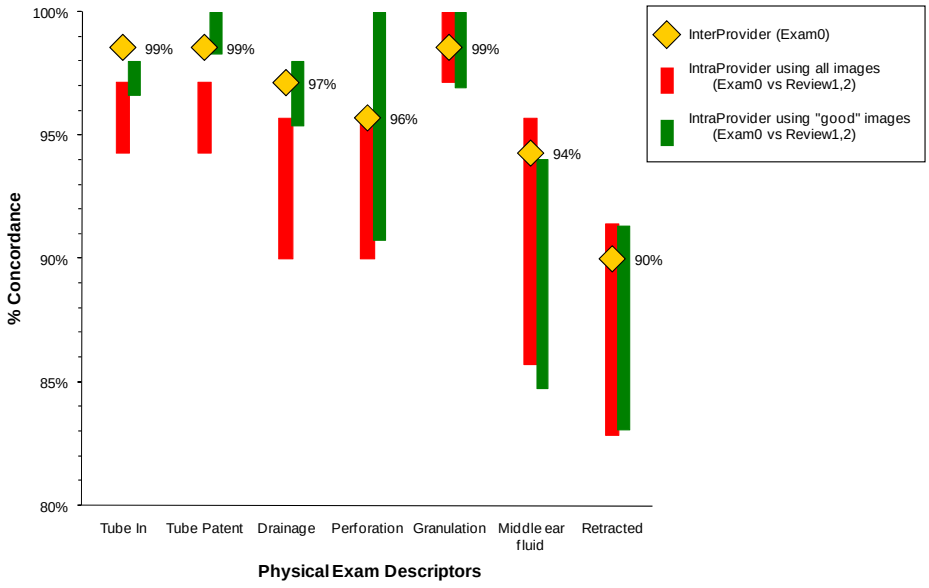
One of the difficulties in a distributed health care enterprise is providing adequate follow-up care to patients after they are seen at a tertiary care facility. S&F telehealth enables the use of "physician extenders" to increase the productivity of physicians by allowing the telehealth system to be their "eyes and ears" to remote sites. Making use of remotely located physician extenders empowered with S&F telehealth, "standard of care" for follow up and monitoring of clinical conditions can now more easily and reliably be met.

In this sense, telehealth provides the opportunity to examine, diagnose, treat, and manage patients from a far distance. It is important to know that these virtual opportunities are done with similar care and diligence to assure proper care of the patient.

There is much literature that supports the accuracy and use of telehealth for examination, diagnosis, and treatment of patients with skin diseases. Therefore, S&F telehealth is an accepted method of practice in the field of dermatology.

In the past several years, there has been considerable work done in Alaska that documents and validates the reliability of S&F telehealth for treatment of ear, nose and throat conditions. For example, a recently published study demonstrated that video otoscope images of the tympanic membrane are equivalent to an in-person examination for follow-up of tympanostomy tube placement in children.

*Figure* **17** | ***Provider Concordance on Physical Exam Descriptors***



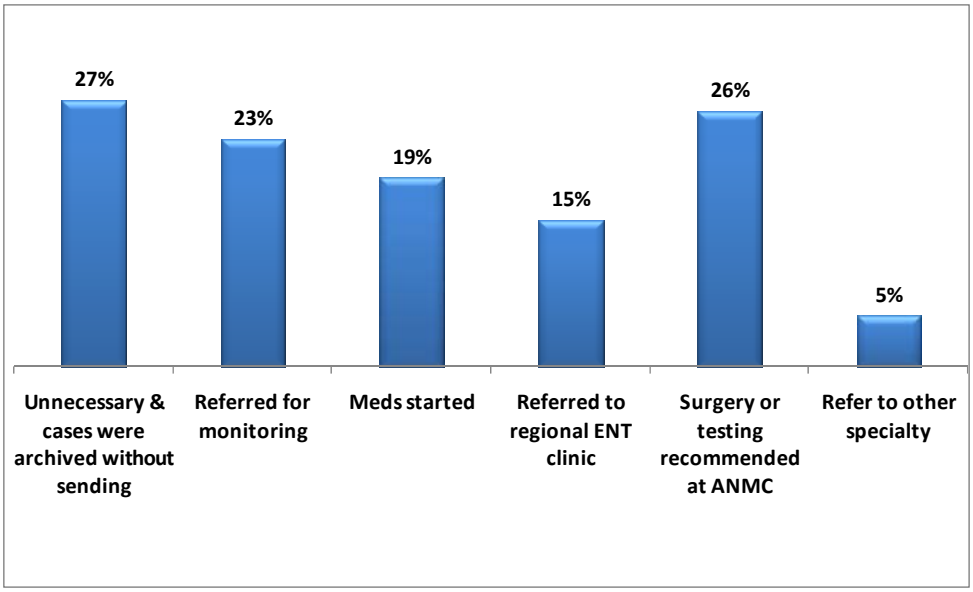

The overall results of that study are shown in Figure 17. The gold diamonds indicate the percent concordance between providers during the in-person exam – i.e. how much they agreed with each other using standard examination techniques without involving telehealth. The red bars indicate the range of concordance for individual otolaryngologists between the in-person examination (termed "Exam0) and their reviews of telehealth images which were conducted at two different times (termed "Review" and "Review2"). The green bars represent a similar min/max range for intra-provider concordance once ears were removed from consideration for which the image sets were rated as having "Poor" or "Very Poor" image quality. This study showed that for the purpose of following children with tympanostomy tubes, S&F telehealth could be used to replace in person encounters. A second study performed in very rural sites essentially replicated these result.

Taken together, these studies led to the process that is currently in use in Alaska where follow up of patients with ear tubes is done primarily by means of S&F telehealth: non-physicians acquire images in the patient's village and send them for review to a specialist at the tertiary center in Anchorage. This has eliminated the need for about 1200 in-person ENT examinations per year, keeps patients in their village and specialists at their primary location where they can be most productive.

## Traveling a Provider

The "Traveling Audiologist" program (described in the previous section) was a focused effort to employ a mid-level provider to travel to remote villages for the purpose of originating S&F telehealth cases on patients previously identified as needing ENT consultation or follow. The 1,458 encounters that were provided replaced the need for 75 days of specialist outreach clinics in the regional hospitals. Again, these days could then be used by the specialist for seeing patients and performing procedures at the tertiary facility. Loss of productivity due travel and weather related problems were also eliminated.

*Figure* **18** | ***Outcomes from Travelling Audiology Program***




In this pilot program, a remarkable finding was that 27% of the referrals to the specialist were actually found not to require consultation (Table 18). These were cases, for example, where the patient had been sent to the incorrect specialist or where the clinical problem had resolved while the patient was waiting for the appointment ("the ear stopped draining"). In the "*Pre-telehealth*" era, many of these patients would have traveled to see the specialist only to find that the visit was unnecessary.

In addition, 26% of the patients needed to be seen at the tertiary referral center and did not need to wait for an intervening specialty clinic appointment. In cases such as these, the telehealth encounter enabled the specialist to determine that definitive care was required at the tertiary center, and that an evaluation at a regional facility added nothing to the patient's care. These patients likely received faster care through the triage mechanism using the traveling audiologist.

## Expert Triage Model

In the existing traditional care model, the initial or primary care provider treats a patient according to their knowledge base and competency to the point where involvement by a specialist is required. The specialist becomes involved at the end of the primary treatment course and then usually assumes care of the patient during the course of treatment for the specific problem. Decisions about whether and when to refer, and what diagnostic and treatment measures should be undertaken prior to referral, are generally made by the primary care provider without input from the specialist.

In the "Expert Triage Model", information is shared between the primary care provider and specialist at a much earlier stage such that these decisions are made collaboratively. The specialist plays a greater role in the "triage decision", and is arguably the best suited to determine which patients should be referred, the urgency of the referral and what should be done prior to referral.

The experience in Alaska is that several unique and important features of S&F telehealth allow the Expert Triage Model to naturally evolve. The information exchange is content rich, bidirectional and rapid. Barriers to receiving expert opinion such as distance, patient travel, appointment availability and waiting times are eliminated.

For the patients, the result has been earlier involvement of a specialist in their care and the peace of mind that comes with that. For the primary care provider, advice and assistance in managing a patient is obtained easily and early on, frequently enabling the provider to manage the patient with no further specialist involvement. For the specialist, unnecessary or "inappropriate" in person referrals are virtually eliminated, as the specialist has in effect pre screened those patients prior to their appointments. When the patient is seen by the specialist, the appropriate studies and treatments have been done. Overall, low complexity problems are identified as such and kept with the primary care provider; high complexity problems are routed in a priority fashion to the specialist.

Once a S&F case is created, it can be directed anywhere. A specific clinical problem can therefore be sent to the specialist or group of specialists offering the specific expertise needed to address the problem. Likewise, S&F telehealth can tie together specialists separated geographically or by time zone but united by common competencies or expertise to create "Virtual Centers of Excellence". These "Virtual Centers" can be used to deliver high level, narrowly focused care for unusual clinic problems or more general consultative services for patient populations without access to consultants.

This concept has been evaluated in Alaska through the "Yakama Indian Medical Center Demonstration Project" where an Ear, Nose and Throat (ENT) Virtual Center of Excellence was created at the Alaska Native Medical Center in Anchorage, Alaska and,

using S&F telehealth, consultations were provided for patients with ENT problems in Yakima, Washington by ENT specialists in Alaska.

This "proof of concept" project, under the direction of Indian Health Service (IHS), continues to this date, and it is planned to offer this service to other IHS sites in the continental US.

## Summary

S&F telehealth creates an environment of maximal flexibility that can be adapted to the clinical needs in a region or organization. It is accessible to the full range of health care providers, from health aids and clinic assistants to subspecialists with specific areas of expertise. Cases can be originated from anywhere and sent anywhere. Providers may "chat" in a near simultaneous interchange or may interact "asynchronously" eliminating the need for simultaneous availability, broadband network access and video link up.

Complex data flows can be supported and are retrievable and auditable. Service line agreements and business relationships can be supported by providing metrics on performance and time to service. The experience in Alaska has taught us that the specific needs vary depending on patient population, providers, disease states and technology availability, and may change or evolve over time. Because of its inherit flexibility, providers using S&F telehealth discover how best to adapt it to their needs at a given time and situation.

# IMPROVES QUALITY OF CARE

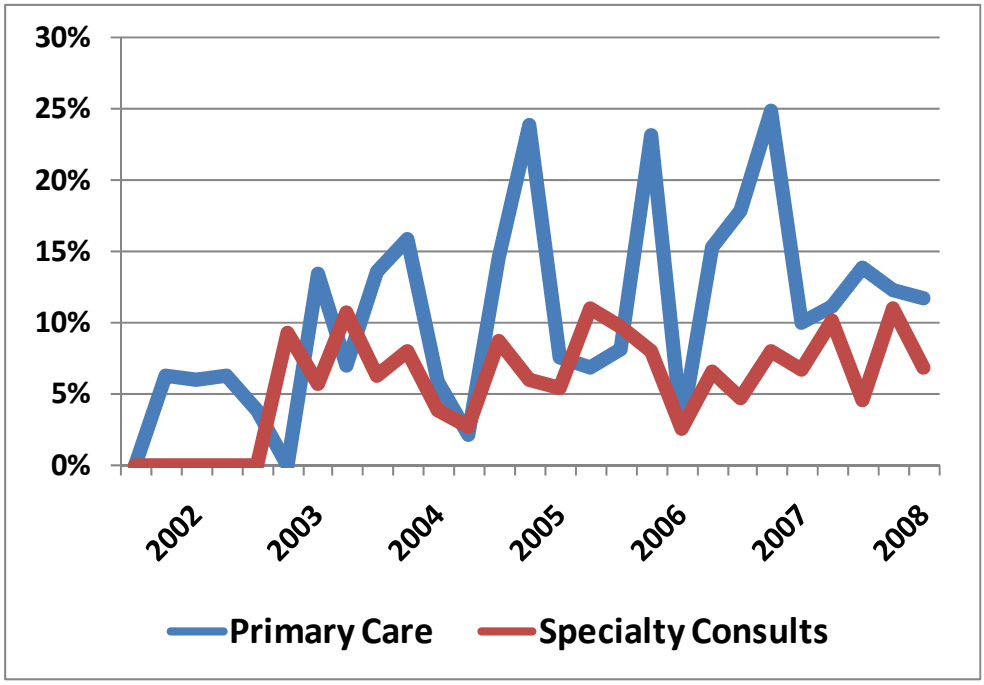
In remote regions, a significant portion of the population is awaiting specialty care at any given time, and others have clinical issues that may remain undetected or untreated for a significant length of time. In all cases, faster access to care and earlier detection are critical factors in improving the quality of care.

