Final Deliverable

NEW TECHNOLOGY STUDY

Department of Veterans Affairs

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Booz | Allen | Hamilton

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Introduction

The new technology study incorporates two analysis questions focusing on access and utilization of three specific new technology items within prosthetics

The Department of Veterans Affairs (VA) is interested in understanding the rate of access veterans have to high-cost, new technology items, as well as factors that may impact the utilization of these items. VA contracted with Booz Allen Hamilton (Booz Allen) to answer two specific study questions.

- Do veterans have a rate of access to new technology items commensurate with the private sector?
- What is the rate of utilization by veterans for the selected new technology items and what factors impact utilization?

VA collaborated with Booz Allen to select three recently developed high-cost technology items that are furnished by the Prosthetics and Sensory Aids Services (PSAS). The three items selected include:

- Computer readers for the blind,
- Cochlear implants, and
- Automated implantable cardiac defibrillators (AICD).

Booz Allen reviewed information from both the private sector and VA to identify eligibility criteria, utilization of technology and potential barriers to access for veterans

The Booz Allen team conducted literature reviews to gather information relating to each of the three new technology items. The team relied on literature reviews to understand how and when these items are provided in the private sector, as well as to determine whether access and utilization are comparable between the veteran population and the private sector. Additionally, when appropriate, the Booz Allen team conducted telephone interviews with private-sector representatives such as advocacy groups, vendors, and philanthropic organizations to gain further knowledge of private sector practices in these areas.

The Booz Allen team performed a thorough review of VA information relating to the new technology items. The team reviewed VA directives, eligibility criteria and clinical guidelines, and utilization data on devices distributed through PSAS. In addition, the team also conducted interviews with clinical and administrative decision makers within VA. The information gathered through these efforts provide a framework for understanding the general process veterans undergo to obtain one of these three new technology items.

This report will outline findings, conclusions and recommendations for each of the three new technology items separately. Although all three items are issued through PSAS, each item is clinically very different, with varying eligibility criteria, as well as distinct decision-making and distribution processes.

I. Computer Readers for the Blind—Introduction

Individuals that are visually impaired or legally blind are able to become more independent due to advances in technology

Presently, there are approximately 1.3 million legally blind Americans and 93,000 legally blind veterans. By the year 2010, it is projected that the number of blind veterans will reach over 147,000. [1] The population of veterans with a visual disability has changed from young, service-connected blinded returning soldiers to older persons with age-related low vision. According to Blasch, seventy percent of the visually impaired people in this country are beyond retirement age. [2]

As a result of the electronic revolution, advances in adaptive access technology have enabled the blind to access the same information, such as news updates and e-mail notification, as sighted people. The last two decades of this electronic revolution have expanded technology in the areas of speech, magnification, Braille access and optical character recognition (OCR). These new innovations in technology allow blind individuals to access printed material. Computers and access to the Internet allow individuals to be better informed, more connected to the outside world and maintain contact with other people with similar interests and experiences. In the United States, approximately 102,000 blind people use a computer on a regular basis. [3]

VA developed programs to enable blinded veterans access to assistive technology

The Department of Veterans Affairs (VA) has been instrumental in funding innovative training for blinded veterans and developing and evaluating new technology. Since approximately 1950, VA has funded major efforts to construct guidance devices and electronic mobility aids for veterans. [2] Advocacy groups such as the Blinded Veterans Association (BVA), Disabled American Veterans (DAV) and American Veterans (AMVETS) have been particularly vocal in the equal treatment of blinded veterans. Through veteran surveys, petitions, workshops and presentations, these advocacy groups have tapped into the real issues and concerns that are important to veterans. Often these advocacy groups lobby and testify before Congress on behalf of veterans and their issues.

In response to the specialized needs of blinded veterans, VA established the Blind Rehabilitation Service (BRS). This service provides an array of assistance programs to legally blind veterans, which are provided to veterans through Visual Impairment Services Teams (VISTs), Blind Rehabilitation Outpatient Specialists (BROS), and Blind Rehabilitation Centers (BRCs).

VA has defined legal blindness as:

- central visual acuity better than 20/200 in the better eye, and a field defect where the peripheral field at its widest tested diameter is less than 20 degrees, or [4]
- central visual acuity of 20/200 or less in the better eye, with ordinary corrective glasses.

VA has established 10 Blind Rehabilitation Centers across the country (including one BRC in Puerto Rico). These BRCs offer comprehensive rehabilitation for the blind, and training is designed to help veterans achieve a realistic level of independence. Veterans are led through exercises that help them adjust to their blindness and reorganize their lives in various areas, such as communications (i.e., reading Braille, telling time, management of finances), activities of daily living (i.e., dressing, cooking, shopping)

and independent living. For those veterans who will be living alone after rehabilitation, this part of the program allows the veteran to practice the acquired skills under minimal or no supervision.

The average age of the veteran currently being served by VA BRS is 67 and only 11% are totally blind or have light perception only. The vast majority of veterans have some level of low vision. This is similar to the general population, where complete blindness is rare. In fact, the vast majority of the general population who are visually impaired report the loss of some, but not all, of their eyesight. [5]

As a component of the BRS, the Computer Access Training (CAT) Program provides basic instruction in the use of computer equipment, and teaches veterans to operate the computer technology with a high level of independence. All visually impaired veterans who show an interest and capacity to learn are eligible for CAT. Following successful completion of CAT, veterans are furnished with the necessary equipment (i.e., CPU, monitor, printer and word processing software) and any necessary access hardware and/or software (i.e., screen reader, speech-board/card, Braille or large print display). Veterans are also provided with follow-up technical support as needed.

VA is interested in determining whether blinded veterans have equal access to computer reader technology, as well as exploring the issues surrounding the distribution of computer reader technology within VA system

VA is focusing on the rate of access that veterans have to computer readers considering the significant benefits achievable from this technology. This evaluation includes an exploration of various factors that influence a veteran's chances of obtaining the technology, such as cost, eligibility criteria, geographical proximity to a BRC, etc. VA is also interested in determining whether veterans' utilization and access to such technology is commensurate with that of the general population.

II. Computer Readers for the Blind—Methodology

VA contracted with Booz Allen to evaluate the rate of access that visually impaired veterans have to computer readers

The Booz Allen team developed an analysis plan focused on a comparison of veterans diagnosed as legally blind with veterans who received a "computer reader" from VA during the years 1998, 1999 and 2000. Veterans assigned a diagnosis code of 369.4 (legal blindness) were extracted from the Patient Treatment File (PTF) and the Outpatient Clinic File (OPC) and compared to the group of veterans who received computer reader technology. A computer reader was defined by the project team as items coded as "blind aid" within the National Prosthetic Patient Database (NPPD) with a cost greater than $800. The team further defined the technology, based on discussions with BRC chiefs, to specifically identify the items typically provided to blinded veterans following completion of CAT at VA's BRCs. These items were identified as:

- Comprehensive computer package consisting of PC, scanner and specialized software, and
- Self-contained computer readers that provide reading capability only (no other computer functions), through Optical Character Recognition (OCR) software (i.e., Reading Edge).

Following telephone interviews with representatives from each BRC, the Booz Allen team decided to also provide analysis on the provision of Closed Circuit Televisions (CCTVs) based on the understanding that

the majority of veterans who are classified as "legally blind" maintain some level of low-vision and frequently opt for a blind aid that allows them to continue using their vision. CCTVs are often provided to blinded veterans and are also considered high cost new technology within VA.

In addition to reviewing eligibility criteria and utilization of computer reader technology within VA, the Booz Allen team also examined private sector practice on provision of computer readers to the blind

The Booz Allen team conducted a literature review to determine the level of access of the general population to computer reader technology. The project team reviewed journal research and contacted private sector organizations to identify services offered and criteria utilized to determine eligibility for the blind aid technology. The literature review provided information on a variety of topics related to the visually impaired, including prevalence of legal blindness, use of technology differences between people with disability and ones without, and statistics on utilization of technology by the visually impaired. The Booz Allen team focused the literature review on the following areas:

- Prevalence of legal blindness in the general population and patterns in prevalence based on age,
- Availability and utilization of computer reader technology, and
- Eligibility criteria for provision of computer reader technology.

The Booz Allen team contacted several associations for the blind including National Federation of the Blind, National Library Services for the Blind, and The Lighthouse. We also contacted several state blind rehabilitation programs to gain an understanding of the types of computer training and computer reader technology available to the legally blind.

The Booz Allen team contacted representatives within VA to obtain their perspectives on veterans' access to computer reader technology

As part of the program evaluation, the team conducted site visits to seven VA Medical Centers (VAMCs). During these site visits, the Booz Allen team met with staff representatives from PSAS, Blind Rehabilitation and Visual Impairment Services. For those sites that had a Blind Rehabilitation Center, the project team toured the facilities and observed the computer access training stations, the computer reader equipment and other services and programs provided to blinded veterans. The Booz Allen team visited VAMCs listed below.

- Hines, IL
- Atlanta, GA
- New York, NY
- Richmond, VA
- Seattle, WA
- Miami, FL
- West Palm Beach, FL

In addition, we also contacted BRC chiefs and a VIST coordinator from each Veterans Integrated Service Network (VISN), to ensure that our interview findings adequately represent the VHA system. VA did not include the BRC in San Juan, PR in our review of computer reader access.

III. Computer Readers for the Blind—Findings

FINDINGS FROM LITERATURE REVIEW

The Booz Allen team conducted a literature review to identify practices in the private sector

We reviewed articles describing computer access and use by blinded and visually impaired adults as well as prevalence of adult vision impairment and age-related diseases. The literature review provided information on a variety of topics related to the visually impaired, including prevalence of legal blindness, organizations serving visually impaired individuals, utilization of computer reader technology, and barriers to computer use.

Prevalence of legal blindness in the general population

According to the National Institutes of Health's National Eye Institute, (NIH NEI) the current overall national prevalence rate of vision impairment, including blindness, is 2.85%, which translates to approximately 3.4 million Americans who are 40 years of age or older. [6] Blasch from the Atlanta VAMC indicates that older individuals with low vision constitute the largest segment of individuals with a severe visual impairment. According to projections by the American Federation for the Blind, the number of individuals aged 65 or older with severe functional limitations in vision will increase by 284 percent from the year 2000 to 2050. [2]

"The Vision Problems in the U.S." report released by NEI, in partnership with Prevent Blindness America, predicts that the number of Americans who are blind or visually impaired will double over the next 30 years as the baby boomer generation ages. [6]

Organizations Serving the Blind

The Division of Vocational Rehabilitation (VR) assists individuals with disabilities overcome barriers to employment, independence, and community life. VR is a combined federal/state program under the authority of the Rehabilitation Act of 1973. Various services are provided to accomplish each client's individualized goals, including a full array of vocational rehabilitation services, supported employment, and assistive technology. In partnership with private-sector vendors, nonprofit rehabilitation organizations, and other state agencies, the division helps individuals realize their potential to achieve vocational and personal independence. [7]

A VR counselor works with the disabled individual to determine the services needed. If the disabled individual needs an assistive technology device in order to meet work-related goals, the equipment and related services are provided by VR, or a VR counselor will provide assistance to the individual in order to obtain the necessary equipment and services. Each state has its own Division of Vocational Rehabilitation and some states have VR agencies specifically related to the blind or visually impaired population, e.g., New Jersey Commission for the Blind and Visually Impaired. [8] These VR programs are dependent on the individual's work- or school-related need for the technology.

Even though most services are provided through VR, there are schools, such as the *Hadley School for the Blind* in Illinois, that offer more than 90 distance education courses, i.e., away from the classroom setting, to students completely free of charge. These courses range from basic training (which teaches the individual to adjust to daily living activities) to computer training addressing basic computer concepts

including touch-typing skills, commonly used software, and types of access technology that can be used by someone who has a visual impairment. The computer training is not restricted to those who show need for vocational purposes. [9]

Lighthouse International is a non-profit organization for the blind and visually impaired, and is supported by donations from individuals, foundations, and corporations. Lighthouse has international, national, and regional programs. Internationally, Lighthouse collaborates with global partners, e.g., the World Health Organization (WHO), to develop strategic plans addressing the needs of individuals with visual impairments. Nationally, Lighthouse has capabilities to conduct vision, psychosocial, and evaluation research, and provides training to professionals through continuing education programs regarding low vision care and vision rehabilitation. They provide and promote high standards of care and facilitate contract negotiations with healthcare organizations to guarantee medical payments for vision rehabilitation services. Regionally, Lighthouse provides services related to early intervention and child development programs, counseling, career services, low vision services, computer instruction, orientation and mobility training, and independent living programs. The division offers computer courses for older adults who have access to a computer and desire basic training and information. [10]

Lighthouse provides rehabilitation services encompassing the full continuum of vision impairment from partial sight to blindness. For these courses, each participant is required to have prior knowledge of the keyboard, as well as access to a computer to practice skills and complete homework assignments. The blind person needs to purchase his/her own computer and will incur appropriate fees for course study. [10]

Utilization of computer reader technology

Gerber and Kirchner concluded that legally blind and visually impaired individuals are as likely as the general population to use the computer and access the Internet if they have the equipment and appropriate training. In addition, there is a decrease in computer use when an individual has some level of impairment accompanied by additional disabilities. [11]

Gerber and Kirchner also determined that computer literacy and technology skills are at least as important to an adequate adjustment to vision loss as Braille literacy and good orientation and mobility skills. In addition, their report indicates that there is over 30% difference in rates of access to the Internet and regular computer usage between people with no disabilities and people with limitations in seeing. The majority of individuals over 65 years old with visual impairments have multiple impairments, lower rates of access to the Internet than those with lesser visual impairments (13% vs. 23%), and lower rates of computer use as visual impairments progress (7% of those with severe impairment vs. 15% with less severe impairments). [11]

Barriers to Computer Use

Griffith revealed that several issues contribute to the resistance and complications related to the use of the computers. [12]

> **Limited product usability:** Some hardware and software products are not compatible with other hardware and software, thereby limiting the use of these products by all users. More specifically, blind or visual impaired individuals utilize several Input/Output devices that sometimes are incompatible with hardware/software and interfere with other I/O devices. I/O devices introduce data into or extract data from a system.
>
> **Unreliable or incomplete information**: Some I/O devices utilized by the blind or visually impaired require the use of video media. Due to the visually impaired individual's inability to respond to

visual cues, the piece of the I/O device can prove to be ineffective, and may render the whole device useless.