Much of the evidence present in earlier sections applies to these concepts: telehealth was shown to reduce the waiting times for specialty consults, presumably leading to more immediate care for those needing it. The traveling audiology program was able to screen patients at the village waiting for access to specialty care at ANMC. In fact, that program demonstrated that this underserved population was waiting in the queue for an in-person appointment at regional hospital outreach clinic yet almost half had clinical problems justifying some form of immediate treatment – either medications or surgery- and they received these treatments months earlier than they would have if reliant upon the traditional non-telehealth system. The quality of care improved anecdotally because patients otherwise would not have been seen or would have been seen later in the course of their illnesses.

Though some illness states do resolve or improve during non treatment, our assumption is that the earlier diagnoses and treatments that occurred as a result of this project led to better individual outcomes.

*Figure* **19**

***Impact of Telehealth on Causing Patient Travel***



A portion of all telehealth cases do cause patient travel – most likely because a disease state is being caught at an earlier time. Overall, 7.1% of all specialty consults and 9.2% of all primary care cases cause patient travel (Figure 19) – as determined by the evaluation questions posed to providers (described earlier).

A surprising finding is the rate of "caused" travel is fairly uniform across all types of cases and all organizations. Perhaps the best example is to compare two organizations that use the telehealth system extensively but for different purposes. It was shown earlier that organizations refer S&F telehealth consults to ANMC at differing levels of usage. We compared five such organizations – of which two are shown in Table 9 for the impact of telehealth on causing patient travel. The differences between these are significant in some respects: Organizations #1 refers only 4.4% of cases to ANMC, and Organization #2 refers 25.7% of cases to ANMC, and they differ greatly in the percent of cases that prevent travel. Yet both organizations find that about 9 to 13% of all case cause travel – regardless of the type of case.

*Table* **9**

### *Organizational Differences on the Impact on Travel*

| | | Org #1 | Org #2 |
|---|---|---|---|
| **Primary Care** | Number of Cases | 2,243 | 1,273 |
| | % Prevent Travel | 9.9% | 33.6% |
| | % Cause Travel | 8.8% | 13.3% |
| | % No Effect | 81.4% | 53.1% |
| **Specialty Consults** | Number of Cases | 644 | 2,707 |
| | % Prevent Travel | 68.6% | 73.7% |
| | % Cause Travel | 7.6% | 6.3% |
| | % No Effect | 23.8% | 20.0% |

The link between "caused" travel and improved quality of care is being inferred through the opportunity for earlier diagnosis and treatment for patients. While the "caused" travel cases would appear to add cost to the health care system – we feel that the system will save costs in the long ran due to this earlier intervention. In addition, eventually the patient would have to travel for their healthcare problem when it worsens.

In a medically underserved population (no local access to physician), we found a higher rate of "caused travel" for patients having telehealth cases involving an ECG consultation. In the past it is likely that many more patients would have been travelled – whereas now the providers request an ECG prior to making a travel decision. This process significantly reduces patient and family anxiety. CHA/Ps, who never had ECG equipment prior to AFHCAN, are now requesting portable units to provide ECGs in elder's homes.

There are anecdotal reports from clinical health aids in remote villages that the use of telehealth with ECGs saved lives, and portable telehealth enabled ECGs are being increasingly requested by health aides to be used in patient homes. Taken together, this suggests that making ECGs widely available at the point of care and using S&F

telehealth to obtain an expert level interpretation is an effective means of identifying patients with significant problems requiring urgent transport. Whether this translates into improved cardiac outcomes for the populations requires further study.

There are many anecdotal cases where S&F telehealth clearly led to improved outcomes for individual patients.

> *One example is that of a 16 year old female presenting to a primary care provider at a regional hospital with a unilateral paralyzed face. The provider contacted the consulting ENT physician at the tertiary facility by phone, reported that there was an ear infection on the side of the paralyzed face and asked for recommendations regarding antibiotic treatment and possible transfer to the tertiary facility for surgical drainage of the ear. The consultant requested that images of the face and ears be sent by means of store-and-forward telehealth. The images verified the facial paralysis, but revealed a normal ear exam rather than the reported infection, consistent with a diagnosis of Bell's palsy. The appropriate treatment (oral steroids rather than antibiotics), testing and follow up was recommended and arranged to be done at the regional hospital. The patient was treated and the condition resolved without the patient leaving their home region. Had it not been for store-and-forward telehealth, the incorrect treatment would have been initiated for an incorrect diagnosis, and the patient would have been transferred unnecessarily to the tertiary facility.*

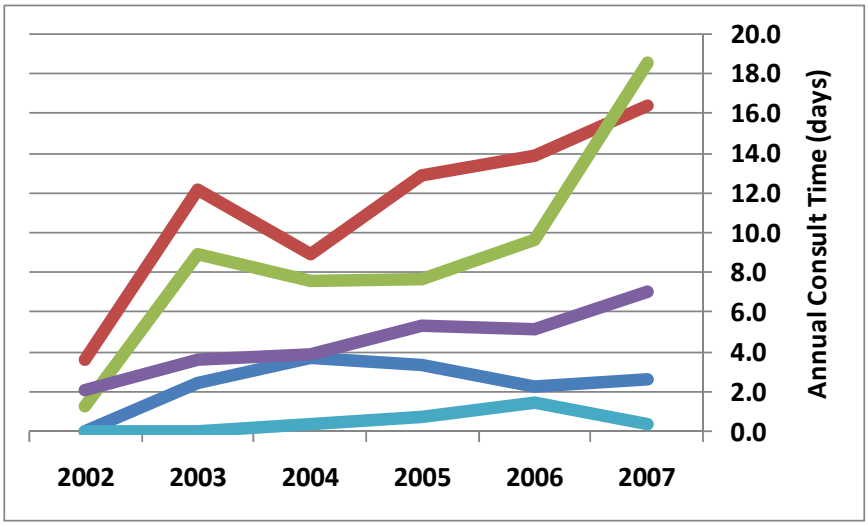
# HEALTH DISPARITIES: MATCHING NEED WITH CAPACITY

Most of Alaska is designated with some form of Health Professional Shortage Area status. 23 of 27 Boroughs/Census Areas are either whole or part Medically Underserved Area/Population (MUA/P) or Governor-designated Medically Underserved Population (MUP). The statewide underserved population totals 370,088 or 59% of the state's residents, and this is probably understated. 25% Alaskans (46% of Alaskan Natives) live in communities of less than 1000 people.

## Virtual Presence

In Alaska, the AFHCAN system has been able to reach out to the most remote regions of the state and provide needed health care services. Based on utilization data, store-and-forward telehealth provided the equivalent of weeks of specialty care for the health professional shortage areas. Through telehealth alone, ANMC was able to provide the equivalent of as many as 19 days of consultation time to organizations in Alaska in 2007. This is shown graphically in Figure 20 as a line plot for each of 5 organizations.

*Figure* **20** | ***ANMC Consultation Time to 5 Organizations***




Through continued increases in utilization, access to providers has continued to grow steadily through telehealth since 2002. It should be noted that the estimates of days of consultation time are based on the time required to provide a specialty consult which, as noted earlier, is a highly efficient process and likely underestimates the time savings over an in-person examination.

## Disparities by Health Problem

Skin disorders are common among Native peoples and cultures. For example, Native Americans who live in close quarters and with limited resources are at increased risk of contracting cutaneous infections. The Alaska Native population has not had access to a dedicated dermatologist prior to 2002 when a dermatology consultant was added. The fact that this dermatologist is a champion of S&F telehealth services has expanded access and is reducing health disparities among the Alaska Native population.

Respiratory illness (bronchitis, emphysema and asthma) is the 8th leading cause of death for American Indians and Alaskan Natives. Indian Health Service statistics show that the crude death rate for Alaska Natives from COPD has almost tripled over the past decade from 10.2 in 1981-83 to 27.9 in 1996-98. For Native elders greater than 65 years old, respiratory illness (bronchitis, emphysema and asthma) is the 6th leading cause of death while pneumonia (and influenza) is the 5th leading cause of death. S&F telehealth is being used in Alaska for better diagnosis of respiratory diseases. For example, the telehealth carts include spirometers. Spirometry is considered to be the gold standard for COPD Diagnosis. In this way, simple equipment coupled with S&F software can be used to level health disparities among remote and disparate populations.

Ear disease represents the major presenting symptom in 10-15% percent of all Alaskan village encounters. In a 1982 survey of four villages, chronic otitis media with effusion (OME) occurred in 8.9% of persons under 20 years of age and 21% of children under 5 years of age. Those most affected by chronic supporative otitis media include Inuits of Alaska (30% to 46%), Australian Aborigines (12 to 25%), Navajo and other NA tribes (4% to 8%). Otitis media in rural Alaska results in high rates of hearing loss that can be avoided through proper diagnosis and treatment. The extensive otolaryngology telehealth program we have described is working to resolve this health disparity.

## Store-and-Forward Solution

A store-and-forward telehealth network can link a patient population in need of service with a provider group willing and able to provide that service. Barriers related to geographic distance, socioeconomic status and time zone can be overcome, and disparities in health care can be addressed. To accomplish this, a S&F telehealth system must have several characteristics:

- Providers at remote sites must be able to easily and reliably originate cases. They must be able to understand and use the necessary software and medical devices, have access to the internet, and they need some means of technical support.

- Differing levels of providers must be capable of case origination. Underserved populations rely on nurse practitioners, physician's assistants and health aids for their initial care, and these providers must be able to initiate the telehealth consultation with as much ease and reliability as physicians.

- The content presented to consultants must be "rich" enough in content to enable them to perform their work. The proportion of telehealth cases with information insufficient to allow the consultant to render an opinion must be

low. The telehealth system must be integrated with and/or accept data from appropriate biomedical devices (e.g. ECG, Vital Signs Monitors) and consumer grade devices (e.g. digital cameras).

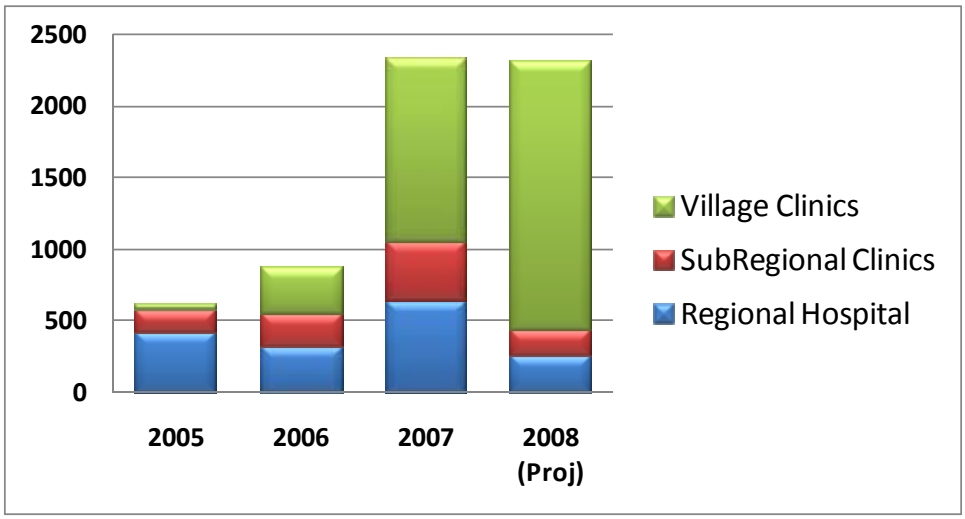
- The telehealth system must be flexible and scalable, providing options for adding consulting providers as need grows.

One impact of a scalable and flexible system is the dynamic changes that will occur in usage patterns as organizations best utilize the technology.

An example of this metamorphosis is shown in Figure 21, which shows the relative distribution of utilization of telehealth at 3 different levels within a regional health corporation. In this case, the corporation utilizes subregional clinics (well equipped, multi capable clinics geographically proximal to villages) to support village clinics. Following an immense effort in 2006 to increase access to care, the use of telehealth tripled in 2007. The rate was sustained in 2007, but usage shifted significantly towards the village clinics. This is a wonderful example of the diffusion of technology throughout an organization. The same organization is now actively engaged to promote telehealth at all levels within the organization so this distribution will continue to evolve.

*Figure* **21**

***Example of Dynamic Re-Distribution of Telehealth***




A telehealth system should also offer the possibility for "reverse telehealth" where through communication and online training the competencies and capabilities of the originating providers grow as they use telehealth. Their need to use telehealth should actually diminish over time as their competency grows and they become better able to meet the needs of their target population.