Limited perceptibility: The blind or visually impaired user cannot always utilize visual enlargement devices. Controlling and utilizing these enlargement devices can be difficult, though this difficulty can be alleviated through specialized training.

Overstressed memory capacity: The blind or visually impaired user has to take additional steps at times to complete tasks comparable to the sighted user. These additional tasks can cause difficulties in retaining information in both short and long-term memories.

The disruption of motor tasks: The blind or visually impaired user may not have the ability to use the mouse; therefore, the keyboard is utilized. These keys may not always be at optimal locations; therefore, the individual may require specialized training.

Unreliable or slow feedback: Since the resolution of many computer related problems are executed in several steps, it may be more work for the blind individual to resolve the problem.

Slowed information processing: All of these issues can slow the computer's processing of code instructions for optimal computer and Internet access.

These issues illustrate the challenges facing the blind computer technology arena, and corroborate the need for formal training and continual innovation in these areas. [12]

FINDINGS FROM VA DOCUMENTATION REVIEW

The Booz Allen team reviewed VHA guidelines to gain an understanding of the process for a visually impaired veteran to receive computer technology

VHA Handbook 1174.1 (February 16, 2000), *Blind Rehabilitation Outpatient Specialist Program Procedures* were reviewed to determine the guidelines that Blind Rehabilitation staff follow to identify:

- visually impaired or blinded veterans who could benefit from computer technology,
- criteria used to refer a visually impaired or blinded veteran to CAT, and
- roles each plays in the process of CAT assessment.

The Director of Blind Rehabilitation Service at VA Central Office provided additional guidelines that were reviewed for this study. These guidelines were identified from existing practices at various BRCs, but have not been finalized and are not being applied uniformly across the country. These VA documents were reviewed to identify: requirements related to issuance of the prescribed computer technology and successful discharge from CAT, and training guidelines applicable to computer technology issuance.

Veterans are provided computer technology through the assistance of the VIST Coordinators and Blind Rehabilitation Outpatient Specialists (BROS)

The BRCs were established to provide comprehensive rehabilitation to blinded veterans, including CAT. VA has established 10 BRCs across the country and also in Puerto Rico.

Table 1—VA Blind Rehabilitation Centers

STATE	BLIND REHABILITATION CENTER
Alabama	Southeastern Blind Rehabilitation Center
Arizona	Southwestern Blind Rehabilitation Center
California	Western Blind Rehabilitation Center
Connecticut	Eastern Blind Rehabilitation Center
Florida	West Palm Blind Rehabilitation Center
Georgia	Augusta Blind Rehabilitation Center
Illinois	Central Blind Rehabilitation Center
Puerto Rico	Puerto Rico Blind Rehabilitation Center
Texas	Waco Blind Rehabilitation Center
Washington	American Lake Blind Rehabilitation Center

CAT provides basic instruction in the use of computer equipment, which enables veterans to minimize the impact of blindness and operate the equipment with a high level of independence. After CAT is complete, veterans are furnished with the appropriate equipment as identified by staff members who facilitate this process for the blinded veteran, including the VIST coordinator, the Blind Rehabilitation Outpatient Specialist (BROS), and additional BRC staff. According to a VA briefing provided to Veteran Service Organizations in October 2001, there are 92 fulltime VIST coordinators and 19 fulltime BROS to assist veterans with visual impairment.

As identified in VHA guidelines, the VIST Coordinator identifies the blind veteran and schedules a VIST Review, an evaluation that includes an eye examination, medical evaluation, hearing examination, benefit review, psychosocial interview, and patient education. When the visually impaired veteran expresses an interest in CAT and the receipt of computer technology, the VIST coordinator will perform an assessment to see what level the veteran is with his/her computer skills. At some BRCs, the veteran will need to understand speech synthesizers with or without hearing aids, to touch-type accurately, and to read and write Braille. After meeting these guidelines, some BRCs require the potential candidate to demonstrate the ability to utilize the computer equipment for the needs and goals identified at the BRC. Depending on the BRC, the veteran may need previous experience with computer technology before entering CAT. The VIST coordinator needs to require the potential candidates to meet these guidelines before referral into the CAT program. In addition, if the blinded veteran requires replacement or upgraded items for his/her computer technology, the VIST Coordinator has the responsibility for recommending the issuance of replacement prosthetic equipment. The VIST coordinator has the ability to utilize the BROS who can also provide an assessment of the veteran by testing the veterans' skills.

The BROS is an authorized blind rehabilitation instructor who should be cross-trained to obtain knowledge in each BRC discipline as well as CAT, and is responsible for administering and coordinating specific rehabilitation training activities for blinded veterans. The BROS consults with the VIST coordinator regarding training needs identified from the VIST referral. In addition, the VIST coordinator may determine that the blinded veterans may benefit from a self-contained computer reader, and the BROS should have the ability to issue and train blinded veterans on this equipment without having them go through CAT. This is very useful for veterans who are unable to demonstrate the more advanced skills needed for CAT, and for veterans who do not request a PC computer package and therefore, do not need CAT. After the VIST coordinator and BROS make the assessment, the veteran will be issued a

prescription of equipment consisting of a list of computer equipment to meet his/her needs before attending CAT.

During CAT, the veteran must fulfill approximately 40 hours of training on the issued computer equipment

As identified in guidelines utilized by many BRCs, during CAT, the veteran will need to satisfy requirements related to the prescribed computer technology. The veteran will receive the computer equipment on the first day of training and will train on the same piece of equipment that he/she will take home. The training focuses on the use of hardware and software. At some BRCs, veterans are trained on Internet functions. The veteran needs to identify the basic components of the computer, and have the ability to control the functions on the computer keyboard. In addition, the veteran needs to start and close down the computer properly, as well as create a new file as necessary. The veteran also needs to display the ability to utilize all functions of the dialogue box, as well as use all the basic access commands. These requirements are currently being reviewed by the Blind Rehabilitation Service at Central Office, and are not consistently being applied across BRCs.

Once the veteran completes CAT, the computer equipment is shipped to the veteran's home

Before the veteran is discharged from CAT, he/she must satisfy the majority of CAT requirements in order to complete the training. VA has outlined requirements that each BRC demands of the veteran upon completion of CAT. The veteran has to fulfill at least 5 of the seven requirements.

1. Comprehension and location of controls and connections of relevant hardware components
2. Maintenance of printer
3. Switch between running programs, (i.e., load paper and change cartridge)
4. Windows, (i.e., maximize/minimize a window)
5. Save, retrieve and delete files among drives
6. Exit and restart access technology
7. Read menu bar, select from menu bar, close menu, select from menu, or use hot keys efficiently to execute commands

After the veteran satisfies the majority of these requirements, he/she is discharged from CAT, and the prescribed computer technology is sent to the veteran's home. Several BRCs also provide follow-up technical support to the veteran as needed.

FINDINGS FROM SITE VISITS AND TELEPHONE INTERVIEWS

The Booz Allen team made several observations related to the provision of computer reader technology within VA, as a result of interviews with various BRC staff and VIST coordinators.

Our project team interviewed staff from the Blind Rehabilitation Centers at Hines, West Palm Beach, and Seattle, and also toured the facilities. We also met with VIST coordinators from VAMCs in Miami, New York and Richmond. Additionally, we conducted telephone interviews with staff from each BRC as well as with VIST coordinators from a VAMC in each VISN that was not covered by our site visits.

Our findings from site visits and telephone interviews have been encapsulated into focused areas which include a discussion of the two main types computer reader technology provided by VA, outreach activity, application of eligibility criteria, availability of computer access training "spots" and the potential impact of waiting time on veterans' access to computer reader technology.

VA provides two specific types of computer reader technology, which are similar in cost and utility but require two distinct types of user training

From discussions with BRC technical staff, the Booz Allen team learned there are two types of computer reader technology available to veterans through VA. Veterans who require a computer simply for reading and not for any other computer-assisted functions may receive a "reading machine" which will scan text and read the information to the user. These are considered "all-in-one" machines which include a scanner, Optical Character Recognition (OCR) software and speech synthesizer. These reading machines are similar in cost and level of technology to typical PC computers, yet many veterans require limited training in order to become proficient in its use. Many veterans who choose this technology often do so because they do not meet the criteria for a typical PC computer package, which requires greater skills and ability. Some VIST coordinators reported that their Blind Rehabilitation Outpatient Specialist (BROS) is able to train a veteran on the use of a reading machine without having to refer the veteran to computer access training, if the veteran chooses not to or is not able to go. One VIST coordinator reported that training for reading machines is often completed in a day, and others reported that a week is sufficient. The Seattle BRC reported that veterans complete training on these machines and specifically, on the use of the OCR software, within a week. BRC staff report that this type of technology is often chosen by blinded veterans who are completely blind and do not have any level of residual vision.

Veterans who choose to utilize computer assisted technology for other purposes, such as the Internet, electronic mail, word processing, money management, etc., in addition to reading purposes, prefer the personal computer version of computer reader technology. This type of computer is comprised of a personal computer, scanner, OCR software, and speech synthesizer. Most veterans require substitution of the speech synthesizer with screen magnification software, which is preferable for individuals with some level of low-vision. The computer packages can thus vary, depending on the veteran's intended purpose for the technology and also his/her level of visual impairment.

The multi-purpose personal computer used by the blind require attendance in CAT and demonstration of computer proficiency before equipment is provided to the veteran

According to BRC staff and VIST coordinators, this personal computer package requires extensive computer training, which is provided at BRCs through the Computer Access Training course. BRC staff report that there are national requirements veterans must meet at completion of training in order to receive the computer reader technology. Many VIST coordinators reported that a veteran's ability to successfully meet these requirements serves as a major factor in whether a veteran gets referred for CAT. Many BRC staff that we interviewed also supported this concept, stating that they work closely with VIST coordinators to screen for candidates with the capacity to successfully complete the training. A few VIST coordinators reported that their team included BROS, who facilitate the assessment of a candidate's proficiency by administering a typing test. For example, one BRC requests that any VIST coordinator referring veterans to its BRC for CAT administer a typing examination. This type of requirement also comes with challenges, as one VIST coordinator who refers veterans to this BRC stated that this is not feasible given current workload.

The most frequently requested assistive technology, according to VIST coordinators, is the CCTV

According to reports from BRC staff, the vast majority of veterans diagnosed as legally blind have some level of low-vision. Several VIST coordinators reported that approximately 85% of veterans receiving blind rehabilitation services have some level of usable vision, and that for these individuals CCTVs are important assistive devices. One VIST coordinator estimated that the number of veterans who need and desire a CCTV is far greater than the number of veterans needing and requesting a computer reader. Staff from several BRCs stated that veterans with CCTVs who request computer readers can still obtain them following successful completion of CAT, but the optical character recognition piece of the package that reads to the veteran may not be included. Rather, the veteran may receive the computer with the appropriate magnification software, so that he or she is motivated to continue using any residual vision.

A VIST coordinator's level of outreach activity can vary greatly from medical center to medical center, and can impact the number of veterans referred for CAT

VIST coordinators are involved in various activities to facilitate identification of veterans who would benefit from VA's VIST services. These VIST coordinators receive referrals from both within and outside of the Veterans Health Administration, by a number of mechanisms described below:

- VAMC Eye Clinics,
- Private sector ophthalmologists,
- State vocational rehabilitative services,
- Advocacy organizations, and
- Non-profit services for the blind.

Some VIST coordinators state they try to maintain close relationships with regional outreach organizations, in an attempt to identify as many veterans as possible that might benefit from assistive services. VIST coordinators who reported greater levels of outreach activity stated that they do so because they feel that newly blinded patients are more prone than other disabled patients to feel isolated and may not proactively seek blind services.

Furthermore, a few VIST coordinators emphasized their frustrations with not being able to "advertise" the services offered to blinded veterans. They stated that it was their understanding that they are not allowed to advertise the benefits and services of VA to the public. These VA staff members stated that this regulation restricts their ability to identify veterans in need of their services. Despite networking with other community and state organizations, these VIST coordinators feel that they are targeting veterans who are motivated to seek out services but they still may not reach those individuals who are not as proactive in requesting services for the blind. One VIST coordinator felt that a national effort to communicate about the availability of VIST services could improve and standardize current outreach activity. Upon further research, the Booz Allen team discovered that VA policy authorizes paid advertising only for specific activities such as recruitment and sale of certain supplies; the use of appropriated funds for other paid advertising is prohibited.

This difference in level of outreach activity may be attributed to disparities in workload and size of VIST at each VAMC

Several VIST coordinators interviewed stated that they would like to do more outreach within their communities but do not have the time, due to workload. These coordinators also report that the number of patients showing an interest in CAT has greatly increased over the past three years, significantly increasing their duties. Additionally, one BRC chief attributed the increase in the number of veterans interested in CAT to the increase in incidence of macular degeneration, which is known to be the leading cause of eye disease in people over the age of sixty. According to this BRC chief, as the veteran population ages there is a corresponding increase in the incidence of blindness. Reportedly, the proliferation of Internet and computer use among the general population has further augmented the number of patients requesting computer reader technology.

The composition of Visual Impairment Service Teams within VA can vary greatly, depending on the medical center. One VIST coordinator stated that she was one of two fulltime VIST coordinators at a BRC, while another VIST coordinator reported that she is the only resource for the BRC's home station area. Another VIST coordinator lauded the support of a fulltime BROS, while still another VIST coordinator claimed that she wished there was a BROS position at her VAMC. At one BRC, the chief reported that the BRC had four FTEs that were unfilled due to budget restraints, while yet another BRC reported eight unfilled FTEs.

Although eligibility criteria for referral to CAT seem similar among various medical centers, there is a great deal of variation in the application of eligibility criteria by VIST coordinators

VIST coordinators from across the country, as well as BRC staff, describe very similar criteria in determining whether a veteran will be referred to a BRC for computer access training. The most common criteria reported by VA staff interviewed can be categorized into 4 main areas:

- Diagnosis of legal blindness,
- Ability to touch type,
- Cognitive ability, and
- Communication of reasonable need for computer.

Although practically all VIST coordinators report to using these 4 main requirements, our interview results indicate that they are often interpreted and applied differently, which can impact the standardization or equivalence of these eligibility criteria. With the exception of the necessary diagnosis of legal blindness, the other three requirements can be measured differently. For example, in the area of "ability to touch type" VIST coordinators run the full gamut of what they accept as fulfilling requirements, including: veteran demonstrates knowledge of keyboard and can touch type (no limitations on time or errors), veteran is able to pass formal typing test developed by a particular BRC, and veteran demonstrates ability to type 15 words per minute with 90% accuracy.

For cognitive ability, some VIST coordinators conduct formal cognitive assessments, while others test the veteran's memory. Still others review cognition more informally, through personal interviews with veterans. Likewise, most VIST coordinators accept a letter from the veteran stating why he or she would like a computer as sufficient demonstration of need. Tied very closely to this requirement is the VIST coordinator's assessment of the veteran's motivation and enthusiasm for training. The request for

statement of need for the computer appears to be utilized to ensure that the veteran will be the primary user of the technology.

Furthermore, some VIST coordinators utilize additional criteria, different from the categories listed above. For example, one VIST coordinator stated that he requires that the veteran have some level of basic computer knowledge. Another VIST coordinator reported that the veteran must be medically stable, while another one reported that the veteran must be honorably discharged. Still another VIST coordinator reported that she conducts a "cognitive and learning" assessment prior to referring the veteran.

A veteran's projected ability to successfully complete CAT is a significant factor in determining whether a veteran will be referred

Many VIST coordinators stated that the lengthy wait time for acceptance into CAT, as well as the distance traveled and time spent away from home, can be too much to handle for some veterans and so they try to screen for veterans who will be able to successfully complete training. Many BRC staff report that they try to introduce the veteran to computer reader technology during the comprehensive blind rehabilitation program, and will often assess the veteran's capacity to learn and interest in CAT while the veteran is able to utilize a CAT station and technical trainers are present. For these veterans who are identified, the BRC staff will work with the veteran's VIST coordinator to get the veteran on the waiting list.

For veterans who are newly diagnosed as legally blind, VIST coordinators will assess the veteran's ability to handle both comprehensive blind rehabilitation and CAT. If the veteran is deemed to be a likely candidate, he or she may be referred to one of the dual programs within VA. These dual programs combine the comprehensive training on adapting to daily life and mastering key basic skills with CAT. BRC staff warn that selection for the dual program takes into consideration the ability of the veteran to be away from home for a longer period of time (the dual program tends to be longer due to the amount of material that must be covered), and the veteran's ability to absorb all the information, along with the new adjustment to his disability. These dual programs are offered at the BRCs in Tucson, Waco, and Birmingham.

VA staff report that the waiting lists and waiting times for CAT continue to grow, as the number of blind veterans increase and more veterans show interest in CAT

The Booz Allen team interviewed staff from each BRC and found that the average wait time among the nine BRCs is approximately 10 months, with outliers ranging from a low of 6 months (Augusta) to a high of 13 months (Birmingham). The BRCs also vary in the number of beds they have, and the number of beds that may be dedicated to CAT. For example, West Palm Beach has a total of 15 beds, with six dedicated CAT beds, while Birmingham has 30 beds with 10 dedicated CAT beds. The VIST coordinators are very aware of the lengthy wait times and a few coordinators reported that the wait time is often an impediment to access, as veterans sometimes lose hope or interest over time, and some lose the motivation to train. In response to this, several VIST coordinators described their efforts to manage the wait time by identifying alternate sources of blind aid services within the veteran's community or even nationally for veterans while they wait for availability in CAT.

Many VIST coordinators referenced the Hadley School for the Blind, a correspondence school that provides services free of charge and offers courses in typing instruction. This is particularly useful if a veteran is unable to meet the typing requirements for CAT. Some VIST coordinators reported that they work with local Lighthouse chapters to introduce veterans to computer training, as they wait for CAT.

Interviews with BRC staff show that there is a shortage of trainers among the facilities, and many BRCs are not fully staffed. Staff indicate that this contributes to longer waiting times for veterans

As mentioned earlier in the site visit findings, some VA staff reported that FTEs are not filled at BRCs and staffing levels are inconsistent with workload. One BRC reported a loss of 8 staff members overall within their visual impairment services team. There are also variations in the number of beds available for CAT at each BRC. Some BRCs do not assign beds or distinguish between CAT and comprehensive blind rehabilitation while certain BRCs have a set number CAT "beds" in their program. For example, staff from the Birmingham BRC report that the BRC has 10 CAT stations, while West Palm recently increased the number of CAT-designated beds from 4 to 6.

Seattle had historically decided to focus its BRC program on comprehensive blind rehabilitation and referred all veterans interested in CAT to the BRC in Palo Alto. Due to the growing wait list at Palo Alto, the Seattle BRC is now offering CAT as part of its rehabilitation program, although the primary focus continues to stress training blinded veterans in adapting to daily life. The Seattle BRC is able to shorten its wait time by providing some assessments and services typically done in CAT on an outpatient basis, as the BRC manages an outpatient program so local veterans can begin CAT-related tasks without having to wait for a bed. The wait time for veterans who would have to travel to Seattle is approximately nine months.

Each BRC is different in the number of veterans it can accommodate, based on the number of beds or stations designated for CAT and the level of staffing available to handle the training. BRCs can also differ in their overall stance on blind rehabilitation.

Some VIST coordinators and BRC staff reported that the level of service connection could impact a veteran's ability to move through the waiting list for CAT. Others reported that priority groups do not make a difference. Birmingham, Augusta, Hines, West Haven and Seattle all reported that veterans' priority groups can allow them to "bump" non-priority veterans on the waiting list for CAT, while West Palm, Waco and Palo Alto reported that veterans are not prioritized. Meanwhile, Tucson BRC will prioritize veterans on the waiting list if they are enrolled in school or employed.

FINDINGS FROM DATA ANALYSIS

Booz Allen conducted data analysis on data extracted from various VA databases

Booz Allen received NPPD, PTF and OPC files for the years 1998, 1999, and 2000 from VA. Data from these files were merged to provide a record of VA's delivery of high technology blind aids for this time period. The NPPD files represent an inventory of items furnished through the Prosthetics and Sensory Aids Services (PSAS) of VA. As such, it offered a look at the volume of blind aids distributed by VA overall, as well as at the VISN and medical center level. The PTF and OPC files provide specific information related to individual patients. For example, these files capture demographic data as well as medical information such as the patient's diagnosis, and were used to identify all patients diagnosed as legally blind. By combining these two databases the Booz Allen team could review specific trends in the data and target specific groups of patients.

Our analysis began with a look at high cost, high technology aids for the blind, specifically computer reader packages and closed circuit televisions. The results from the analyses are presented in the following section.

Between fiscal years 1998, 1999 and 2000 VA provided care for over 2,000 legally blind veterans across the US

VA data for the fiscal years 1998, 1999, and 2000 indicate that 2,358 different veterans had a diagnosis of legal blindness during these years, which was identified by the diagnosis code for legal blindness (ICD-9 code 369.4). These veterans were treated at 121 different VA facilities, at least one in each VISN. **Appendix A** details the total number of blind veterans by home station and by VISN. The total number of veterans newly diagnosed as legally blind increased each year within the three years reviewed. In fact, there were 2.5 times as many veterans (1097) with a diagnosis of legal blindness in 2000 than in 1998. Table 2 shows the total number of veterans diagnosed as legally blind for each year.

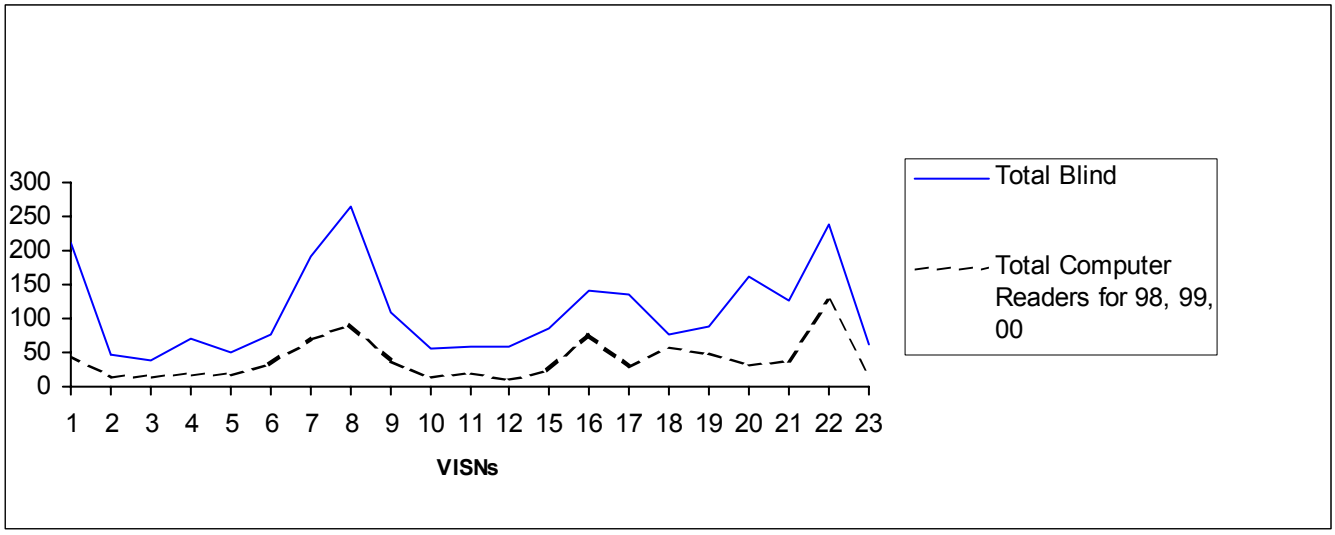
Table 2—Legally Blind Veterans by Year

YEAR	NUMBER OF LEGALLY BLIND VETERANS
1998	431
1999	830
2000	1097
Total	2358

Booz Allen isolated veterans who received a computer reader package and conducted additional analyses on the utilization rates per VISN and per station

Of particular interest to VA is the distribution pattern of computer reader packages. Therefore, Booz Allen performed additional analyses of the NPPD data to identify and report on the findings. Overall, 840 blind veterans from 105 facilities received a computer reader **(see Appendix B).** These readers were provided to the veterans by 58 facilities. Each VISN provided at least one blind veteran with a computer reader. The figure below demonstrates the rate of utilization of computer reader technology by veterans who have been diagnosed as legally blind.

Figure A - Utilization of Computer Reader Technology by VISN



Computer Readers

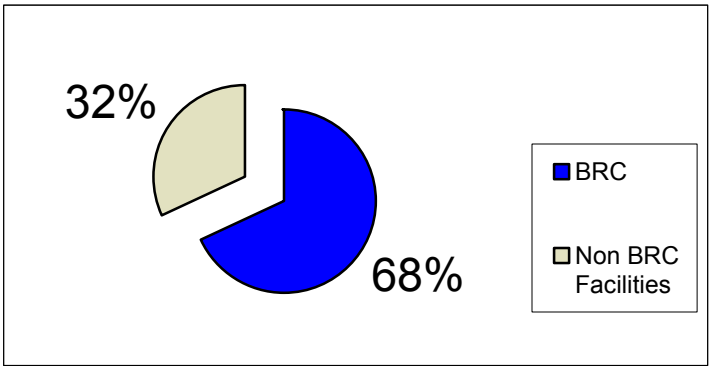
This graphic illustrates the number of patients associated with each VISN who are legally blind and the number of these patients who have received computer readers. For example, there are 211 veterans in VISN 1 who are legally blind and 48 legally blind patients from this VISN received a computer reader. This means that 23% of the legally blind veterans in VISN 1 received a computer reader, which is below the national average — 36% of blind veterans VA-wide received a computer reader. The West Haven BRC is located in VISN 1. In contrast, VISN 16 has 75 veterans who have received computer readers, as compared to 142 veterans who are diagnosed with legal blindness. This computes to a 53% utilization rate of computer reader technology in VISN 16. VISN 16 does not have a BRC within its network.