These characteristics have been illustrated to varying degrees by the use of telehealth in the Alaska Tribal Health System (ATHS) and by many of the studies and analyses performed over the last several years.

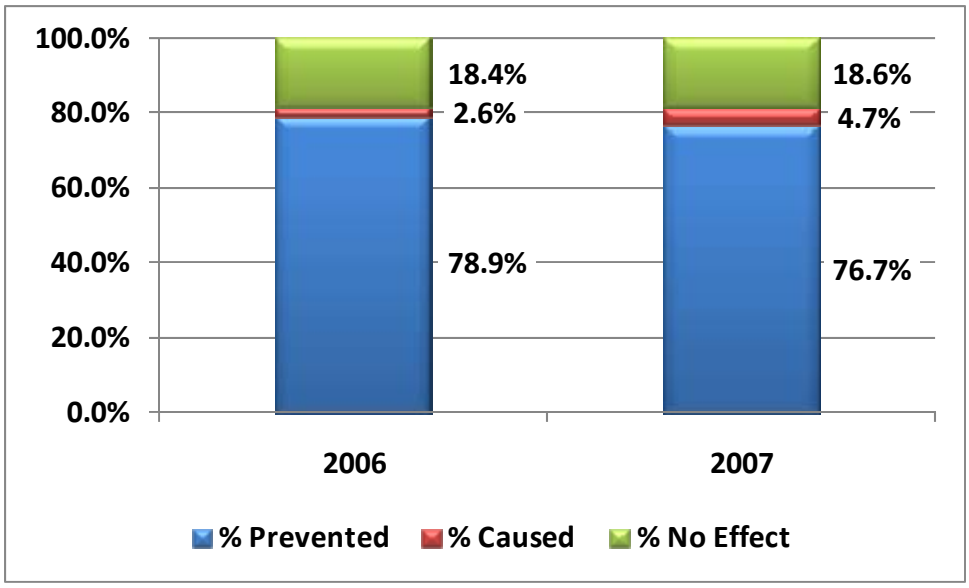
The value of "reverse" telehealth cannot be overstated. Having specialist request the assistance of other providers to care for patients empowers providers at all levels of health care. It provides a mechanism for communication, learning, and assistance that is virtually unknown outside the confines of a telehealth system.

## Yakama Data – Meeting a need for ENT access

The Yakama demonstration project provides an example of the ability of S&F telehealth to help address a disparity of care issue (Yakama Indian Medical Center demonstration project.) A specialist group thousands of miles from an underserved population has been able to address *some* of the needs of the target population. As the large consultant group in Anchorage has a capacity far in excess of the needs of the Yakama clinic, the work load generated was absorbed quite easily.

Initial results are shown in Figure 22 for 38 consultations provided in 2006 and 43 consultations provided in 2007. Similar to the results found statewide in Alaska, approximately 80% of all consults prevent patient travel. The difference in this case is that these patients would not have travelled to ANMC for care – but would have gone to Seattle or some other facility in the state of Washington. Each year, 1 or 2 cases caused travel – and were most likely patients that were caught at an early stage of disease and traveled to Seattle for care.

*Figure* **22** | ***Affect on Patient travel at YIMC***



However, while a S&F telehealth system creates a situation where specialists can render opinions and advice to the primary care providers enabling them to provide some specialty level care, it cannot provide the capability to perform the procedures and hands on examinations ultimately needed by some of the patients. Patients requiring this still go wanting for the care they need.

The Yakima project has thereby illustrated what we have discovered in the Alaska Native system: that a telehealth system is an excellent enhancement to a traditional health delivery system based on in person encounters but cannot replace, eliminate the need for such a system or create one where it does not exist. The most that can be expected of telehealth when applied to an underserved population is that some patients will receive definitive treatment through their local provider and those who absolutely need to see a specialist in person will be clearly identified and prioritized. For organizations struggling with unmanageable backlogs of patients needing to see specialists in short supply, this is a useful service.

## PE Tube 2 – Meeting a Standard of Care

American Indian and Alaska Native (AI/AN) children face a particularly difficult situation, as they often have higher rates of otitis media and thus greater rates of tympanostomy tube placement – but live in an environment that makes post-surgical follow-up challenging and expensive. Post-surgical follow-up of these children typically involves examination of the ears at 1 month (or earlier) and then at intervals of 3 – 6 months. In the past, it was unreasonable to fly children to specialty clinics for frequent follow-up visits.

Now, using S&F telehealth, the ENT department at ANMC is able to meet a higher standard of care by following up with these patients on a more timely basis. S&F telehealth using video otoscope images has several attractive features. The image documents the pathology, transmission requires little bandwidth and is asynchronous, maximizing efficiency of the consultant. Video-otoscopy is a technical skill that can be taught to providers with various backgrounds and training. Experience has shown that CHA/Ps in remote villages are fully capable of obtaining adequate images for case origination and review by the consultant.

## Low entry costs, simple design and straight-forward training

S&F telehealth is an appropriate technology at remote sites with low entry costs and simple design. It is a general purpose tool – not restricted to one specialty but rather has broad implications for many specialties. We have demonstrated that remote providers are fully capable of imaging and managing equipment for effective usage.

Subsequent experience gained has verified that almost all providers can be adequately trained to use telehealth in a matter of hours (one hour of training for a receiving consultant, eight hours for an originating provider, including training in the use of various medical devices.) The NSHC audiology review (Norton Sound Health Corporation – Review of Audiology Telehealth Cases) showing only a 10% need for in-person examination subsequent to a telehealth encounter and the AFHCAN Evaluation Question review (Analysis of Evaluation Questions posed during telehealth cases to

providers) showing only an 8% "need for travel" rate both support the notion that the majority of telehealth encounters allow the consultant render an opinion based on the information presented.

## Flexibility and Scalability

Store-and-forward telehealth is scalable and flexible. It is easy to add consulting providers to a group receiving cases – anywhere, with the only barriers related to credentialing, privileging, and licensing. This allows providers to extend careers or fit a unique lifestyle by offering a non-traditional model for providing consultation services (i.e., anywhere and anytime). Flexibility and scalability have been demonstrated by the ease with which providers have been added to the system as dictated by need and the willingness to accept telehealth as means of performing medicine.

## Specialist Capacity – Access to Specialists wherever they are

In both the Dermatology and ENT departments at ANMC, providers have consulted on Alaskan patients while traveling out of state and, in the most dramatic illustration of flexibility to date, a provider on sabbatical has continued to perform consultations daily while located in a foreign country. Since an experienced consultant needs only a computer, internet access and basic training in telehealth to receive and consult on cases, this "work flexibility" suggests the intriguing possibility that providers located anywhere and at any stage of their career (for example, semi-retired) can be virtually linked with underserved groups needing their expertise and services. The experience in the Alaska Native health system is that this is certainly technically possible, and it is the regulatory, business and workflow issues that need addressing to further this concept.

## Training material generation, otoscopy atlas

S&F leads naturally to the development of appropriate training materials gathered from the images and data acquired by providers. Training materials can be specific and focused on their needs and problems. An Otoscopy Atlas is presently being generated and has the potential to serve as a decision support tool for primary care providers, a tool for ENT specialists for documentation and comparison, and potentially lead to improved outcome documentation via image comparisons of patient progress.

## Reverse Telehealth and Educational Opportunities

The concept of "reverse telehealth" is one only recently appreciated in the Alaska Native health system as more experience has been gained with the full effect of S&F telehealth on providers. One normally thinks of the information flow in a S&F case as being essentially from primary care provider to consultant, whether that be from a physician's assistant to a family medicine physician or from a family medicine physician to a surgical subspecialist.

However, information flows in the opposite direction also. And while that information does focus on specific recommendations and advice apropos to the individual case at hand, it also offers the opportunity to educate the provider about the disease process under consideration. The immediacy and relevance of the educational opportunity are

unique. Any medical student can relate to the fact that the most profound learning occurs when educational content is coupled to the patient encounter at hand, and practicing physicians are frequently frustrated by the temporal delay in getting feedback from a consultant in traditional medical systems. The rash on the child or the tracing on the ECG is long forgotten by the time the consultant's letter arrives at their office.

Telehealth offers the potential to radically alter this paradigm, making every case sent to the consultant a potential meaningful learning opportunity. This would foster the development of expertise, competency and confidence in the referring providers. While we do not have specific data showing this (for example, telehealth use leading eventually to a decreased rate of requested consultations) anecdotal reports from primary care providers suggest that this is occurring. Comments such as "I finally understand what I have been looking at in these ears all these years" are not uncommon.

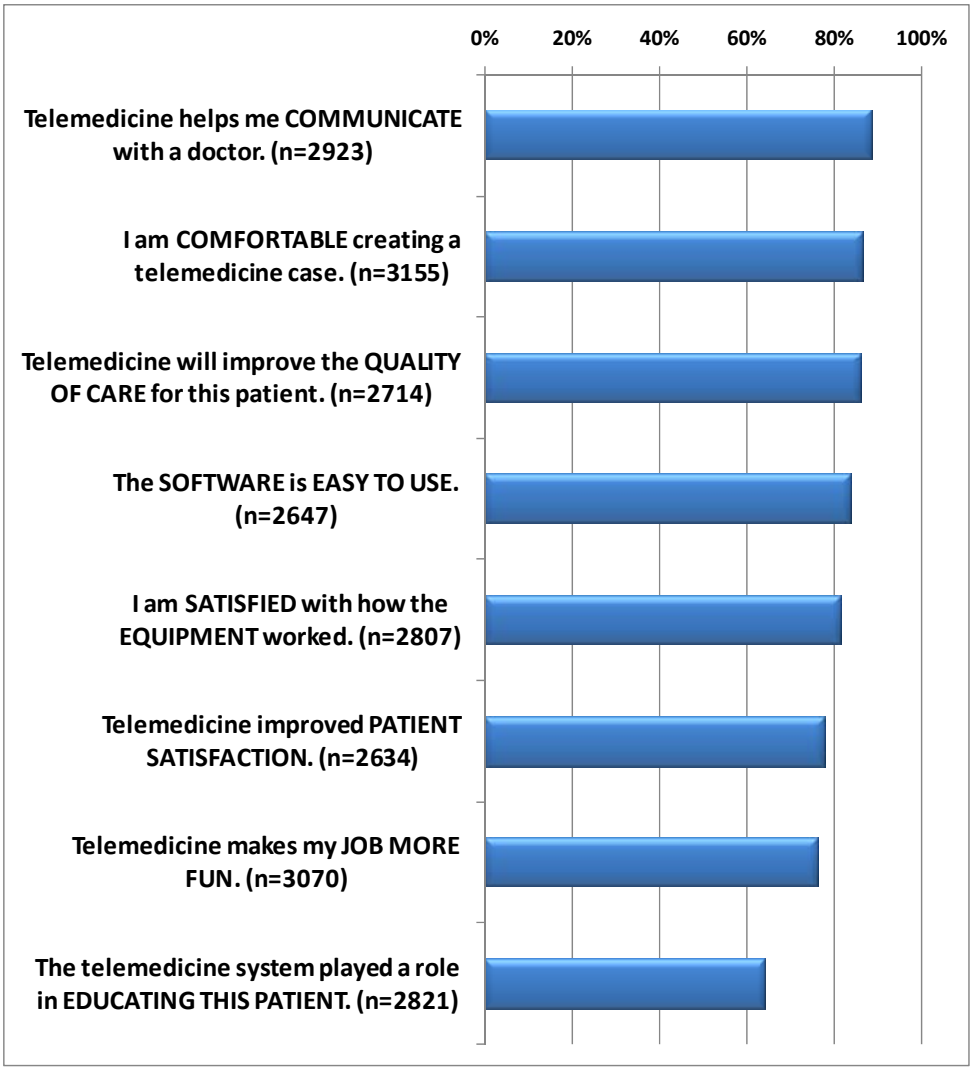
AFHCAN is currently working on a project where an on line archive of clinically relevant images and educational content is being developed with the intent to offer it to primary care providers at the "golden moment" when they are receiving the consultant's opinion on a specific telehealth case. Such bidirectional flow of information simultaneously meeting the unique needs of the patient, primary care provider and consultant is an exciting prospect.

# ADDITIONAL BENEFITS

## Provider Responses

Provider response to S&F telehealth has generally been very positive in Alaska – especially from providers that create telehealth cases (e.g. those in village clinics). A variety of questions are posed to providers in that setting to gauge their response. A summary of those responses are shown in Figure 23 as the percentage of responses that either "Agreed" or "Strongly Agreed" with the statements shown on the left. (Details on this evaluation tool are described in Appendix C).

*Figure* **23** | ***Responses to Evaluation Questions by Case Creators***



Perhaps the most obvious point is the high agreement on most statements. The highest responses were obtained on questions that are more objective – such as the impact on communication and comfort with the equipment. The hardest measure – and the one receiving the lowest response – was the impact on educating the patient. However – questions that related to quality of care and access to care all received high levels of agreement.

## Information Benefits

In general, store-and-forward telehealth offers benefits beyond the standard health care delivery. It promotes capture and storage of data so that additional information, structure, and multi-media richness are added to the patient record. There is added documentation to encounters that would otherwise normally be missed or would be lost in a paper shuffle between telephones, fax machines and mailboxes.

By definition, S&F telehealth requires that text, data, and/or images are captured and documented as an electronic consultation. The act of consultation requires physician documentation and, therefore, the health care organization benefits from all of the advantages of electronic data collection, storage and retrieval.

Our experience in the Native health system is that S&F telehealth greatly reduces the phenomenon of the "missing chart" that plagues so much of medical practice. S&F telehealth supports and benefits from electronic health record (EHR) integration, and can be used to transport information between differing EHRs where full interfaces do not exist. This has been the experience in Alaska where consultants travel to and work at different Tribal Health Organizations with different EHRs. Workloads are fully documented and metrics generated, providing data for planning purposes and business decisions. S&F telehealth can also be interfaced with registration and billing systems, promoting more streamlined and paperless workflows.

## Startup Benefits

There are few technical barriers to starting a S&F system; the hardware, software and networks are available now in most settings. S&F operations are scalable in several ways. An organization can begin with one specialty that requires minimal investment in medical equipment. An organization can begin with few providers. Specialties, medical equipment, providers and organizations can be added as demand grows and resources are identified.

S&F operations require minimal bandwidth connectivity when compared to VTC or teleradiology. Because the utilization of S&F telehealth is automatically recorded, it can be used to easily justify costs of overall network expenses. Costs for S&F software are a small percentage of what a full electronic health record would cost. Rarely, an EHR vendor will offer S&F functionality as an added software module to their existing EHR. There are a variety of options for spreading software and server costs by sharing server space or utilizing server hosting agencies.

# POTENTIAL FOR FRAUD AND ABUSE

There has long been concern that a decision to reimburse store-and-forward telehealth would open the door to fraud and abuse. The specific fear is that cases would be routed from consultant to consultant for no good clinical reason, with each adding little to the care of the patient, yet billing for service at each stop. Compounding the concern is that sending a case to another provider can take as little as a mouse click.

In Alaska, we have not experienced fraud and abuse related to telehealth. Medicaid and private insurers have been reimbursing for S&F telehealth for several years. In 2002 Alaska and Hawaii were identified as demonstration sites for Medicare where billing for S&F telehealth is allowed. Reviewing the reimbursement for telehealth at Alaska Native Medical Center from 2004 – 2007, it is noted that there were some problems related to how S&F telehealth should be properly coded and billed (as no precedent existed for this), but there were no concerns about fraud and abuse. Ironically, there have been claims questioned because the consultation occurred too soon after the request for consultation was documented (for example, the patient received consultation from a consultant hundreds of miles away on the same day.)

There are probably several reasons why there has not been fraud and abuse related to S&F telehealth as it has been used in Alaska. First, by its nature, S&F telehealth deters fraud and abuse because it requires documentation that makes the reason for visit readily apparent. Second, the S&F software used in Alaska deters fraud and abuse with audit trails, automatically registering the user that is accessing, reading, writing, sending or receiving the case. Third, by its nature, S&F telehealth can be used for only some kinds of visits, and therefore, represents a tiny portion of overall outpatient visits. Fourth, this application has not yet saturated the market. Fifth, consultants presently involved in S&F telehealth probably are among the more altruistic providers, have a mission focus, and most are salaried.

It is noted that the Alaska experience has measured S&F encounters that occur between health care professionals. This should not be confused with consumer-to-provider email exchanges. Consumer-to-provider email exchanges have different challenges to reimbursement and potential for fraud and abuse.

# RECOGNIZED BARRIERS

There are several recognized barriers to the development of store-and-forward telehealth in Alaska and some of these have national implications.

## No reimbursement for the sending site (Referring)

The advantages that accrue through the system are not matched to where the costs and workloads are absorbed. A telehealth encounter takes two willing providers –one to create and send a case and one to receive and review it. If the incentives to create a case are lacking, or if the additional time and expense for creating a case are not fairly compensated, telehealth usage will suffer.

## It requires significant time and effort to create a telehealth case

Clinicians are generally busy and when they need to send a patient to a specialist, it is most efficient for the clinician to hand write a referral note and send the patient for an in-person appointment, regardless of how far the patient may need to travel. S&F telehealth requires the referring clinician to spend more time gathering data, documenting and following through with the telehealth encounter.

It was shown in an earlier section that providers spend significantly more time creating a case than providers spend consulting on a case. With S&F telehealth, the patient care is often retained by the referring clinician, who is taking more time and more responsibility for treatment that may be out of his or her expertise or scope of practice.

## There is higher capital investment at the sending site

The sending site has most investment in equipment, training and maintenance needs. A typical S&F telehealth cart in Alaska costs $20,000 to $50,000 depending on the integrated biomedical equipment. Consultant sites need little more than a computer with appropriate software and an internet connection. In addition to the front end expense, the participating site has the responsibility of continued training and maintenance that require dedicated staff time. The upkeep, training and use will only continue if the organization sees value in the service and if they do not lose money in the venture.

## There is low reimbursement at the sending site

The sending clinician and organization does not receive adequate or any reimbursement for time, effort and risk invested in the creation and follow-up of a S&F telehealth case. In an analysis of 1071 reimbursed cases over a one year period (Analysis of Reimbursement for Telehealth) it was noted that as currently practiced in Alaska, only the consulting provider is reimbursed for the telehealth encounter. On the other hand, the realized savings in terms of prevented travel costs, etc. goes to the insurer and patient; nothing is gained by the sending clinician.

Due to the high travel costs in Alaska, most of the costs saving that have resulted from S&F telehealth have been from avoided travel costs. Our Medicaid reimbursement data (Review of telehealth cases reimbursed by Alaska Medicaid**)** shows that Alaska Medicaid saved $7.95 in avoided travel costs for every $1.00 spent on telehealth reimbursement. As the cost of equipment, training, maintenance and support lie increasingly with tribal organizations, some inequalities in costs and savings exist.

## Lower level E & M codes for the receiving site (Consultant)

The application of current coding rules to S&F telehealth creates a disincentive for a consulting provider to accept telehealth cases. No precedent exists for how S&F telehealth should be billed and reimbursed. In 2002, Alaska Medicaid and ANMC agreed to follow the existing Evaluation and Management (E&M) coding system rules to code and subsequently bill for telehealth consultations.

One of the important determinants of the level at which any encounter is coded, billed and reimbursed is the number of body systems examined. The practice which developed in Alaska after consultation with Alaska Medicaid was to equate image review with examination, and as even the most complex telehealth case tends to contain images of only one body part, codes tend to be locked in at low levels. Analysis of 1,071 reimbursed cases (Analysis of Reimbursement for Telehealth – Process) revealed that all of the reimbursed cases were at Level 1. In an in person encounter, these consultation would have undoubtedly been coded at higher levels (Level 2 or 3) as additional body parts would have been examined, and additional questions would have been asked and documented in the encounter for the review of systems.

The resulting "telehealth tax" or reduction in coding level that accompanies S&F telehealth may create a disincentive for a consulting provider to participate in a S&F telehealth network. It would simply be more profitable to insist that all consultations be seen in person. This has not been an issue in the Alaska Native or Federal systems where physicians are salaried and the level at which they code encounters does not directly affect their compensation.

## Simultaneous Patient Registration and Patient Care

Store-and-forward telehealth creates a unique situation where the health care provider is faced with registering and caring for the patient at the same time. Because most organizations have disparate electronic or paper systems, there is not a mechanism to automatically port demographic and insurance information into a telehealth case. This requires the clinician to become responsible for both patient care and operational data entry at the point of care: the clinical information and demographic and registration information arrives simultaneously to the clinician rather than first being processed by a registration clerk. This creates "patient registration woes" that frustrate the clinician and may result in lack of information for EHR data merging and consultant billing.

Store-and-forward telehealth is relatively new, and there are no precedents on how it fits into currently accepted business related practices – registration, coding, billing, reimbursement. In many ways, it does not fit well with processes designed to fit more traditional models of care. As with most health systems, the registration, insurance

verification and billing process at ANMC are based on the model where the patient registers and provides their insurance information *before* the medical encounter occurs. With S&F telehealth, where, for example, a case may be sent to a consultant and read off hours, the medical encounter occurs first and the registration and verification has to occur later. This would typically occur hours to days after the encounter and would involve tracking down the patient who has long since left the referring clinic site. This greatly increases the administrative time necessary to process a bill for telehealth. The lesson learned from this experience is that new processes were needed to accommodate the "encounter first, register later" model that an organization faces when it is a receiving site for S&F telehealth.

## Challenges for the Private Sector

There are particular challenges in implementing S&F telehealth across the private sector. S&F telehealth is implemented more easily in organizations that can decide on a common software application and have definitive referral patterns. Therefore, in Alaska, S&F telehealth has been most successful in the federal and tribal health environment. While there is no managed care in Alaska, one can assume these organized healthcare networks would also be amenable to S&F telehealth. In Alaska there are 1454 physicians representing 49 specialties. The majority of these physicians (1,326) are in private practice, while the remainders are in public health (67), military (42) and municipal, state & federal (19). The private sector has a variety of challenges related to telehealth. For example, referral patterns are more open, competitive and changing than the federal sector. There are logistical, political, operational and technical issues related to establishing and maintaining specialty referral access (database) in a S&F software application. There are additional technical challenges to privacy and security when referral networks are open and changing. The private sector does not have a common voice that speaks for all providers. While most physicians have internet access, there is not a dedicated private communication network that reaches most physician offices. There is not an agreed upon electronic health record for the private sector in Alaska. While the AFHCAN telehealth software is being used in some parts of the private sector, it has not been formally adopted as a common platform for S&F telehealth in the private sector.

S&F telehealth creates the possibility for interstate, and for that matter, international medical practices. For this reason a review of the existing regulatory environment is needed. This is especially true applies for the private sector, where a state medical license is generally needed for the state in which the patient resides and where the physician is providing care. For S&F telehealth cases that need to be sent to a specialist out of state, this presents additional problems. In the federal health care system, physicians that reside in different states and have different state licensures are able to consult on federal beneficiary patients outside of their state without fear of violating a licensing issue. For the private sector, the state licensure issue remains a problem.

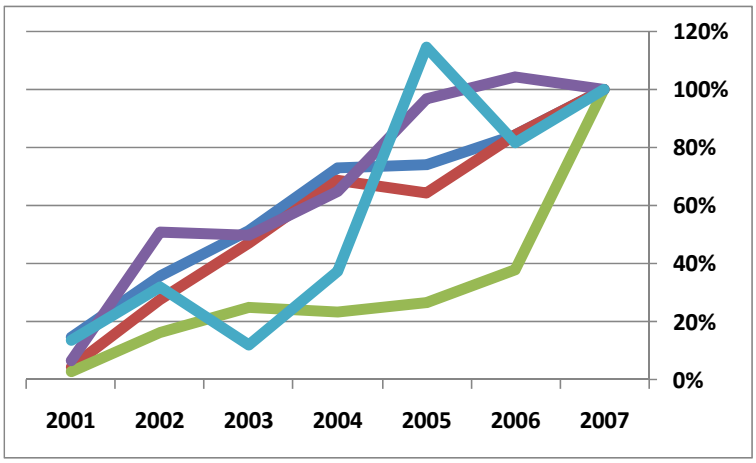
# ADOPTION OF TELEHEALTH

The AFHCAN Office has had the opportunity to work with a variety of organizations in their adoption of S&F telehealth technology. Similar to the experiences with other systems around the world, AFHCAN benefitted from the energy and wisdom of early adopters, and struggled to provide the level of training and support required to maintain and grow a large scale telehealth system.

## Growth in Utilization

Organizations proceed at different paces in their adoption of telehealth. Examples of 5 organizations in Alaska are shown in Figure 24. The data is shown normalized to the number of cases created by each organization in 2007. In 2007, these 5 organizations accounted for the creation of 10,500 telehealth cases by 402 providers for 8,277 unique patients. This amounts to an average of 26 cases being created each year by each provider, but only 1.3 cases being created for each patient.