Booz Allen staff conducted a chi square test of independence to determine if variation among VISNs was significant. The expected frequencies for each VISN was calculated using the VA-wide percent of veterans who received a computer reader (36%). When compared to the observed frequencies for each VISN, and aggregated to provide a comparison value, it was determined that there is a significant difference among VISNs related to the number of blind veterans who receive a computer reader. The total number of computer readers distributed by each VISN is detailed in Table 3. Facility-level detail of the percentage of veterans receiving computer reader technology is provided in **Appendix D**.

97% of blind veterans in fiscal years 1998, 1999, and 2000 received a computer reader package OR a closed circuit television

Overall, 97% of the blind veterans received either a computer reader package or a closed circuit television. Although the data represents 121 VA medical centers that regularly treat blind veterans, 68% of these high technology blind aids items were distributed from nine VA facilities operating a Blind Rehabilitation Center. Site visit and telephone interview findings indicate that non-BRC medical centers may provide computer readers to veterans who choose to utilize the "self-contained" reading machines that do not necessarily require attendance at CAT. The 32% of computer readers distributed at non-BRC facilities may be associated with this practice.

Figure B—Distribution of High Cost/High Tech Blind Aids



The majority of the blind aid technology distributed by VA was closed circuit televisions. These were distributed almost three times as often as computer readers. Overall, 2,498 veterans received a CCTV as compared to 840 veterans who received a computer reader package. According to the data for the three years, only four veterans received both a CCTV and computer reader package. **Appendix B** provides a breakdown by VISN and facility for computer reader package and **Appendix C** provides this same detail for the provision of CCTVs.

Our data analysis indicates that 1,070 veterans who received CCTVs did not have a diagnosis of legal blindness. This suggests that veterans who are not considered legally blind are receiving CCTVs through

VA. However, these veterans may still have some level of visual impairment, or their records have been inaccurately coded and do not appropriately designate them as legally blind.

During the three-year period under review, VA distributed a total of 840 computer readers at a cost of 3.3 million dollars

For the three-year period covered under this study, VA spent $3.3 million dollars on computer reader equipment. VISN to VISN comparison of total cost showed considerable variation. However, when volume was considered, the variation was minimal. Overall, VISN 3 had the highest per item cost for computer readers ($4,069). VISN 3 provided 6 computer readers to veterans during the three-year period reviewed, and does not have a BRC. In contrast, VISN 18 provided 298 computer readers to veterans at a cost of $1,610 per item. VISN 18 includes the Tucson BRC. Table 3 provides a detailed breakdown of the cost per item and volume for each VISN.

Table 3—Computer Readers – Cost per item, by VISN

VISN	TOTAL ITEMS	TOTAL COST	COST PER ITEM
1	155	$351,000	$2,265
2	3	$5,559	$1,853
3	6	$24,416	$4,069
4	1	$3,461	$3,461
5	9	$28,210	$3,134
6	30	$83,739	$2,791
7	258	$566,038	$2,194
8	65	$159,886	$2,460
9	20	$47,990	$2,400
10	3	$6,020	$2,007
11	11	$21,405	$1,946
12	143	$290,041	$2,028
15	14	$38,516	$2,751
16	19	$35,369	$1,862
17	126	$372,584	$2,957
18	298	$479,924	$1,610
19	11	$30,241	$2,749
20	30	$77,489	$2,583
21	227	$538,347	$2,372
22	53	$131,791	$2,487
23	9	$19,747	$2,194

VISNs that provided high volumes of blind aid technology proved to be those which had a BRC within its network: VISN 1 (West Haven), VISN 7 (Augusta & Birmingham), VISN 8 (West Palm), VISN 12 (Hines), VISN 17 (Waco), VISN 18 (Tucson), VISN 20 (American Lake), and VISN 21 (Palo Alto). These 9 facilities accounted for 80% (673) of all computer readers distributed to veterans. Variations in volume among these nine facilities may be attributed to the differences in the size of the catchment area

associated with each BRC, which can vary significantly. One BRC may address the needs of only 1 or 2 VISNs while a BRC such as Hines services nine VISNs.

The remaining 20% (167) of the computer readers were distributed by 43 facilities. Table 4 provides the location of these additional facilities.

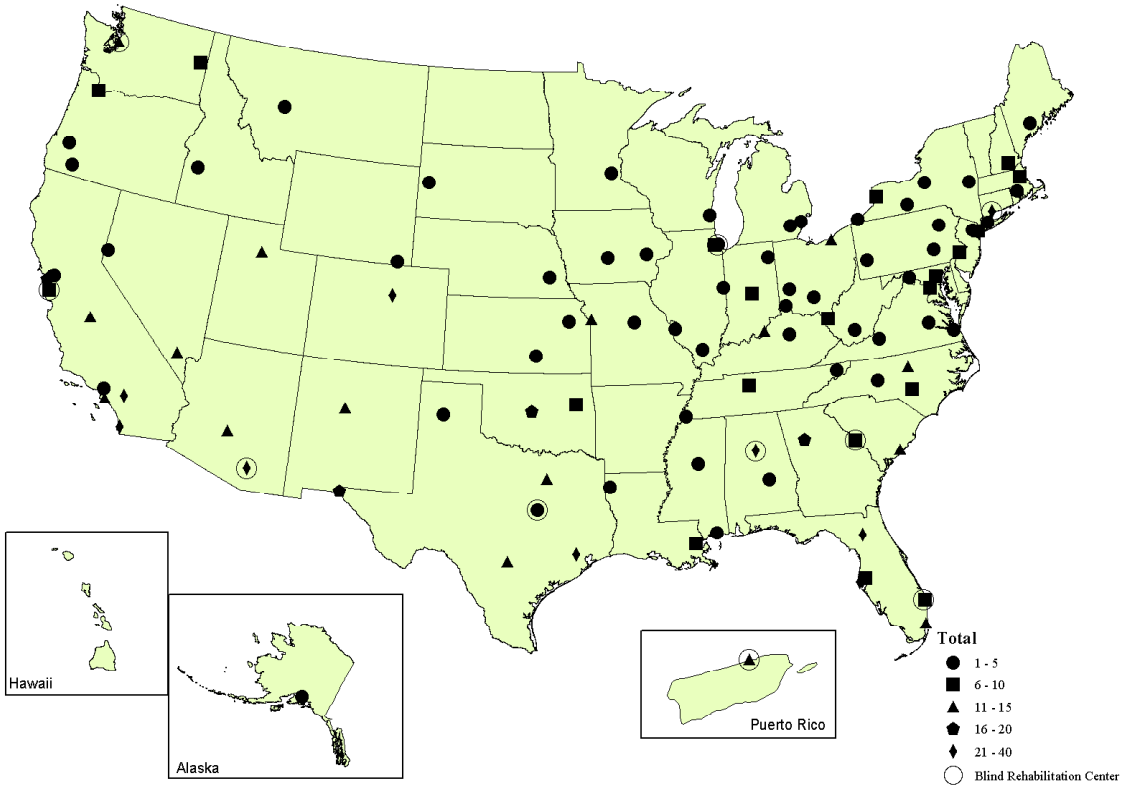
Table 4—Volume of Computer Readers Distributed by a non-BRC facility

VISN	SITE	VOLUME	VISN	SITE	VOLUME
22	Loma Linda, CA	**20**	22	West LA, CA	**3**
17	San Antonio, TX	**17**	1	Boston, MA	**2**
8	San Juan, PR*	**15**	9	Nashville, TN	**2**
19	Denver, CO	**8**	19	Salt Lake City, UT	**2**
6	Durham, NC	**8**	19	Cheyenne, WY	**1**
22	San Diego, CA	**8**	16	Biloxi, MS	**1**
8	Oakland Park, Fl	**7**	10	Dayton, OH	**1**
21	San Francisco, CA	**6**	6	Fayetteville, NC	**1**
15	Wichita, KS	**5**	23	Hot Springs, SD	**1**
7	Atlanta, GA	**4**	21	Fresno, CA	**1**
8	Bay Pines, FL	**4**	23	Minneapolis, MN	**1**
17	Dallas, TX	**4**	16	Tulsa, OK	**1**
8	Gainesville, FL	**4**	16	New Orleans, LA	**1**
9	Huntington, WV	**4**	16	Oklahoma City, OK	**1**
11	Indianapolis, IN	**4**	18	Phoenix, AZ	**1**
5	Washington, DC	**4**	11	Saginaw, MI	**1**
2	Buffalo, NY	**3**	15	Marion, IL	**1**
16	Houston, TX	**3**	6	Salem, VA	**1**
22	Las Vegas, NV	**3**	1	Newington, CT	**1**
1	Manchester, NH	**3**	20	White City, OR	**1**
9	Mountain Home, TN	**3**	10	Columbus, OH	**1**
23	Omaha, NE	**3**			

These non-BRC facilities may be distributing self-contained computer reader packages to veterans who express a need for the type of computer reader technology that only scans and reads aloud written words, as described in the Site Visit Findings section of the report. Facilities such as Loma Linda, CA and San Antonio, TX may have the resources necessary to train their veterans on the self-contained packages, rendering attendance at CAT unnecessary for those veterans who do not require or opt for a traditional PC computer reader package. A review of the VIST model at these sites may be warranted, as these stations are apparently able to distribute computer reader technology locally. A graphic depicting the geographical distribution of veterans who received computer readers is presented in Figure C.

** San Juan, PR operates a BRC*

Figure C — Geographic Distribution of Veterans Who Received Computer Readers for Fiscal Years 1998-2000



Our cost analysis of the provision of computer reader technology does not incorporate the cost of providing computer access training

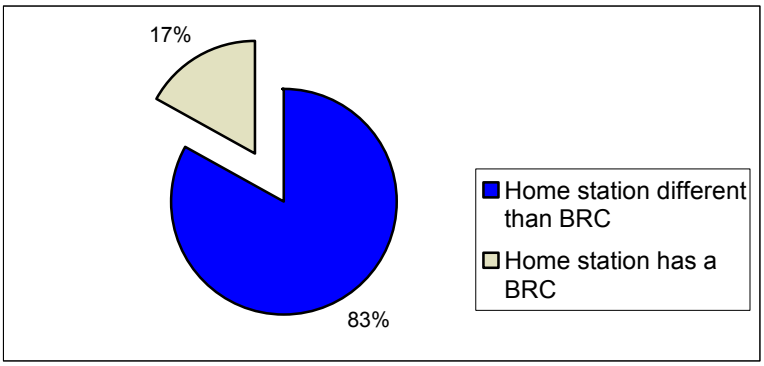
Since the majority of computer readers are provided at BRCs following completion of CAT, the cost to VA of providing CAT is an important factor when estimating the cost of this new technology. However, when the Booz Allen team attempted to collect this data we learned that VA makes no distinction currently within VA-wide databases between attendance at a BRC for comprehensive rehabilitation and computer access training. While data is available on volume of patients accessing BRC services, specific data on CAT services is not available at a national level. During our database assessment, we discovered that a "clinic stop code" does not exist for CAT, and volume and cost cannot be tracked at this time through NPPD, PTF or OPC. Since the cost of housing a veteran and providing daily computer training for three to six weeks as an inpatient can well exceed the cost of the computer reader itself, the cost analysis provided here provides a limited view.

Data analysis did not indicate any patterns in utilization and geographical proximity of veterans to BRCs

Further analysis showed that although these nine facilities were far above average for distribution of computer readers, the majority of veterans receiving these items were from a facility other than these nine that operate a BRC. Only 17% of veterans who received a computer reader identified a VA facility with a

BRC as their home station. The remaining 83% of veterans have their primary medical needs attended to at a facility other than the BRC from which they received their computer reader.

Figure D—Home Stations of Veterans receiving Computer Readers



The population of blind veterans does not appear to be clustered in any type of recognizable pattern

When we reviewed the distribution of home stations for veterans with a diagnosis of legal blindness, we found a relatively flat distribution with few exceptions. Although some VAMCs that have a BRC on the grounds had a higher number of blind veterans, and distributed a higher number of computer readers, this was not the general pattern uncovered by our analysis. **Appendix C** presents the number of blind veterans at each facility with the total number of computer readers distributed at that facility.

IV. Summary for Computer Readers

In summary, the Booz Allen team addressed the New Technology Study performance measures provided by VA by determining results to applicable analysis metrics.

New Technology Performance Measure - % of patients who receive computers for the blind

What is the percent of VA patients who receive computers for the blind compared to those who would benefit?

36% of all legally blind veterans received a computer reader during fiscal years 1998, 1999 and 2000.