*Figure* **24** | ***Telehealth Usage at 5 Organizations (relative to 2007)***




This plot demonstrates the characteristics of linear adopters, late adopters, and erratic adopters. Three organizations adopted telehealth in a linear fashion – growing their usage linearly over a 6 year span of time. One organization had erratic growth with period of increased and decreased activity. One organization experiences a very slow start and only recently attained significant growth.

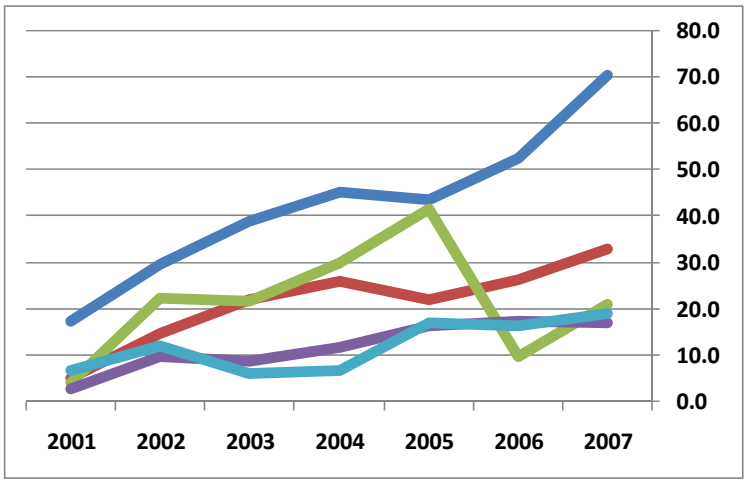
What fuels this growth – and how can we better prepare to handle this growth as a telehealth system? Is this growth fueled by adding more providers to the mix? Or is it fueled by doing more cases for the same number of patients?

Growth in usage is actually due to more cases being created by each provider – rather than adding more providers to the system. This is shown in Figure 25. This is actually

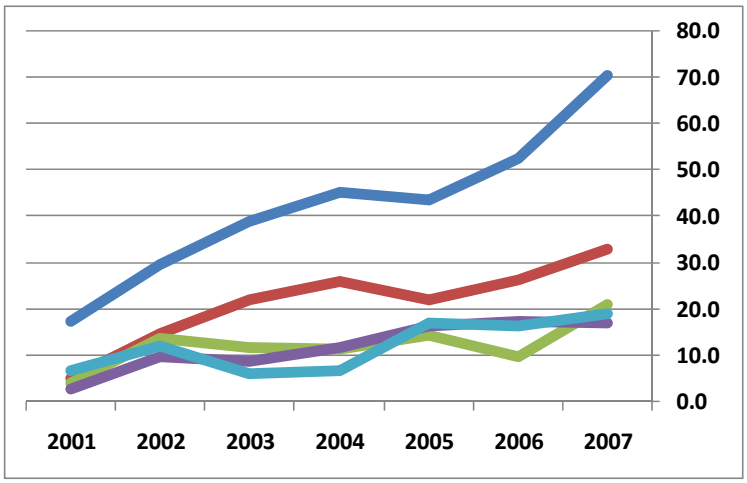
good news for a telehealth system, as it reduces the training and support burden. Surprisingly – all 5 organizations created many more cases per provider as they adopted telehealth – typically doubling or tripling the usage per provider in a linear fashion over the years of the project with no obvious leveling off in sight.

*Figure* **25**

## *Cases Created per Provider at 5 Organizations*




Number of cases created by all providers.




The effect of removing a single early adopter at an organization.

It should be noted that these plots are the average number of cases created by each provider using AFHCAN technology at each organization. This is calculated as the number of cases created each year divided by the number of users who created telehealth cases that year.

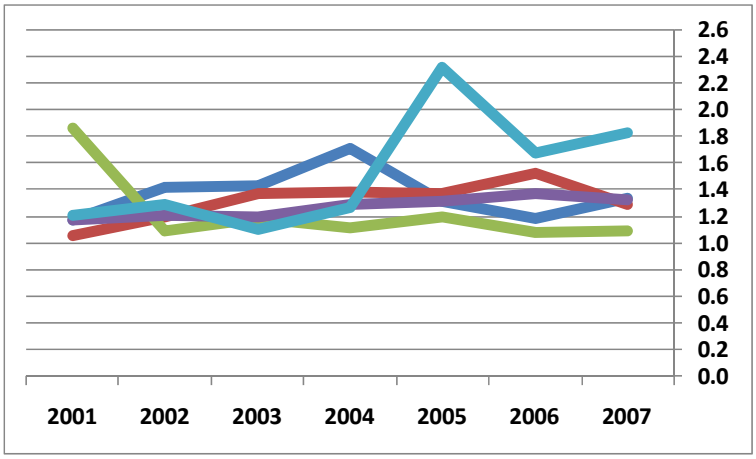
One organization was heavily influenced by a single early adopter (or champion) who no longer was involved in telehealth after 2005. After removing the effect of this early adopter at one organization, all five organizations have similar growth curves albeit different slopes or adoption rates. This is a great example of the impact of individuals

on the early adoption rate, and the risk that is posed when such individuals (champions) leave an organization.

The continual growth in usage at these organizations was not due to the creation of more cases per patient, but was in fact due to more individual patients requiring consultation. A plot of the cases created per patient (Figure 26) clearly demonstrates that almost all organizations created 1 to 1.5 cases per patient per year – regardless of the overall growth. Thus the growth in telehealth is indicative of a growth in access to care.

*Figure* **26**

***Cases Created per Patient at 5 Organizations***




## Provider Turnover and the Impact on Telehealth Participation

Most telehealth systems anticipate turnover in the providers actively engaged in telehealth. The level of turnover has serious implications for overall usage and sustainability of the telehealth program, as well as directs effects on training and other operational requirements.

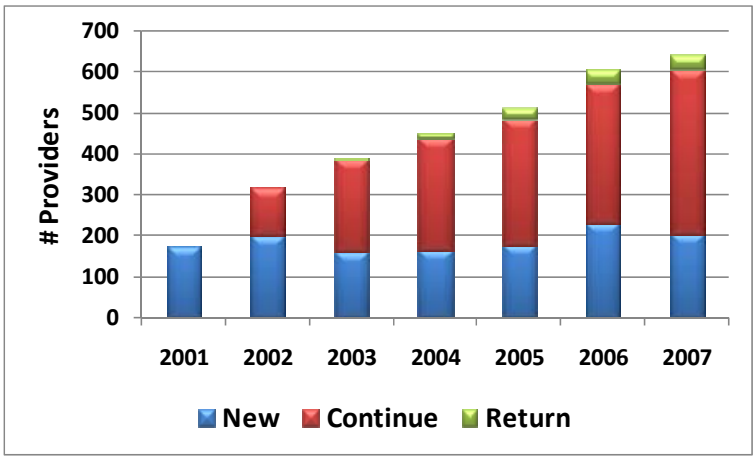
One measure of this turnover is the number of providers that are new to the system each year. Historically, the AFHCAN statewide system expects to see close to 200 "new" users each year (Figure 27) – i.e. users that have never used the system before. This number has remained fairly constant from the first year of deployment (when all users were "new" in 2001) to the most recent year (2007) for which data is available.

A cadre of "experienced" users has continued to grow since 2001, with more than 400 experienced users using the system in 2007. While the actual number of new users was fairly steady for the past 5 years (annual average of 193 new users per year), the number of experienced users grew by an average of 52 new users each year. The net effect is that, while the number of new users remains constant each year, this group diminishes over time as a percentage of the overall number of users. It should also be noted that a

very small percentage of users are "returning" veterans, having used the system in previous years but skipped one or more years.

*Figure* **27**

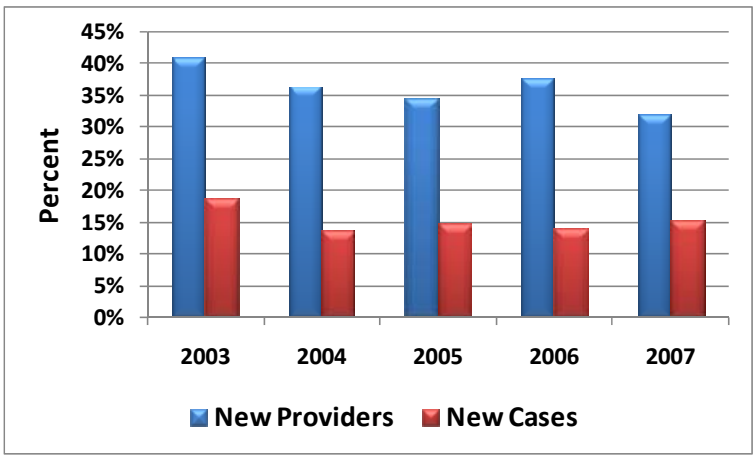
### *Statewide Providers Involved in S&F Telehealth*




Surprisingly, provider turnover appears to have little impact on telehealth "production". One measure of "production" is the level participation of "new" providers each year in telehealth cases. (Note: A provider is considered to have participated in a case if he/she materially contributed to the case by creating or consulting on the case).

*Figure* **28**

### *Participation by 'New" Providers*




In 2007, for example, 32% of all providers were "new" to telehealth and these providers participated in 15% of all cases (Figure 28). While this suggests that new providers

participate at a lower level , the difference can be accounted for by the fact that, on average, a "new" provider would only participate for 6 months of their first year (assuming an equal distribution of those that start early and those that start late in the year) whereas a returning provider typically participates for the entire year. This 2:1 ratio between "new" providers and their participation has been maintained for the past 5 years.

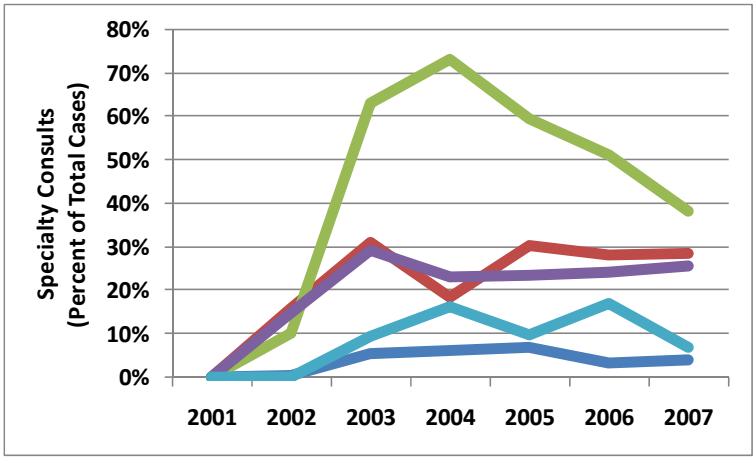
## The Need for Primary Care versus Specialty Care Consults

The AFHCAN system was designed to work with existing clinical workflows without forcing new workflows or new relationships to support telehealth. One sign of this adaptability is the varying degrees to which the organizations use the system for specialty consults versus primary care telehealth, as documented in earlier sections. Depending on the organization, specialty telehealth consults represent 2-30% of all telehealth usage.

Interestingly, many organizations rapidly reached a steady-state whereby the percent of telehealth cases used for specialty consults did not change over time – despite an increase of 2-5 times the number of cases.

This is demonstrated in Figure 29 which shows the percent of cases that were specialty consults as a function of time for five different organizations. Four of these organizations achieved the steady-state percentage in the first 2 years of operation – with minor fluctuations over time. The one exception is an organization that had a champion that generated a significant number of specialty consults; he was no longer with the organization after 2005 and the organization simultaneously started to diffuse the telehealth technology from the hospital to subregional clinics and later to village clinics leading to more primary care cases. (This organization was described in earlier sections.)