However, 97% of all legally blind patients received either a computer reader or a CCTV from VA during fiscal years 1998, 1999 and 2000. Approximately 85% of legally blind veterans have some level of low vision and choose a CCTV instead of, or in addition to, a computer reader package.

By VISN:

The breakdown of percentage of legally blind veterans receiving computer reader technology by VISN is provided in Table 5.

Table 5 — Percent of Legally Blind Veterans Who Received Computer Readers

VISN	% OF LEGALLY BLIND VETERANS RECEIVING COMPUTER READERS
1	23%
2	30%
3	37%
4	24%
5	35%
6	43%
7	38%
8	34%
9	36%
10	26%
11	36%
12	21%
15	27%
16	53%
17	21%
18	75%
19	57%
20	20%
21	30%
22	54%
23	24%

What is the percentage of utilization compared to non-VA population?

Literature review and research of private and public sector practice indicates that the majority of computer reader technology provided to blind individuals is related to vocational or educational training. Most other computer training for the blind is associated with a fee. Actual percentage rates of utilization of computer reader technology are not available. Research indicates that VA is unique in its service offering of computer reader technology to all legally blind patients who demonstrate interest and capability for computer access training.

New Technology Performance Measure - How does cost affect the availability of computer readers provided to veterans?

Is there a pattern in the rate of new technology provision (those who received vs. those who could benefit) by VISN for computer readers?

Greater than 50% of the legally blind veterans in VISNs 16,18, 19, and 22 received computer reader technology. VIST coordinators at these VISNs facilitated the provision of computer reader technology for its veterans by identifying and referring them accordingly. However, veterans may have received the computer reader technology from other VISNs.

Palo Alto, Tucson, Hines, Birmingham and West Haven were the top five facilities to distribute the greatest number of computer readers. All five facilities operate BRCs. All five facilities also have a minimum of 30 beds in their BRCs while most of the other BRCs have 15 or fewer beds.

80% of all computer readers are distributed by BRCs while 20% are distributed by non-BRC facilities. Patients interested in a "self-contained" reading machine, which has no other computer functionality other

than scanning text and reading aloud, may receive computer readers through non-BRC facilities, which may account for the 20% of readers distributed by non-BRC facilities. Veterans may not need to attend and complete CAT in order to receive these self-contained reading machines, as they are not as complex and training on the software usually lasts 1 day to 1 week, depending on the veteran.

Characterize the responses about the role of cost in the provision of new technologies.

Through onsite visits and telephone interviews, we determined that cost does not appear to impact the provision of computer reader technology. Other factors, such as the length of a BRC's wait list, may impact the rate of access to computer reader technology.

New Technology Performance Measure - How are decisions made on the availability of computer readers?

Characterize the decision making process across VISNs

VIST coordinators at each facility serve as gatekeepers to CAT and provision of computer reader technology. These VIST coordinators assess veterans who express an interest in receiving computer reader technology, and evaluate veterans based on criteria established by the VIST. Overall, veterans are evaluated based on ability to complete CAT successfully.

According to onsite visits and telephone interviews with VIST representatives, we determined that all veterans who express an interest in receiving computer reader technology and demonstrate capability in successfully completing CAT are referred and placed on the waiting list.

Characterize the criteria used across VISNs

Most VIST coordinators across the country report similar criteria, but may apply these criteria differently across the country. These criteria are as follows:

- Diagnosis of legal blindness,
- Ability to touch type,
- Cognitive ability, and
- Communication of reasonable need for computer.

Although practically all VIST coordinators report to using the same requirements when evaluating the veteran for CAT, interviews reveal that criteria may be applied differently across the country, resulting in a lack of standardization or equivalence of these criteria.

Performance Measure – Are computer readers available to VA patients commensurate with the private sector or other government entities?

How does the rate of computer reader provision compare to the non-VA rate?

Most legally blind veterans utilize some level of assistive technology provided through VA. These types of blind aid technology appear to be available in the general population only as needed for vocational or educational purposes. Otherwise, most training courses require payment of a fee and individuals are required to purchase their own technology.

V. Next Steps

- VA should consider reviewing the data collection efforts in the area of blind rehabilitation, and should begin collecting volume and cost information specifically related to CAT.
- VA should consider conducting an evaluation to determine the effectiveness of providing inpatient CAT as compared to outsourcing this training, in an effort to decrease the barriers to access created by long waiting times and lengthy waiting list.
- VA should consider a review of staffing levels within VIST, to determine impact of differences in resources across the country on access to computer reader technology.
- VA's Blind Rehabilitation Service should evaluate and finalize the guidelines collated from various BRC practices. Concurrent with this effort, VA should establish strict eligibility criteria at a national level to equalize veteran's access to technology. Additionally, VA should incorporate national guidelines related to priority levels to make access more uniform across VA.
- VA Central Office should consider providing each VISN with reports of names and addresses of blind veterans. Such reports can be generated through the Patient Treatment File (PTF). VISNs may use such reports to conduct more targeted outreach to blind veterans, in an effort to disseminate information related to blind rehabilitation services and computer reader technology.

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VI. Cochlear Implants—Introduction

Cochlear implantation may be the only alternative for individuals who are hearing impaired and have no success with hearing aids

Hearing impairment is a chronic condition that affects over 22 million Americans. Many people who are hearing impaired are able to utilize assistive devices, such as hearing aids, to amplify sound. Individuals with severe to profound hearing loss who do not respond to hearing aids may benefit from cochlear implantation. A cochlear implant is a surgically implanted auditory device that electronically stimulates the cochlear (hearing) nerve providing a hearing impaired person with the necessary auditory sensation in order to *electronically* perceive sound. A cochlear implant allows the hearing impaired to become aware of speech and environmental sounds, thus enabling communication through spoken language. The cochlear implant was first developed in the late 1950s, and was approved by the Food and Drug Administration (FDA) for use in adults in 1985.

Cochlear implants and hearing aids are devices that assist in hearing and interpreting language, however they are fundamentally different. Hearing aids acoustically amplify sound and rely on the responsiveness of normally functioning auditory cells. A cochlear implant bypasses these cells completely and directly stimulates the auditory nerve by transforming incoming acoustic signals into electrical currents. Cochlear implants are especially helpful to individuals who do not have normal functioning auditory cells, in which case a hearing aid will not work.

Cochlear implants consist of internal and external components. Part of the device is surgically implanted in the skull behind the ear and tiny wires are inserted into the cochlea. The other part of the device is external and has a microphone, a speech processor (that converts sound into electrical impulses), and connecting cables. The implant does not restore normal hearing but does improve the person's ability to hear environmental sounds, to hear rhythms and patterns of speech, and to use speech reading (lip reading).

VA is interested in veterans' access to cochlear implantation because this procedure is considered a high-cost, new technology

There are 10 sites within the VHA that are equipped to perform this procedure, based on the existence of specialized equipment and staff. VA is interested in exploring whether veterans within the system have an equitable rate of access to this new technology, as well as understanding how utilization and access to the cochlear implant procedure within VA compares to that of the general population.

The typical cost of cochlear implantation includes the initial costs of assessment, the device, implantation, rehabilitation and programming/maintenance of the device. Implantation costs have been estimated at $30,000 to $50,000, and are covered by most healthcare payers. Although Medicare, Medicaid, VA and many commercial insurers cover this procedure, coverage requirements and conditions vary among the payers.

VII. Cochlear Implants—Methodology

The Booz Allen team examined patterns of utilization in cochlear implant technology in the general population and within VA

VA is interested in determining the rate of access that veterans diagnosed with severe to profound hearing impairment have to cochlear implantation. Additionally, VA requested the identification of any potential barriers to access. To perform this assessment, the Booz Allen team conducted a literature review to explore research relating to prevalence of severe to profound hearing impairment in the general population, rate of cochlear implantation among this group, and any major issues surrounding access to this technology. We reviewed research studies, information disseminated by vendors of the cochlear implant device, as well as editorials and stories on current events, and communications from advocacy groups and resource centers.

We also obtained data from VA on the number of cochlear implantations performed during fiscal years 1998, 1999 and 2000. The Booz Allen team obtained volume statistics on cochlear implantation by searching the National Prosthetic Patient Database (NPPD) by the specific code assigned to the cochlear implant device. The volume associated with these codes represents the number of devices dispensed by VA's Prosthetic and Sensory Aids Services (PSAS). We supplemented this data by searching VA's Patient Treatment File (PTF) and Outpatient Clinic (OPC) databases to obtain volume statistics on the implantation procedure, and pooled this data with the volume obtained from NPPD. Together, these two sets of volume statistics provided us with an idea of the number of implantations performed within VA in fiscal years 1998, 1999 and 2000.

Additionally, the Booz Allen team conducted site visits to seven VA medical centers (VAMCs) and met with audiologists at each of these facilities. We also conducted telephone interviews with staff from each of the ten cochlear implant centers as well as audiologists from each VISN, to ensure adequate geographical representation of our findings.

The Booz Allen team worked with representatives from VA's Audiology and Speech Pathology Service at Central Office to develop an estimation of the number of eligible cochlear implant candidates within VA

Since severe to profound hearing impairment is not a diagnosis easily identified by a diagnosis code, the Booz Allen team collaborated with the Deputy Director of Audiology and Speech Pathology to estimate the number of veterans who may be considered eligible candidates for cochlear implantation. It was agreed that age-adjusted prevalence rates for deafness from the general population would be applied to the enrolled veteran population to estimate the number of enrolled veterans who suffer from severe to profound hearing loss. The prevalence rate used in our projections is taken from a study conducted by Holt et al., which defines deafness as "At best, can hear and understand words shouted in the better ear". [1]

There are several limitations to this methodology of estimating the veteran population who would benefit from a cochlear implant

Candidacy for a cochlear implant involves a variety of factors, the specifics of which will be discussed in detail in this report. In brief, certain factors can impact an individual's eligibility for implantation but cannot be measured in our efforts to develop an estimate. Factors, such as an individual's medical status and ability to undergo surgery, or an individual's limited or zero benefit from use of a hearing aid, cannot

be ascertained from the data and resources available to us. These factors may decrease our estimate of eligible veterans. We have chosen to apply the prevalence rate of deafness to the enrolled veteran population.

Also, the term "hearing impairment" encompasses a broad range of hearing deficits and audiologic conditions. Researchers have defined this term differently, and prevalence rates can therefore vary greatly. The definition of deafness, which accompanies Holt et al's prevalence rates for the general population includes individuals who are considered to have "severe to profound" hearing loss, a significant indicator for eligibility.[1] However, the use of this prevalence rate does not take into consideration an individual's ability to benefit from a hearing aid. It also does not take into consideration individuals who are not covered by this definition of deafness but may still have severe hearing impairment and could potentially be appropriate candidates for cochlear implantation. These limitations should be taken into consideration when evaluating the projected estimate of veterans who may benefit from cochlear implantation.

VIII. Cochlear Implants—Findings

FINDINGS FROM LITERATURE REVIEW AND INTERVIEWS WITH INDUSTRY REPRESENTATIVES

Literature reviews and interviews with industry representatives provided information related to prevalence and utilization of cochlear implants

The list below represents the organizations that were contacted and/or provided information to conduct this study.

- American Speech-Language Hearing Association (ASHA)
- American Hospital Association (AHA)
- Michigan Ear Institute
- League for the Hard of Hearing
- The Cochlear Implant Association, Inc. (CIAI)
- AdvaMed
- The Listening Center at Johns Hopkins University
- National Center for Health Statistics
- Alexander Graham Bell Association for the Deaf and Hard of Hearing
- American Academy of Audiology
- National Electrical Manufactures Association
- American Academy of Otolaryngology
- Cochlear Implant Center at Gallaudet University
- Cochlear Corporation
- House Ear Institute (HEI)
- Deafness Research Foundation
- U.S. Food and Drug Administration's Center of Device and Radiological Health
- NIH's National Institute of Deafness and Other Communication Disorders
- Med-El Corporation/Combi System

Prevalence

Journal research indicates that exact prevalence rates of severe to profound hearing impairment in the US are not available. Although hearing impairment is a common chronic condition in the US, there are varying degrees of impairment. Research indicates that there is no standard definition distinguishing between the various levels of hearing impairment. As a result, there is a lack of definitive data on the prevalence rates and demographics associated with specific levels of hearing impairment. Researchers have, however, estimated the prevalence of severe to profound hearing impairment using nationally representative data. These prevalence rates provide some insight into the number of individuals who may benefit from a cochlear implantation.