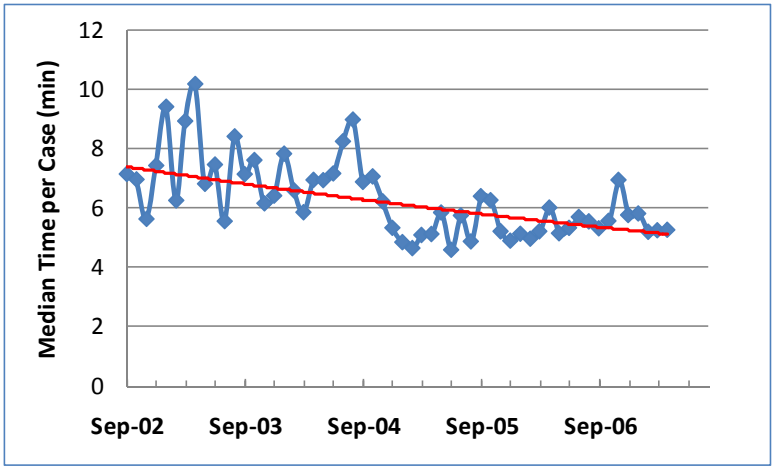
*Figure* **29** | ***Specialty Consults at 5 Organizations***



## Increasing Efficiency of Usage

Another significant benefit to growth in adoption of telehealth is the efficiencies that are achieved in the telehealth process. Figure 30 demonstrates that the median time spent by a consultant responding to a case at ANMC dropped from 7.5 minutes (in 2003 with 1,435 cases) to 5.5 minutes (in 2006 with 2,123 cases) over a period of 4 years as experience was gained with the system and the system was improved to meet their needs.

*Figure* **30** | ***Median Time Spent by a Consultant Responding to a Case***




For a large system, this reduction in time can be significant. ANMC provides 2,000 to 3,000 consultations per year, and a 2 minute saving on each consultation translates into 8 to 12 days of provider time per year. It should be noted that the majority of these consultations were ENT or Dermatology cases; times may vary depending on the specialty involved.

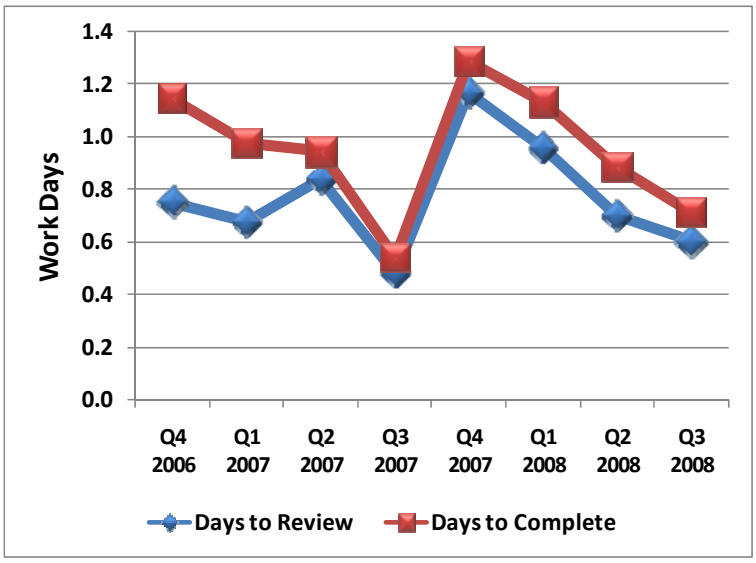
## Increasing Efficiency of Process

Departments that provide telehealth consultation need to learn to adapt to the growing demand on their services. This requires process re-engineering. While ANMC continues to deliver a very high level of telehealth service, some departments face the struggle of keeping up with demand. A provider may be able to handle up to 300 cases per year with significant process changes, but growing demand can force changes to be considered.

The impact of this can be measured on the turnaround time of an organization. The average turnaround time for ANMC on consults is shown in Figure 31. With the exception of Q4 2007, the organization has steadily decreased its turnaround time over the preceding quarter. We do not have information to explain what happened in 2007, but the overall story seems to be that of an organizations that continues to improve its

processes to achieve fast turnaround times on telehealth cases. Note that telehealth cases are generally resolved within 24 hours.

*Figure* **31** ***Turnaround Time at ANMC on Consult Requests***




Without telehealth, these patients would remain in the queue for an in-person visit, and the diagnosis, treatment, and documentation would often not be resolved for many weeks.

## Creating and Improving Provider Relationships

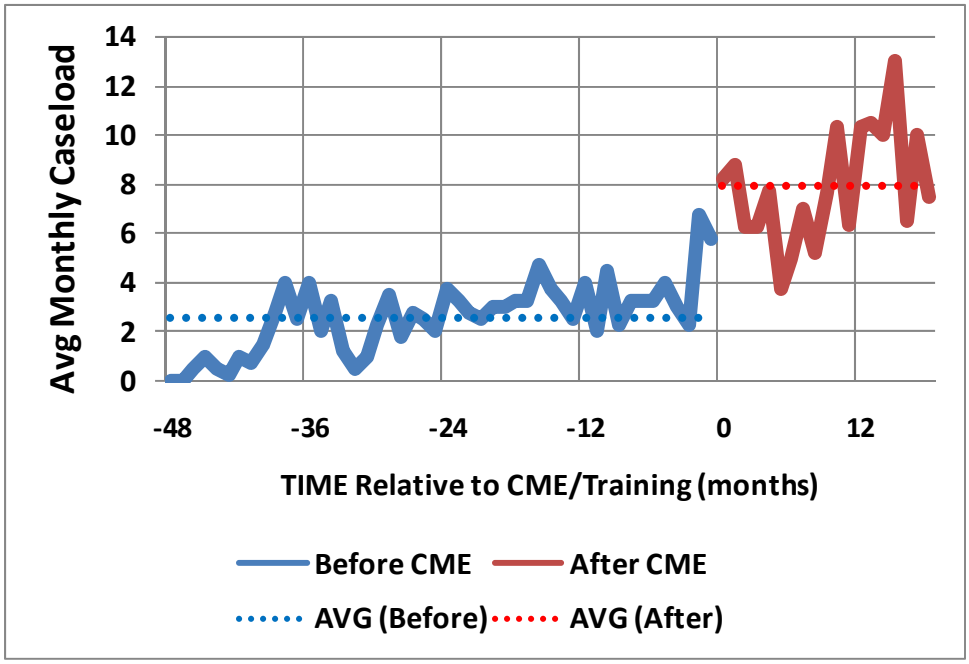
Simply deploying a telehealth system is not sufficient to guarantee its usage or sustained growth. There is always a need for training and looking for innovative ways to provide health care.

AFHCAN worked with ANMC to create opportunities to promote telehealth by travelling a specialist to regional hospitals to meet local physicians and provide CME / Telehealth Training. This has been conducted with a number of specialists. The impact of this is shown in Figure 32 for the impact of a Dermatologist travelling to hospitals and building relationships with providers that would facilitate the usage of telehealth. We now believe the building of relationships is extremely important – especially for S&F telehealth where the specialist will remain a disconnected disembodied entity until the providers actually meet in person.

Figure 32 shows the impact of this exercise on building relationships. Monthly telehealth usage was measured at each of 4 organizations prior to the visit by the Demonologist, and immediately following the visit. The data for all 4 organizations is aligned at the time of the visit (t=0).

Figure 32

## Impact of Consultant Visit on Telehealth Usage




The average telehealth case load to Dermatology from each organization was 2.6 cases/month prior to the consultant visit. This rose to 7.9 cases/month for each organization and was sustained for 18 months after the consultant visit. The net effect is that approximately 250 more patients are being seen through telehealth from these organizations on an annual basis in response to 4 one-day trips to regional hospitals by the Dermatologist. Given the current 4 month backlog to see the dermatologist in-person, the 250 visits represent a savings in 80 man-years of waiting time.

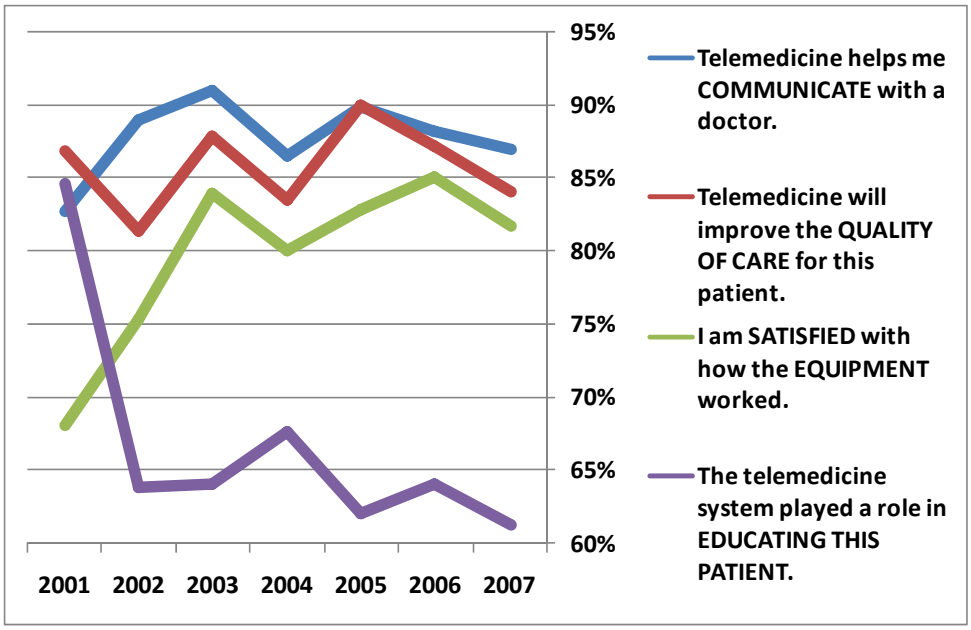
Changes in adoption also trigger changes in attitudes and provider acceptance which were measured through the evaluation capability of the AFHCAN software. Figure 33 shows the changes in the average response to some of the question posed to providers who create cases throughout the AFHCAN system.

The majority of responses were invariant – as demonstrated by the continued high level of agreements to the statements on Communication and Quality of Care. The AFHCAN system was also being refined and improved during the early phases of the project, which most likely explains the growth in the agreement to the topic of satisfaction with the equipment.

Surprisingly, the agreement with the impact of the system on patient education dropped during the early years and has continued a slight drop in recent years. We suspect this may be an indicator of the system becoming routine and less of an anomaly, and perhaps is a sign that adoption has been achieved.

*Figure*
**33**

## *Variations in Responses to Evaluation Questions*



# SUMMARY

S&F telehealth is not only a means to deliver health care to remote populations, but an important piece in a new paradigm of health care delivery. The seven year experience in the Alaska Native health system shows that S&F telehealth has improved efficiency of care delivery and has increased access to care, and as such has helped to address the health care disparities of Alaska Natives.

While clinical outcomes seem to be improved as a result of telehealth, more rigorous study is certainly needed in this area. Our experience comes primarily from three active fields using telehealth in the Alaska Native system – ENT, Dermatology and Family Medicine / Primary Care. Other specialties such as cardiology, pediatrics, orthopedics, endocrinology, general surgery and dental health are in the early stages of integrating telehealth into their clinical strategies. Time and further analysis will show if such favorable experiences hold true for other specialties.

Finally, there are barriers to the further growth of S&F telehealth, mostly related to policy and the current medical business infrastructure. It is our hope that the improvements in clinical care and health care delivery resulting from S&F telehealth will raise awareness and foster an environment more conducive to its growth.

# APPENDIX A. A BRIEF HISTORY OF AFHCAN

The Alaska Federal Health Care Access Network (AFHCAN) has deployed telehealth solutions to 248 sites throughout Alaska to improve access to health services for federal and tribal beneficiaries. AFHCAN designed hardware solutions, software solutions, a statewide network, and developed comprehensive support and training services to implement and sustain telehealth at the AFHCAN sites.

AFHCAN began as an initiative of the Alaska Federal Health Care Partnership (AFHCP). The "Partnership" is a unique collaboration of federal agencies that has been in existence since 1994. The AFHCP has brought together the Department of Veterans Affairs (VA), Department of Defense (DoD), Department of Homeland Security (U.S. Coast Guard - USCG), Indian Health Service (IHS), and the Alaska Native Tribal Health Consortium (ANTHC) for the purpose of providing health care to over 300,000 federal beneficiaries in the state of Alaska. The mission of the AFHCP is to: *Provide federal beneficiaries ready access to quality, customer oriented, compassionate, comprehensive, cost effective health care, in a health care delivery system where the strengths of individual agencies are combined to provide quality customer service.*

The Alaska Federal Health Care Access Network (AFHCAN) began as a project in 1998 to improve health care for federal beneficiaries using modern telehealth technology. During the early years of the project there was overwhelming response for creating a store-and-forward telehealth system in Alaska. Clinical needs assessment indicated that primary care, otolaryngology and cardiology were those services most needed and amendable to S&F applications. The mission of AFHCAN is to: *Improve access to health care for federal beneficiaries in Alaska through sustainable telehealth systems.*

## Participating Sites

The AFHCAN project was designed to provide telehealth solutions to 248 sites throughout Alaska represented by 43 autonomous organizations. Organizations participating in AFHCAN (with the corresponding number of sites shown in brackets).