Blanchfield et al., in a 2001 study, estimates that hearing impairment affects over 22 million Americans. According to data from the National Health Interview Survey, through the National Center for Health Statistics, the "hard-of-hearing" population was estimated at approximately 20 million people, which encompasses 8.6% of the total US population over 3 years of age.[2] However, of this range of 20-22 million people who reportedly suffer from some level of hearing impairment, it is estimated that approximately 464,000 to 738,000 people have severe to profound hearing impairment in the US. [2]

Holt et al defines deafness as "At best, can hear and understand words shouted in the better ear," and provides age-specific prevalence rates in the US population based on 1990 and 1991 Health Interview Surveys conducted by the National Center for Health Statistics. [1] These prevalence rates are detailed in 6 and will be utilized later in the report to estimate the number of enrolled veterans suffering from severe hearing loss. [1]

Table 6—Prevalence Rates

AGE GROUP	PERCENT OF POPULATION
3-17 years	0.10%
18-44 years	0.12%
45-64 years	0.49%
65 years and older	2.48%
TOTAL	0.49%

A population-based study by Noe et al. explored the risk of hearing loss and rate of hearing impairment between veteran and non-veteran populations. Results indicated that veterans were neither at higher risk for hearing impairment, nor did they have a greater degree of hearing loss than non-veterans. This study supports the premise that prevalence rates for hearing loss do not differ between veterans and non-veterans. [3]

Blanchfield et al. indicated that the hearing impaired are more likely to have other vulnerabilities, which may impact the rate of access to high cost technology.[2] Studies on the hearing impaired indicate that those who have some level of hearing loss are more likely to be publicly insured and less likely to have private insurance. Of the estimated number of Americans with severe to profound hearing loss, 31 percent have public insurance and 40 percent have a combination of public and private insurance. [2] 5.9 percent of this group has no insurance at all. [2] Additionally, the hearing impaired are more likely to have lower family incomes, as evidenced by study results which indicate that 53% have a family income of less than $25,000, compared to 35% of the general US population. [2]

Also, individuals suffering from severe to profound hearing impairment are less educated than the general population, and are more likely to be unemployed. Specifically, of the severely to profoundly hearing-impaired group over the age of 17, approximately 44% did not graduate from high school, as compared to 19% of the general population. [2] Additionally, 42% of the group aged 18 to 44 years are not working, compared to 18% of the general population.[2] These demographic factors indicate specific vulnerabilities in health insurance, employment, and income, all of which can significantly impact an individual's access to high technology interventions for the hearing-impaired, such as cochlear implantation.

Utilization

The Booz Allen team uncovered several estimates of the number of cochlear implant users. The most recent data was obtained from an interview with the Chief Medical Officer of FDA's Center of Device and Radiological Health. The FDA collated volume data provided by the three cochlear implant manufacturers: Cochlear Corporation, Advanced Bionics and Med-El Corporation. The total number of cochlear implants as of June 2002 is shown in Table 7 below.

Table 7– Total Number of Cochlear Implants World-wide [4]

Number of Cochlear Implants Performed in the U.S. to date	22,516
Number of Cochlear Implants Performed Outside of the U.S. to date	36,020
Total Volume of Cochlear Implants World-Wide:	**58,536**

Source: Data provided by Chief Medical Officer, FDA – Center of Device and Radiological Health

The Booz Allen team contacted each of the three CI manufactures to obtain more information related to the number of procedures performed on adults as compared to children. Two of the three vendors were unwilling to provide volume data and reported that this information is considered proprietary.

The Booz Allen team met with the Vice President of Consumer Affairs for Cochlear Corporation to discuss various issues related to the utilization of cochlear implants technology and potential barriers to access. Cochlear Corporation, a publicly held company, provided data on the national rate of growth of cochlear implant technology compared to the previous year. However, these growth rates are based on estimates. According to Cochlear Corporation, these statistics are a national estimate of the penetration rate of cochlear implants by age group [5]. This estimate was established by Cochlear Corporation, and is based on the company's sales data and estimated market share.

Table 8 – Cochlear Implant Surgery Comparative Annual Growth Rates in the U.S.[5]

AGE GROUP	1997	1998	1999	2000	2001	5-YR. GROWTH
18-44	12%	-3%	34%	13%	15%	104%
45-64	16%	1%	22%	24%	3%	81%
65-79	-1%	-1%	26%	20%	1%	50%
80+	45%	-3%	21%	32%	16%	160%
Total	**9%**	**2%**	**27%**	**14%**	**14%**	**84%**

Figures are based on estimates only.

Source: Cochlear Corporation

Using 1996 as the base year, the table above shows the annual rate of growth of cochlear implant surgery when compared to the previous year. The growth rate has varied over the five-year period. Also, there is wide variation in the growth rate of implants among the different age groups. The compound annual growth rate from years 1997 to 2001 is 16.4%, based on the number of implants provided by Cochlear Corporation.

Our research also indicates that obtaining accurate volume data on the utilization of cochlear implant technology is a significant challenge. We contacted associations and consumer groups for hearing impairments who reported a lack of accurate volume information on the number of cochlear implantation procedures performed. This issue was reinforced during our discussion with Cochlear Corporation and several advocacy groups contacted as a part of this study[5, 6].

One report by the Lewin Group, prepared for The Advanced Medical Technology Association in 2000, reported that there were approximately 3,000 device sales in 2000 [6]. The Lewin Group based this information on interviews that they conducted with representatives from the two cochlear implant vendors in the U.S. at that time, Advanced Bionics and Cochlear Corporation. This approximation indicates that there were 3,000 cochlear implant procedures performed in the U.S. in 2000 [6]. In 2001, Blanchfield et. al reported that as many as 464,000 – 738,000 people in the U.S. are severely to profoundly hearing impaired [2]. Representatives from the cochlear implant device industry indicate that 10% to 25% of people severely to profoundly hearing impaired may be candidates for cochlear implants[6]. We applied the 10% estimate to the lowest number of severely to profoundly hearing impaired (464,000) and the higher percentage of 25% to the highest numbered estimate to develop a range of eligible candidates.

Applying this estimated percentage to Blanchfield's report of the number of severely to profoundly hearing impaired, we estimate that there are 46,400 to 184,500 likely candidates in the U.S. This results in a utilization rate of 1.6% to 6.5% for cochlear implants, if one were to apply the utilization number of 3,000 reported by vendors for 2000.

The Booz Allen team contacted the Centers for Medicare and Medicaid Services (CMS) to obtain volume information on the number of cochlear implant procedures reimbursed by Medicare for 1998, 1999 and 2000. CMS's Office of Information Services provided data for 1999, 2000 and 2001 based on the code used by the Medicare program to represent an ***outpatient*** cochlear implantation, CPT Code 69930 (there is a charge to obtain data for 1998).[7] The ***inpatient*** procedure is incorporated into a Diagnosis-Related Group (DRG). This DRG covers all operations on the ear, of which the cochlear implant procedure is one. CMS does not have publicly available data beyond the DRG volume information. In other words, we do not have access to CMS data at the procedure level, which would allow us to determine how many cochlear implant procedures were reimbursed by the Medicare program.

Lewin's report on *The Medicare Payment Process and Patient Access to Technology* reported that by 1998, 70% of cochlear implants for Medicare patients were performed on an outpatient basis[6]. The table below lists the volume per year of outpatient cochlear implantations reimbursed through the Medicare program, based on the CPT code 69930 [6]. We have estimated the number of inpatient procedures based on the assumption that if 70% of all procedures are performed on an outpatient basis, then 30% are performed inpatient. This inpatient estimate is likely to be over-stated, as there has been a significant movement towards outpatient surgery within recent years.

Table 9 – Volume of Cochlear Implants Reimbursed by Medicare*

YEAR	# OF OUTPATIENT PROCEDURES[7]	ESTIMATED # OF INPATIENT PROCEDURES	ESTIMATED MEDICARE TOTAL FOR COCHLEAR IMPLANT PROCEDURES
1999	469	201	670
2000	556	238	794
2001	630	270	900

** Estimate based on total number of outpatient procedures*

Issues Affecting Utilization

The use of cochlear implant technology appears to be lagging behind in today's healthcare marketplace. The Lewin Report states that the use of cochlear implants in the Medicare population has been disproportionately low, given the high percentage of severely to profoundly hearing impaired people who are of Medicare age[6]. This report cited inadequate reimbursement and the high cost of the procedure as the principal factors contributing to the under-utilization of this technology[6].

Our interview with the Vice President of Consumer Affairs of Cochlear Corporation revealed several significant indications for underutilization of cochlear implants. Although cochlear implant surgeries are increasing, cochlear implant technology is still underutilized because new technologies take time to penetrate the market[5]. There is still a general lack of public awareness of the procedure, effectiveness and potential benefit of cochlear implants.

According to Cochlear Corporation:

- The estimated candidate pool of children and adults in the U.S. with severe-to-profound hearing loss who do not derive significant benefit from hearing aids range from 464,000 to 738,000 [2,5].
- The total number of CI recipients in the U.S. comprises only a small proportion of the potential candidates for the procedure[5].
- Expanded candidacy guidelines have increased the number of severely to profoundly hearing impaired people who may qualify for surgery[5]. For example, the FDA has revised its clinical eligibility criteria from "profound hearing impairment" to "severe to profound hearing impairment" and made accompanying changes to clinical assessment scores of hearing and speech understanding. Candidacy criteria requirements continue to be expanded, as research results show improved outcomes in broader candidate populations.
- The number of cochlear implants performed in the U.S. has been increasing – despite the hesitancy seen in the late 80-early 90's because of the newness of CI technology. Today, the number of CI surgeons and implant centers is increasing in the general population.[8]

At present, industry experts cite that the number of adult candidates for cochlear implants has been increasing over the last several years. However, adults have a more difficult time finding coverage for CI than children.[9]

Booz Allen team identified several significant findings regarding cochlear implant utilization in the private sector

Cochlear implants vs. Hearing Aids

The Cochlear Implant Association states that cochlear implantation significantly impacts people who cannot benefit from a hearing aid. After receiving a cochlear implant, recipients report having the ability to hear speech and distinguish words without reading lips. Cochlear implant users have been able to use the telephone, enjoy music and become fully aware of speech and environmental sounds, which were not achievable at the same levels with the hearing aid. [10]

According to the Medicare Coverage Issues Manual, "The purpose of implanting the device is to provide awareness and identification of sounds and to facilitate communications for persons who are profoundly hearing impaired."[11] At one time, age was a major consideration for implants, and currently, volume is increasing because older candidates are now being offered this benefit. Providers continue to take medical condition into consideration, rather than setting an age limit. In addition, Spitzer reported that hearing loss is considered a handicap, yet after cochlear implantation, the user feels that the level of handicap decreases.[12]

Low Volume

Cochlear implantation volume is low comparable to its potential candidates due to a number of factors, yet the numbers are increasing. In the past, the volume was considerably low due to the strict guidelines and lack of awareness. Sorkin reported that those who qualify for a cochlear implant have increased due to the expansion of candidacy guidelines established by the Food and Drug Administration (FDA) over the recent years.[5] Currently, according to the FDA, only adults who suffer from severe-to-profound hearing loss, are now considered candidates if they understand less than 50% of sentences spoken to them. In prior years, according to the FDA, adults who suffered from profound hearing loss were considered candidates and needed to understand less than 30% of sentence.[13] Rush Limbaugh recently had received a cochlear implant to restore some partial hearing loss due to autoimmune inner ear disease (AIED). This case has increased public awareness of the availability and applicability of cochlear implant technology.[14]

Quality of Life

Hogan et al testified that the cochlear implant has improved quality of life overall for those who suffer from severe to profound deafness. [15] According to a study presented in 1999 at the Annual Meeting of the American Academy of Otolaryngology (AAO)-Head and Neck Surgery Foundation by researchers at the University of Minnesota, elderly patients who have received cochlear implants gain increased quality of life including significant improvements in social life and confidence. [16]

In the late 1990's, the cochlear implant device "Nucleus 24" was approved, and adults who were performing with hearing aids then became potential candidates. After implantation, these adults were achieving word recognition scores of over 90%. Cochlear implants were found to be one of the most cost effective medical interventions in terms of the long-term impact on a recipient's quality of life relative to their cost. [17] Spitzer reported that the quality of life had improved for the cochlear implant users [12] and the majority of health insurers are providing additional coverage after considering this benefit.

Insurance Coverage

Medicare, Medicaid, and commercial health care plans provide some coverage for cochlear implants. Cochlear implants are considered to be medically necessary for the treatment of severe to profound

hearing impairment, and therefore a covered procedure by a majority of U.S. health insurers. Medicare coverage is provided only for those patients who meet all the guidelines stated in the Medicare Coverage Issues Manual.[11] Volume is increasing due to expanded indications, improved technology, proof of cost-effectiveness, and increased awareness of social and medical benefits of cochlear implant technology. As of May 12, 2000, CMS approved cochlear implants as being one of the medical devices that will be tracked more accurately in order to establish future payment levels from Medicare and Medicaid, which will affect commercial health care plans as well.[11] CMS, in addition to commercial entities, utilize FDA criteria as a set of guidelines to establish their eligibility criteria.

The 2000 Lewin Report on *The Medicare Payment Process and Patient Access to Technology* indicated that inadequate Medicare payment for cochlear implants played a major role in the under-utilization of cochlear implant technology among the Medicare population[6]. The report further suggested that poor Medicare reimbursement levels for the procedure created a disincentive for hospitals to perform cochlear implantations on Medicare beneficiaries[6]. Specifically, 10% of the 170 hospitals that provided cochlear implant technology in the late 1980's plainly stated that they restrict the number of procedures performed due to anticipated financial loss[6]. Our findings indicate that historically, the high cost of the procedure and the insufficiency of payer reimbursement for cochlear implants impede one's ability to obtain access to this technology.

According to our discussion with Cochlear Corporation, the full cost of cochlear implant surgery, the device and rehabilitation currently ranges between $50,000-65,000 in the U.S. Cochlear America's published cost of device is $24,000[5]. Typically, insurance covers the costs associated with CI and very few people pay out of pocket for the procedure.[18] The National Institute on Deafness and Other Communication Disorders (NICDC) of the NIH reports that several private insurance companies have just recently excluded CI in their policy coverage.[18] Cochlear implants seem to be considered a cost-prohibitive procedure, for which many providers do not receive adequate reimbursement.

Our literature search and discussions with industry representatives indicate that the cost of the cochlear implant procedure, combined with the level of reimbursement established by payers, can serve as a major barrier to access. Several representatives from the provider community report the current Medicare and Medicaid reimbursement levels for CI are inadequate. A number of consumer and professional organizations related to hearing healthcare and hearing loss are concerned about reimbursement for cochlear implants.[18] According to Cochlear Corporation, several manufacturers are developing a coalition to lobby CMS to increase current reimbursement rates.[5] Additionally, more and more private insurance policies are beginning to exclude CIs as risk avoidance and cost savings strategy.[18, 19]

Despite low reimbursement and potential financial loss, healthcare providers continue to provide cochlear implant services for a variety of reasons. Currently CI surgeons are paid on a fee-for-service basis and many accept the financial loss due to the low reimbursement rate or they simply provide the service pro-bono.[8] Many surgeons continue to perform the surgery because of altruistic reasons ("I just want to help").[8] As a result, many hospitals will allow for surgeons to do the surgery because of the overall volume of business they bring to the hospital.[8]

It was reported that some hospitals continue to provide cochlear implants if the loss is minimal, because they reportedly obtain discounts on the cost of the device when purchasing devices in larger quantities. Larger purchasers of cochlear implant technology are able to generate deeper discounts are a result of increased purchasing power by the hospital. [20]

Academic hospitals also perform the procedure, despite its poor reimbursement, for clinical training and educational benefits. Furthermore, surgeons and hospitals typically strive for the capacity to provide the newest technology available. We interviewed one ENT surgeon who is both a VA provider and on faculty at Baylor College of Medicine. He reported that many institutions have an interest in providing cochlear implant technology because it lends to the hospital's "clinical prestige"[21]. He also stated that cochlear implants are considered the first device to replace a sensory input, and as such, is the first of a new breed of technology – neuroprosthetics[21]. He indicated that while hospitals in the industry may lose money by performing the procedure, it is possible that this loss is supplemented to some degree by the reimbursement collected for provision of rehabilitation services[21]. Over time, charges for the education, training, programming and rehabilitation of the cochlear implant recipient may generate profit for the hospital.

Additionally, this contact reported that hospitals that provide this level of technology might attract federal funding and research dollars, which also contribute to why hospitals are motivated to provide this technology, despite the financial loss that may result from it[21]. Beyond these reasons, there are general cost-shifting practices that hospitals may utilize to offset the loss of particular procedures. Hospitals may generate profit from other procedures, and this profit may be used to supplement losses in other services/areas.

FDA Guidelines

All payers use FDA guidelines to establish the eligibility criteria for cochlear implant candidates. Each payer uses the FDA criteria as a benchmark when establishing the eligibility criteria. Medicare covers implantation for adults with proven limitations, as specified by the Medicare Coverage Manual. Medicaid coverage and payment levels for cochlear implants may vary widely among different states since each state develops its own program within Federal limits. Private health plans usually cover cochlear implants following an individual case review by a medical director. However, Aetna U.S. Healthcare covers cochlear implants for adults with open-set sentence discrimination that is less than or equal to 30%, which meet the older FDA guidelines.[13] As the criteria become less strict in each health plan, the potential candidate volume will increase, yet there continues to be limits to access.

Data Issues Related To Cochlear Implant Technology

The Booz Allen team attempted to collect information related to the collection and reporting of clinical data related to cochlear implant procedures. It has been very difficult to obtain accurate data related to the volume of cochlear implant procedures performed in the U.S., and our findings indicate that some of these challenges are related to incomplete or inaccurate data reporting of procedures performed. For example, CMS establishes payment amounts for procedures based on volume and cost information submitted by providers. The Lewin Report states that CMS conceded to using miscoded data in its analysis of payment levels for cochlear implants in 1988.[6]

We contacted CMS to obtain Medicare volume information related to cochlear implantations. The volume associated with the procedure code was significantly higher than the volume obtained for the code representing the cochlear implant device. This indicates that CMS continues to have significant data integrity issues with regards to accurate and complete capture of cost and volume data for cochlear implants. We utilized the data associated with the procedures for our analysis, as it appeared to be more complete.

The correct coding of cochlear implant procedures is a big issue impacting the capture of cost and utilization data. Cochlear Corporation has made the recommendation to CMS that a comprehensive

analysis of the Medicare databases be conducted to investigate utilization, cost and reimbursement data for CI surgeries in the U.S.[5]

According to the American Speech-Language-Hearing Association's Director of Health Care Financing Analysis, the new Medicare rates for the hospital outpatient prospective payment system (OPPS) were published in the March 1, 2002 Federal Register. CMS delayed the implementation of the 2002 rates because of various errors in calculation of medical device costs associated with specific procedures. The corrected cochlear device costs were raised to $16,243[22]. The new rate, which covers both the device and implantation cost, is slightly higher than the rescinded 2002 rates published in November 2001. This new rate, however, is 23% above the rate originally proposed in August 2001.[22]

Many of the industry representatives that we contacted stated that consistent, accurate coding of procedures and devices is the only way to ensure complete data capture. They indicated that this is a challenge faced by all healthcare providers. This issue is very significant in private sector settings, in which the reimbursement is based on the coding submitted by providers.

Access

Access to cochlear implant technology may be limited due to lack of health insurance coverage as well as poor reimbursement. In 1998, although Medicaid covered implants for adults in the majority of states, average reimbursement was well below the total cost. Medicare reimbursement in 1998 was also found to be lower than average costs for implantation; therefore, deterring patient access. [2]

Currently, Medicare and Medicaid coverage and reimbursement policies conceal serious problems for cochlear implant centers because they are losing money on the procedure. Even large centers that perform over 100 surgeries per year are not able to make money providing cochlear implants. Although only 25% of Americans are covered under Medicare and/or Medicaid, these public plans influence coverage and payments for health services in general. Sorkin indicates that commercial plans tend to follow the trends in guidelines that public health programs set, so the reimbursement levels do not vary considerably.[23]

In 2000, Cochlear Corporation determined levels of payment each state made to determine if access is limited due to Medicaid reimbursement levels. Eighteen states reimbursed less than 80% of the cost of the device and procedure, which translates into a loss of $10,000 for each procedure. [5] The Alexander Graham Bell Association for the Deaf and Hard of Hearing and cochlear implant manufacturers, Cochlear Corporation and Advanced Bionics, began working together to gain more cooperation from the states. Again, the trends in public health programs impact the trends in commercial insurance reimbursement.[23]

Discussions with vendors, non-profit organizations, academic institutions, consumer groups and government agencies revealed a number of issues related to patient access to cochlear implant technology in the general population. Based on our findings, the following barriers were associated with receiving CI in the private sector.

- Lack of knowledge: Public awareness of cochlear implantation technology and benefits is increasing. However there is still a large educational deficit in the U.S. regarding cochlear implants[9, 22]
- Cost: The dramatic cost increases and continued low reimbursement (combined with the monopolistic practices in the cochlear implant market) creates a financial disincentive

to perform cochlear implants for most physicians and audiologists. In addition, some hospitals may discourage patients from receiving a cochlear implant because of low reimbursement rates from Medicare. Patients also may have insurance that does not cover cochlear implantation.[9]

- Perceptions of Individuals with Hearing Impairment: One industry representative described the culture of the deaf community and the opposition that exists for receiving cochlear implants. Individuals with severe to profound hearing loss often feel that they may lose their social network and way of life if they were to have a cochlear implant[5]. They may feel that nothing is wrong with them, so they don't need to fix anything or that they are fine without the technology[5]. In addition, many individuals may not want to go through the surgery or would not like the look of the external component of the device.[9] Therefore; potential candidates may be resistant to exploring this alternative.
- Travel: Travel might be a barrier for individuals because they may not want to make multiple trips to a different city for evaluation, surgery, programming of the device, rehabilitation, etc. Post rehabilitation involving individuals familiar with cochlear implants is necessary to ensure successful outcomes for implant recipients. A multidisciplinary team composed of physicians, audiologists, rehabilitation specialists and educators is necessary. The cochlear implant recipient may have to travel in order to be appropriately followed up by specially trained providers.

Although a cochlear implant is a favorable new technology for those with severe to profound hearing loss, it may not always be an option

Throughout the world, the success of cochlear implant technology has enabled adults with greater residual hearing and speech recognition to qualify as cochlear implant candidates. [15] Yet, in the past, due to high costs, and low reimbursement, it may not have always been an option. In the United Kingdom, the MRC Institute of Hearing Research had determined that there is a relationship between volume and cost of cochlear implantation.[15] Among U.K. health care providers; there is a variation of those who have received a cochlear implant due to location, resulting in a variation of access to these services. [15] Access to cochlear implants in the U.S. is increasing due higher reimbursements, and increased education on its benefits for those with severe to profound hearing loss that have not benefited from hearing aids. [10]

FINDINGS FROM VA DOCUMENTATION

The Veterans Health Administration (VHA) has established a cochlear implant program for veterans

Currently there are 10 sites designated as VA Cochlear Implant Centers to serve deaf or severely hard of hearing veterans. Veterans are evaluated and counseled about the cochlear implantation procedure. While at these facilities veterans are in the care of experienced audiologists, speech-language pathologists, educators, surgeons, medical specialist, psychologists and counselors. Through this program, VA pays the costs of medical, surgical, hospital, audiology, ancillary, and prosthetic services related to cochlear implantation.

Table 10—Cochlear Implant Centers

Ann Arbor VA Health Care System	Long Beach VA Medical Center
Atlanta VA Medical Center	Miami VA Medical Center
Birmingham VA Medical Center	VA New York Harbor Health Care System
Houston VA Medical Center	VA Pittsburgh Health Care System
Iowa City VA Medical Center	VA Puget Sound Health Care System

The implantation involves the inter-disciplinary collaboration of Audiology and Otolaryngology. The otolaryngologist specializes in diseases of the ear, and is responsible for the overall management of care and the medical and surgical aspects of the treatment. The audiologist is responsible for counseling, rehabilitation, training, activation and programming of the device to achieve optimum performance. More traditional amplification strategies, such as hearing aids, will be evaluated and deemed ineffective before the cochlear implant is considered.

VA has established specific guidelines and criteria related to cochlear implantation

VA has established candidacy criteria for implantation of cochlear implants. The criteria for a cochlear implant are based on certain medical and audiological criteria, as well as FDA guidelines. The criteria listed in Table 11 below are widely accepted across VA as the guide by which to measure potential candidates.

Table 11—Criteria Applied to Potential Cochlear Implant Candidates

MEDICAL CRITERIA	AUDIOLOGICAL CRITERIA	OTHER CRITERIA
• No medical contraindications for anesthesia or surgery	• Derives marginal benefits from conventional amplification	• Patient has the cognitive and emotional capacity to adapt to and benefit from implantation
• No active middle-ear disease or infection	• Bilateral severe to profound hearing loss	• Patient displays reasonable and appropriate expectations of potential benefit
• No evidence of disease of Cranial Nerve VIII (Cochlear nerve)	• Speech recognition for open-set sentence identification of 50% or less in the implanted ear or 60% or less binaurally or in the non-implanted ear	• Patient agrees to participate in the treatment and rehabilitative protocol

VA's Cochlear Implant Program guideline articulates that VISN Directors may opt to provide cochlear implant services through non-VA healthcare providers, on the condition the veteran meets the same criteria established by VA sites. The guideline further states no veteran will be denied cochlear implant services based on residence in a VISN that does not operate a Cochlear Implant Center. However, the guideline concedes service delivery decisions remain at the VISN or medical center level.

FINDINGS FROM VA SITE VISITS AND TELEPHONE INTERVIEWS

Through site visits and telephone interviews, VA staff reported issues regarding veteran access to cochlear implant technology

Audiology staff from various VA medical centers were interviewed regarding veteran access to cochlear implantation technology within VA system. Staff shared observations, concerns and suggestions with the

Booz Allen team. VA staff consistently raised funding issues as a primary concern. Audiology staff from three out of ten cochlear implant centers reported restrictions in the number of cochlear implantations they have been "allowed" to perform, per year:

1. The Miami VAMC reported restrictions in performing implantations on patients outside of the center's VISN

   According to the Chief of Staff at Miami VAMC, there is an informal guideline restricting cochlear implantations to veterans within VISN 8. Initially when the CIC was established at Miami, cochlear implant procedures were restricted initially to those veterans from VISN 8. Since then, they haven't received referrals from outside the VISN, so they haven't had to deny anyone an implant. The Audiologist and Chief of Staff both stated that this guideline was established because of budgetary restrictions and issues related to staffing and capacity of the operating rooms. In addition, VISN 8 is considering establishing cochlear implantation capabilities in Tampa as well, due to the high demand, long waiting lists and travel distance to Miami. According to the Audiologist, the Fiscal Officer in Tampa is willing to fund an implant center. This Audiologist reports that it is not necessary to create another center, but would rather have additional resources provided to Miami, so that eligible veterans can be accommodated.