- Alaska Native Tribal Health Consortium (ANTHC) [1]
- Aleutian Pribilof Islands Assn. (APIA) [5]
- Arctic Slope Native Assn. (ASNA) [1]
- Bristol Bay Area Health Corp. (BBAHC) [29]
- Chickaloon Native Village [1]
- Chitina Traditional Council [1]
- Chugachmiut [5]
- Copper River Native Assn. (CRNA) [4]
- Council of Athabascan Tribal Governments (CATG) [8]
- Eastern Aleutian Tribes (EAT) [5]
- Eklutna Native Village [1]
- Hoonah Indian Assn. [1]

- Kenaitze Indian Tribe [1]
- Ketchikan Indian Corp. (KIC) [1]
- Kodiak Area Native Assn. (KANA) [6]
- Maniilaq Assn. [12]
- McGrath Native Village/SCF [3]
- Metlakatla Indian Community (MIC) [1]
- Mt. Sanford Tribal Consortium (MSTC) [2]
- Native Village of Diomede [1]
- Native Village of Eyak [1]
- Native Village of Karluk [1]
- Native Village of Kwinhagak [1]
- Native Village of Tanana [1]
- Native Village of Tyonek [1]
- Ninilchik Traditional Council [1]
- North Slope Borough (NSB) [6]
- Norton Sound Health Corp. (NSHC) [15]
- Seldovia Village Tribe [1]
- Southcentral Foundation (SCF) [2]
- SouthEast Alaska Regional Health Consortium (SEARHC) [11]
- St. George Island Traditional Council [1]
- State of AK Dept. of Health and Social Services: Section of Nursing [26]
- Tanana Chiefs Conference (TCC) [20]
- US Coast Guard (USCG) [8]
- US Dept. of Defense - Army (USArmy) [6]
- US Dept. of Defense - US Air Force - Clear AFB [1]
- US Dept. of Defense - US Air Force - Eielson AFB [1]
- US Dept. of Defense - US Air Force - Elmendorf AFB [1]
- Valdez Native Tribe, Inc. [1]
- Veterans Administration (VA) [5]
- Yakutat Tlingit Tribe [1]
- Yukon Kuskokwim Health Corp. (YKHC) [47]

## Governance and Statewide Participation

AFHCAN worked with each of the 43 autonomous organizations representing these 248 sites across Alaska, to design an effective telehealth system. The early involvement of each organization in designing the AFHCAN solution was a critical factor to success. Input was solicited at all stages of design and development. This ranged from clinical input on assessment and clinical needs, to technical feedback on design of hardware, software, and network connectivity.

Each of the organizations provided representation on five "AFHCAN committees" which met on a regular basis for 4 years (typically on a monthly cycle). These committees were:

- Business & Sustainability Committee
- Clinical Committee
- Informatics Committee
- Technical Committee
- Training Committee

These committees helped identify clinical needs, brainstorm ideas, and give feedback during every facet of the system design.

An AFHCAN Steering Board provided guidance and resolution of issues, while the Alaska Federal Health Care Partnership (AFHCP) Executive Committee provided overall governance of the project. In addition, statewide technical standards developed by the Alaska Telehealth Advisory Council (ATAC) were implemented and fully adopted throughout the project design and development cycles.

The AFHCAN project now supports beneficiaries of IHS and tribal organizations, the Department of Defense, U.S. Coast Guard, and the VA in Alaska. The project also provides benefits to state Public Health Nursing (PHN) offices. These beneficiaries represent approximately half of the state's total population, as shown below:

| | |
|---|---|
| DoD/USCG | 75,000 |
| VA | 75,000 |
| PHN | 45,000 |
| IHS/Tribal | 120,000 |
| **TOTAL** | **315,500** |
| **Alaska Population** | **626,932** |

*(Note: Some patients are beneficiaries of more than one organization)*

The Alaska Native Tribal Health Consortium (ANTHC) is the managing partner of AFHCAN. ANTHC is a tribal organization, as defined in 25 U.S.C. 450 (b) (c). It was formed in December 1997 to manage the statewide health services component of the Alaska Native Health system. ANTHC does so through participation with other Alaska Native tribal health organizations in the Alaska Tribal Health Compact, a self-governance agreement with the Indian Health Service. Furthermore, ANTHC operates the Alaska Native Medical Center (ANMC) – the tertiary care facility for all Alaska Native beneficiaries. ANTHC and ANMC have an existing memorandum of understanding with participating regional health corporations in Alaska to jointly provide quality care to the Native Alaskan community.

## AFHCAN Technologies

The AFHCAN Office developed a hardware platform to support biomedical devices for telehealth applications, a software application to allow telehealth cases to be created and read by providers, and a statewide network to connect the 248 sites throughout Alaska that are involved in the AFHCAN Project.

Every effort has been made to assure that the design of these deliverables is innovative and easy to use since many providers cannot be expected to be technically literate, some

do not speak English as a first language, and access to both support and training is expensive.

The AFHCAN office developed an innovative mobile cart that is robust, mobile, and scalable. The cart is small enough to fit through doorways at most clinics, has large rubber wheels to negotiate uneven floor surfaces, has a low center of gravity to minimize instability, and is designed to meet the ergonomic needs of a wide variety of users.

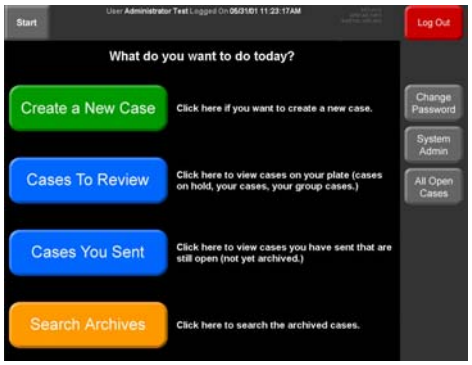
*Figure* **A.1** | ***AFHCAN Cart***

Every component on the cart was selected or designed to maximize ease of use, reliability/longevity, and ease of construction. The cart was designed to be built onsite by local technical staff – thereby facilitating support and knowledge transfer to the local level. The entire cart has a very tight "cable management," with the result that virtually all cables are hidden from the user and immune to "pulling" or damage. Sensitive components such as biomedical equipment and cables are protected from wear and abrasion through recessed enclosures and other facets of the design. Every peripheral medical device on the cart is firmly attached to the cart to minimize dislodging during movement. As an example of this, one cart was recently rescued from a burning village clinic and moved to a nearby classroom and continued to operate without a single item being dislodged during this process.

A key innovative design was the development of the easy-to-use interface on the AFHCAN Cart that achieves high performance over the satellite communication links available at village clinics. The software is designed to use simple but clear word choices and very specific color-coding for buttons. The use of a touch screen is a significant advance in going beyond the need for a keyboard and mouse, especially for technically challenged users. Examples of the design are shown below.

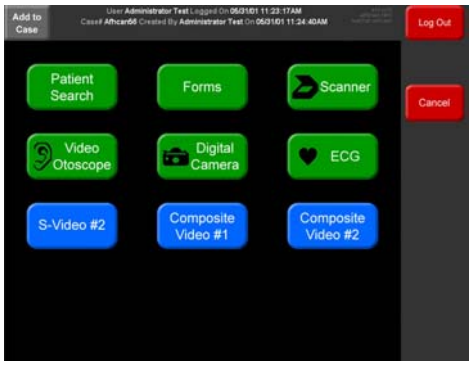
*Figure*
**A.2**

## *Examples of the Provider Interface For Case Creation*




After logging in, the user has 4 choices. Selecting "Create a New Case" provides access to all the biomedical devices.

The user may select any peripherals at this point. Selecting Video Otoscope starts the next screen.



This is the view using the Video Otoscope. The live image is large enough to view and share with the patient. Controls are easily identified on the right side of the screen.

The AFHCAN system was designed to allow providers to access the video otoscope – and all other peripherals – within three touches of the touchscreen. Providers are trained to use the device for medical purposes – and encouraged to use the devices even when they might not send the data in a telehealth case. Such instances are called "unsaved cases" and are not reflected in the overall usage of the system. Typically – the number of "unsaved cases" surpasses the number of "saved" cases.

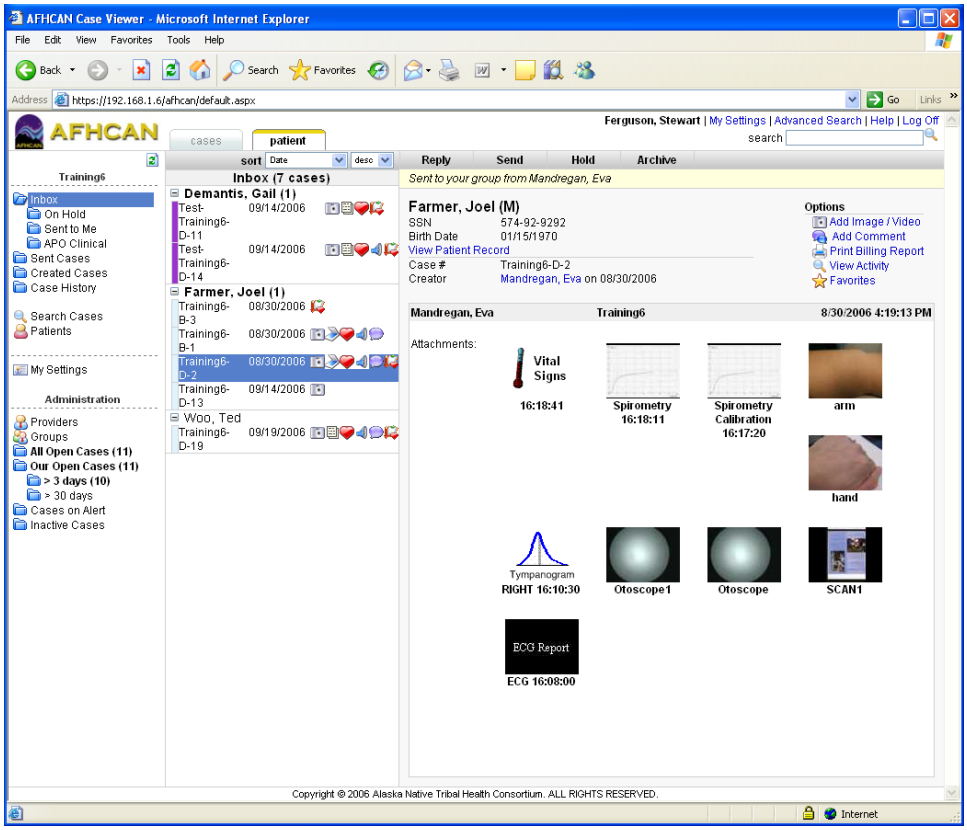
> *On the AFHCAN system, users know they can easily discard the results without having to send the data, and are more likely to use the devices for a routine exam. The significant benefit is the equipment gets used more often because it is not just used when data has to be saved or sent, and it enables the provider to be more familiar with the device and more capable*

*of capturing quality data. Involving the patient in this exam (as the images are clearly displayed for the patient to view) also improves health care.*

Specialist need a more sophisticated patient-oriented interface than what is supported on the cart. This was achieved through a design effort to allows users to browse to telehealth cases even when their PC is fully locked down and secure – allowing the web interface to operate in highly security environments.

*Figure*
**A.3**

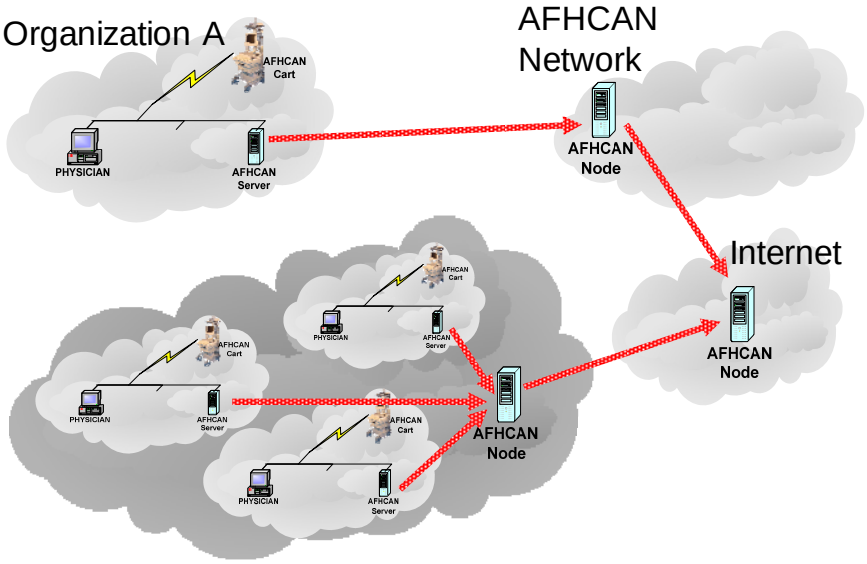
## *AFHCAN Web Interface*




The AFHCAN software architecture supports an enterprise-wide telehealth solution – allowing the 42 deployed servers throughout the state to communicate and share telehealth data. The enterprise approach allows autonomous health care organizations to share multimedia telehealth data in a controlled, secure and robust manner. An example of such a topology is shown below. Organization A manages its own health care data within its network and only transports specific cases to outside organizations at appropriate times and under controlled and secure conditions. A large network (shown as a "dark cloud") with multiple telehealth servers can gain the same level of security and control over these servers, relying on a network of communication nodes to control and secure the transport of health care data.

*Figure*
**A.4**

## *AFHCAN Server-To-Server Topology*




This same secure and trusted communication mechanism, relying on Public Key Infrastructure (PKI) is also used to manage and distribute software components to the servers, nodes, and carts. The AFHCAN software supports the ability for each server to receive code updates from a trusted "code update server". This technology provides a fast, efficient, and secure method for simultaneous code updates to all connected servers and carts.

The AFHCAN Program is the proud winner of multiple national awards, including:

- President's Award, American Telemedicine Association (2004)
- National Managed Health Care Congress' AstraZenca Award (2002)
- Grace Hopper Government Technology Leadership Award (2002)

# APPENDIX B. PROVIDER'S PERSPECTIVES ON TELEHEALTH

The following is an unsolicited summary from a travelling audiologist on the impact she has when providing care in the village setting.

*AN ENT/AUDIOLOGY TELEMEDICINE FIELD CLINIC*

*I arrive in a delta village, armed with equipment, food, bedding, and clothes. I am there for a week, but a week is not long enough for the list I have in my folder. It is a list of names of patients referred for ENT services – children with numerous ear infections who need evaluations for PE tubes, children who have had tubes placed and are being monitored for patency status, patients with TM perforations being evaluated for tympanoplasty, or follow-up for those who have undergone this surgery. There are patients referred for balance problems, hearing loss, tonsillectomy, or sinus problems.*

*My equipment consists of an audiometer, tympanometer, portable otoacoustic emission screener, and a portable ABR. But, the star is the telemedicine cart that resides permanently in this clinic's exam room. It is outfitted with a video-otoscope, dental camera, scanner, and digital camera. It is my reason for being there. With this equipment, I am able to provide surgeons hundreds of miles away with the information they need to make decisions without ever having personally, physically examined the patient.*

*In the past, these patients would wait until they could be scheduled in Bethel when the ENT from ANMC arrived. These itinerant services used to occur monthly for a three day clinic. And now, the monthly clinics are held every other month for a total of 18 clinical days in a year. Besides the shortened ENT schedule, there is always the problem of delta weather. The ENT may make it into Bethel in the Alaska Airlines jet during adverse weather conditions, but it's guaranteed that the surrounding village bush planes won't. Patients who have been waiting months won't make that prized slot and will have to wait until they can be rescheduled.*

*I am usually able to make it out to the patient's village and I can stay for a whole week, thus ensuring that the maximum number of patients can be seen. In the past year, I have seen hundreds of patients that would still be awaiting a slot in the Bethel clinic. I arrive and am met with a staff that is appreciative of my visit. The schedule book is filled with names from my list – and there's usually a waiting list of patients referred from the mid-levels and CHPs.*

*A typical case of a child with recurrent otitis media unfolds as follows: they've been referred by the village practitioner due to their history of numerous ear infections. I'll review the patient's chart, documenting OM episodes and treatments. This information is scanned in to the report that will accompany the eardrum images taken with the video-otoscope. An audiogram with hearing levels and tympanogram information is also scanned into the case. The report is completed with the patient's general health information including any allergy and current meds info. The case is sent that day to the on-call ENT in Anchorage, hundreds of miles away via the magic of the internet. The ENT usually reviews the patient's existing computerized chart history there for supplemental history information. He/she reviews the images and audiological information and makes an immediate decision regarding treatment. This may be a surgical*

*recommendation for PE tubes, antibiotics, or monitoring. This recommendation is returned usually the same day and the family is notified of those recommendations. If surgery is recommended, the family is contacted by that surgeon's case manager in a few days and scheduled. All this without the surgeon having to wait to see the child in person.*

*By the end of the week, I leave the village with patients either on medication or scheduled for surgery, if necessary. Or, the ENT may have just wanted a look-see to check the status of that graft or set of tubes and now feels everything is going as it should and the patient will continue to be monitored. All of this has saved tremendous travel time and costs to patients or 3rd party payers. I leave the village with the best ending from any story – sincere gratitude from patients, parents, and providers alike.*

*Beverly LeMaster*

# APPENDIX C. AFHCAN EVALUATION QUESTIONS POSED TO PROVIDERS

AFHCAN software is programmed to ask each provider a single question when they are creating or modifying a real telehealth case. The questions are configured in the AFCHAN software, and the results to the questions are stored in the database on each server.

This design stemmed from early discussions with the AFHCAN Clinical Committee and Training Committee (representing the 38 participating organizations), whose members approved the concept of asking a single question to providers when they created or modified a "real" telehealth case.

The AFHCAN software supports the ability to create both "Real" and "Test" cases. No questions are asked for "Test" cases – as this would skew the evaluation results when conducting "test" cases for training or demonstration purposes.

It was recognized that some questions may only be appropriate to the provider that creates a case (e.g. questions about patient satisfaction), some may only be appropriate to the provider receiving the case (e.g. effects on patient travel), and some may appropriate to all providers. Each evaluation question was clearly identified as being intended for the initiator (case creator) or consultant (case reviewer) or both.

Committee members of the AFHCAN Steering Board, Clinical Committee, and Training Committee representing the 39 participating organizations approved the wording of the survey questions.

The following table lists the wording of the questions that are programmed into the AFHCAN software. Each question is shown with the possible answers (users may only pick one answer) and the intended user to receive the question (initiator or consultant). Note that only one question is asked to consultants – that being the effect on travel.

| Text of Question | Possible answers (pick one) | Asked to |
|---|---|---|
| 1. For this case, rate the following statement: I am COMFORTABLE creating a telemedicine case. | • Strongly Disagree<br>• Disagree<br>• Neutral<br>• Agree<br>• Strongly Agree | Inititiator |
| 2. For this case, rate the following statement: Telemedicine helps me COMMUNICATE with a doctor. | • Strongly Disagree<br>• Disagree<br>• Neutral<br>• Agree<br>• Strongly Agree | Inititiator |

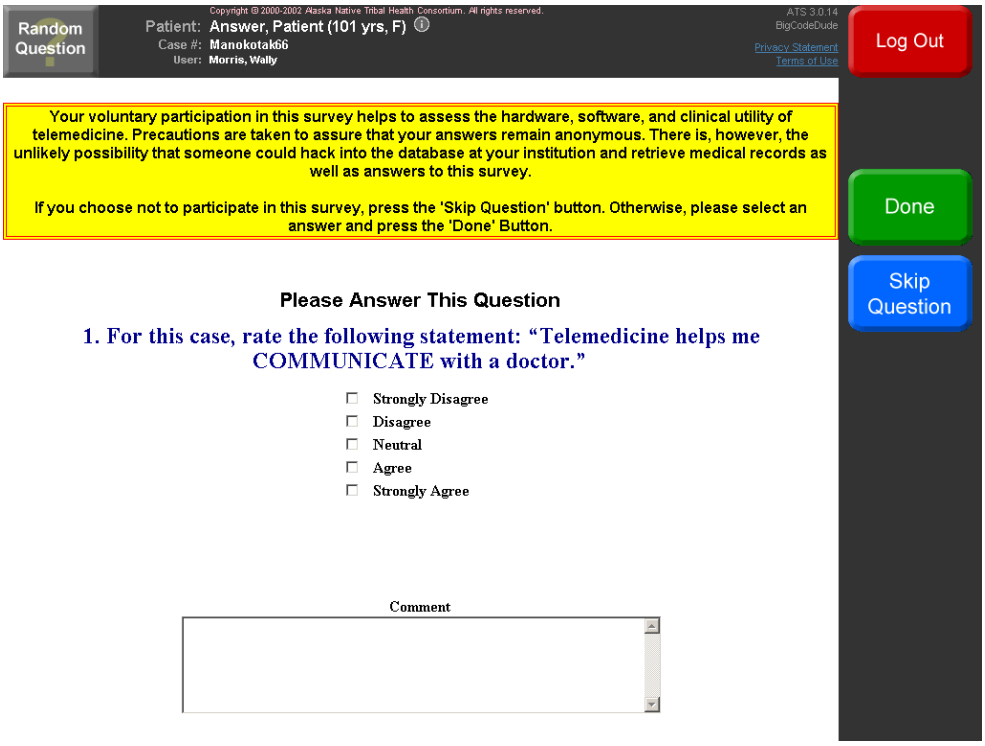
| Text of Question | Possible answers (pick one) | Asked to |
|---|---|---|
| 3. For this case, rate the following statement: The telemedicine system played a role in EDUCATING THIS PATIENT. | • Strongly Disagree<br>• Disagree<br>• Neutral<br>• Agree<br>• Strongly Agree | Inititiator |
| 4. For this case, rate the following statement: Telemedicine makes my JOB MORE FUN. | • Strongly Disagree<br>• Disagree<br>• Neutral<br>• Agree<br>• Strongly Agree | Inititiator |
| 5. For this case, rate the following statement: Telemedicine improved PATIENT SATISFACTION. | • Strongly Disagree<br>• Disagree<br>• Neutral<br>• Agree<br>• Strongly Agree | Inititiator |
| 6. For this case, rate the following statement: Telemedicine will improve QUALITY OF CARE for this patient. | • Strongly Disagree<br>• Disagree<br>• Neutral<br>• Agree<br>• Strongly Agree | Inititiator |
| 7. For this case, rate the following statement: SATISFIED with how the EQUIPMENT worked. | • Strongly Disagree<br>• Disagree<br>• Neutral<br>• Agree<br>• Strongly Agree | Inititiator |
| 8. For this case, rate the following statement: the SOFTWARE is EASY TO USE. | • Strongly Disagree<br>• Disagree<br>• Neutral<br>• Agree<br>• Strongly Agree | Inititiator |
| 9. For this case, rate the following statement: Telemedicine is a WASTE OF TIME for me and this patient. | • Strongly Disagree<br>• Disagree<br>• Neutral<br>• Agree<br>• Strongly Agree | Inititiator |
| 10. In creating this case, what did you have the most difficulty with? | • No Difficulties<br>• Turning the system on<br>• Logging in<br>• Using the software<br>• Using the software forms<br>• Using the video otoscope<br>• Using the digital camera<br>• Using the ECG<br>• Using the scanner<br>• Patient cooperation<br>• Sending the case<br>• Answering this question<br>• Other | Inititiator |

| Text of Question | Possible answers (pick one) | Asked to |
|---|---|---|
| 11. Did viewing this telemedicine case/image affect PATIENT TRAVEL for diagnosis or treatment of this case (compared to a phone consult)? | • It PREVENTED patient travel<br>• It CAUSED patient travel<br>• It had NO EFFECT on Patient Travel | Consultant |

The AFHCAN software remembers the last question asked to a specific provider, and asks them the next question in a sequence. For example, suppose that a provider creates a case and is asked the 5th initiator question ("For this case, rate the following statement: Telemedicine improved PATIENT SATISFACTION."). The next time that provider creates a case, he/she will be asked the 6th initiator question ("For this case, rate the following statement: Telemedicine will improve QUALITY OF CARE for this patient.").

Providers are asked the question when they send a real telehealth case, or when they archive a real telehealth case sent to them. One example of this screen is shown in the table below.

*Figure* **C.1** ***Screen Shot for Evaluation Question***



The top of the page has a disclaimer stating the purpose of the evaluation, and indicates that the provider does not have to answer the question. The provider has the option to skip the question by hitting a button labeled "SKIP QUESTION". The provider also has the option to enter comments to the question. These are currently stored on the server and not retrieved.

Consult requests sent between organizations cause the responses from various providers to a single case to be stored on multiple servers. The AFHCAN system relies on a distributed server architecture, which results in provider's responses being stored on the server to which the provider was logged in. The AFHCAN Office provides a "Reporting Server' which gathers and collates all the responses from all servers and matches the responses back to the server at which the case originated.