2. The Ann Arbor VAMC reported that they are currently on "hiatus" from providing any implantations at this time

   According to the Chief of Staff and Chief of Audiology at the Ann Arbor VAMC, budget constraints are the main barrier to patient access. The Chief of Staff reports that there is no formal policy in place. It was reported that there are long wait times and delays in Audiology due to staffing shortages and lack of necessary equipment to accommodate the demand. It was implied that the time needed for evaluation, implantation, and follow up care for cochlear implant patients adds to this workload. There have been some changes in staffing within the Audiology department recently. The Chief of Audiology has been with the Ann Arbor VAMC for less than a year, but since his arrival, he reports that he is working on increasing the efficiencies of the CIC. Recently, there has been only one cochlear implant surgery performed at this facility. The Chief of Staff stated that he was involved with the decision to put a "hold' on further implantations indirectly, but coordinated with the Medical Director who made the direct decision. There is no formal policy in place addressing this "hiatus" on cochlear implantation, but an informal guideline is in place until the Chief of Audiology improves wait times for other Audiology items.

3. The Iowa City VAMC reported that they are given a limitation of 4-6 implantations a year

   According to the Chief of Prosthetics and the VISN Prosthetic Representative at the Iowa City VAMC, the 4-6 cochlear implants per year restriction is a formal guideline. It was reported that the previous Chief of Audiology, who left over a year ago, had initially set a strict limit. The Chief of Prosthetics and the Audiology department recently clarified that there is no strict limit at this time. The Chief of Prosthetics re-assured the Booz Allen team that if a 'seventh' request for a cochlear implant is received, the request will be granted.

   Our discussions with Audiology representatives from VAMCs across the country suggest that they are also under the impression that they cannot refer to Iowa City, due to restrictions in the number of implants that can be performed at that CIC.

Each Audiology representative interviewed reported that these restrictions were related to the high costs associated with cochlear implantation, as well as the medical center's budget and available funding. Audiology contacts at West Haven, Ct reported that the medical center stopped providing cochlear implant services in 1998 when key staff left. Budgetary constraints prevented the replacement of staff and the maintenance of the CIC program at that site.

Staff from 2 other CICs reported concern over anticipated budgetary pressures, describing an increase in the number of cochlear implant referrals. These sites reported they have seen a direct increase in cochlear implant referrals in response to other centers' inability to accept new patients for implantation.

Many representatives from Audiology and Speech Pathology reported that travel can be a significant obstacle for veterans interested in receiving a cochlear implant

Several staff members across the country reported that the burden of travel might be too much to handle for veterans. Many audiologists pointed out that individuals suffering from severe to profound hearing loss feel isolated from the hearing world and find it difficult to undergo the travel necessary for evaluation, implantation, and maintenance of the cochlear device. Several individuals we interviewed cited the following potential conditions as examples of additional challenges:

- Veterans who are elderly,
- Veterans who lack adequate family/social support,
- Veteran who have grown dependent on familiar surroundings and who are not motivated to travel long distances, and
- Veterans who are unable to afford the cost of travel and lodging.

Audiology representatives reported inconsistent levels of travel benefits for veterans who require travel to a CIC. Several staff reported that the referring site would pay for travel since the CIC pays for the implant and the procedure. Other staff reported the veteran is required to pay travel costs, while a few reported that the veteran must pay travel for one way only. It was reported the CICs in Seattle and New York have been known to share in the cost of travel with the referring medical center.

Several audiologists from medical centers that did not have a CIC reported working within VA system when referring patients for a cochlear implant. Other audiologists reported working with local teaching hospitals to provide cochlear implant services for veterans on a fee basis, in an effort to decrease the veteran's need for travel. These audiologists reported a preference to have the veteran implanted locally if possible, due to the level of programming and maintenance requirements for the cochlear implant device.

While most Audiologists reported the use of similar eligibility criteria, a few audiologists reported age is a consideration when identifying potential candidates for implantation

Almost all of the Audiologists we spoke with were aware of either FDA criteria or criteria disseminated by VA's National Audiology and Speech Pathology Service at Central Office. These criteria include factors such as medical status, ability to sustain surgery, cognitive ability, degree of hearing loss, and compliance. A few people we interviewed stressed that a veteran's age is taken into consideration for referral to a CIC.

Some of these staff members described the incidence of other co-morbidities in the elderly that may preclude a veteran from being a likely candidate for implantation. It was not clear whether these individuals adequately considered an elderly veteran for referral. One individual stated patients over the age of 70 are not eligible for cochlear implantation. Another individual stated her patient population consisted of many residents of the Appalachian region. For these patients, she screens potential candidates differently, and takes into consideration cultural issues as well as whether the veteran is interested in or would be motivated for implantation.

The Booz Allen team interviewed Audiology contacts at medical centers to determine why veterans from those facilities did not receive an implant during the three study years

We selected six sites that did not appear in our analysis of the home stations of veterans who have received a cochlear implant to determine potential reasons why veterans had not accessed this technology. A summary of our interviews with these six sites is provided below.

Boston- VA New England Healthcare System

Contacts: Secretary in Rehabilitation in Bedford; Audiologist, Regional Representative for VISN (located in West Haven); Chief of Otolaryngology in Jamaica Plains; Speech Pathologist in Jamaica Plains

The Speech Pathologist at Jamaica Plains reported that patients are identified for cochlear implant evaluation and referred to West Haven to be worked-up. However, the Chief of Otolaryngology at Jamaica Plains reported that veterans are evaluated at the University of Massachusetts through fee-basis. Additional discussions with the Audiologist at West Haven confirmed that they have not received referrals from the New England Healthcare System for cochlear implant evaluation. This Audiologist expressed concerns regarding the under-utilization of the NY CIC, which is the closest VA CIC. When questioned about this issue, the Chief of Otolaryngology for New England reported that the travel burden on veterans is too great.

Denver VAMC

Contacts: Assistant Chief of Staff, Speech Pathologist, Audiologist, and Network Authorization Officer

According to the Audiologist, one patient was recently referred to a local private facility for implantation. It was reported that Iowa City is the closest CIC, and does not accept new referrals unless the Denver VAMC pays for the veteran's travel cost as well as the cost of the device. The Audiologist reports that veterans do not mind traveling to Iowa City, but due to the waiting list, they opt to have their procedure locally. The Audiologist reported that veterans might obtain this technology through Medicare, or fee-basis through VA. The Network Authorization Officer, who manages data related to services provided by fee-basis, stated that no cochlear implant procedures were authorized during fiscal years 1998, 1999 and 2000. The Assistant Chief of Staff reported that she approves all requests for procedures under fee-basis, and stated that cochlear implantation is an elective surgery. She further reported that a veteran received a cochlear implant through fee-basis in fiscal year 2001. She reported that she does not recall any other requests for cochlear implantation via fee-basis, and she indicated that does not keep a record of requests.

St. Cloud VA Medical Center

Contact: Audiologist

The Audiologist reported that she has referred 3 candidates for cochlear implant evaluation to Iowa City. Iowa City required the referring medical center to pay the cost of the device. The interviewee reported

that PSAS has not approved the payment of the device as yet. One of the 3 candidates waiting for a decision is 100% service connected.

South Texas Veterans Health Care System

Contact: Chief of Audiology

Discussions with the Chief of Audiology revealed that in the years discussed, he recalls 4-5 that were referred to the Houston CIC over the past few years but he does not have specific information related to the exact number of referrals made. Initial testing was performed at the South Texas Veterans Health Care System's Audiology Department. Additional work up was done at the Houston CIC and it was determined that none of the referrals fit the medical eligibility criteria. According to the Chief of Audiology, South Texas Veterans Health Care System Audiology Department does not see many patients who would warrant referral for cochlear implant evaluation. The Chief of Audiology indicated that he is aware of the VA process and that he does adhere to it.

VA Greater Los Angeles Healthcare System (GLA)

Contact: Audiology Section Chief for GLA

Interview revealed that approximately 10-15 CI candidates have been referred to the Long Beach CIC. Dr. Martin indicated that he is fully aware of the VA's criteria and patients identified for CI are referred to the Long Beach VAMC CIC for evaluation. Once a patient is referred, there is minimal follow-up performed by the GLA Audiology Department. Nevertheless, Dr. Martin indicated that he was aware of several candidate referrals that were made where veterans did have the CI surgery performed.

The Booz Allen team concluded that although the home station information related to patients who have received a cochlear implant does not reflect that patients have been referred from GLA, it seems that the home station has not been recorded correctly. In other words, VA data indicates that GLA has not sent veterans to Long Beach for cochlear implantation. Our interviews indicate that GLA has sent several veterans; therefore the station coding may be inaccurate.

FINDINGS FROM VA DATA ANALYSIS

The Booz Allen team applied prevalence rates for deafness in the general population to the enrolled veteran population over the age of 45, to estimate the number of veterans over 45 years who could be considered "candidates" for cochlear implantation

The Veterans Health Care Eligibility Reform Act of 1996 (PL 104-262) mandated VA to establish a patient enrollment system by October 1, 1998. Since the system was not in place until late 1998, VA provided us with enrollment data for fiscal years 1999 and 2000. Since the enrollment data is broken out by age groups that are different from those in our research findings, we can only draw comparisons in prevalence rates for two age groups: 45-64 years and the over 65 age group. Although several other criteria would have to be met before these veterans qualify as eligible candidates, we are able to formulate general estimates for the number of veterans in these specific age groups within the VA system who may benefit from cochlear implantation during 1999 and 2000.

We applied the prevalence rate of "deafness" as previously defined in the literature review (Table 5) in the general population for people aged 45-64 years and over the age of 65, to the total number of enrolled

veterans. Our estimate of the number of veterans in these age groups who may be considered a candidate for a cochlear implant during 1999 and 2000 is provided below.

Table 12—Estimated Number Of Cochlear Implant Candidates Within Enrolled VA Patient Population

YEAR	AGE GROUP	# OF ENROLLED PATIENTS *	PREVALENCE RATE IN GENERAL POPULATION	ESTIMATED # OF VETERANS WITH SEVERE TO PROFOUND HEARING IMPAIRMENT	ESTIMATED RANGE OF CANDIDATES FOR CI** (10-25% OF SEVERE-PROFOUNDLY HEARING IMPAIRED)
1999	45-64 years	1,179,434	0.49%	5,779	578 – 1,445
1999	> 65 years	1,389,918	2.48%	34,470	3,447 – 8,617
2000	45-64 years	1,271,509	0.49%	6,230	623 – 1,558
2000	> 65 years	1,586,379	2.48%	39,342	3,934 – 9,836

** Data provided by VA's Office of Policy & Forecasting*
*** Based on percentages reported by Cochlear Implant vendors, as reported in Lewin Report* [6]

As discussed earlier, our projected estimate of eligible candidates does not take into consideration other factors such as medical status, cognitive status, a veteran's interest in undergoing implant surgery, the veteran's ability to benefit from a hearing aid, speech recognition, or evidence of nerve disease. All of these factors have the potential to impact the estimate of eligible candidates for cochlear implantation.

The number of veterans who report service-connected hearing loss of 80% or greater provides a unique snapshot of the number of veterans who may potentially benefit from a cochlear implant

Veterans who have been categorized as service-connected for hearing loss of 80% or greater may be a comparable example of veterans who are severely to profoundly hearing impaired. Since VA collects this data on veterans with a specific rating of disability, this dataset allows some level of comparison to those who may suffer from severe to profound hearing impairment. Moreover, although service-connection is not a condition of eligibility for cochlear implantation, this data does provide us with an idea of the number of veterans who suffer significant loss of hearing connected with their service to the country. However, some of these veterans may have other forms of insurance coverage, and also may not be enrolled in the VHA system. Although we will not use this data to compare actual volume and utilization of cochlear implantation technology within VA, it is still valuable qualitative data that can be used to further approximate the number of veterans who may benefit from cochlear implant technology.

Table 13—Number Of Veterans With 80% Or Greater Service Connected Disability For Hearing Loss

YEAR	1998	1999	2000
# Of Veterans	3,844	3,154	3,100

Overall, 76 cochlear implantation procedures were reported during the three-year study period, based on data analysis

Booz Allen staff extracted volume data from VA's NPPD and PTF files. Neither database was fully completed (all variables with a valid responses), and both contained few shared data elements (variables that appeared in both databases). Therefore, it was determined that these databases would be treated separately. We developed a study database and eliminated duplicate patient records.

We searched the NPPD by the code associated with a cochlear implant device (L8614) to identify patients who received a cochlear implant. This search resulted in 44 VA patients for the 3-year period. We then searched PTF/OPC by both inpatient and outpatient procedure codes representing cochlear implantation for the same 3 year period, which identified an additional 55 records. Since one database records the device and the other records the procedure, there was some overlap in our results. We then matched the records within the two databases by scrambled social security number, to extract the total number of unique patients who had received a cochlear implant. This process identified 76 patients who received a cochlear implant within VA during fiscal year 1998, 1999 and 2000.

Almost all patients receiving a cochlear implant were linked to a VA facility that operates a cochlear implant center

Of the 76-cochlear implants identified in our analysis, each record was associated with a VAMC, which operates a CIC, with the exception of one record. According to NPPD data, a cochlear implant device was provided by the Nashville, TN VAMC, which does not have a CIC. Of the remaining facilities, Long Beach had the highest number of cochlear implants for all CICs. New York City had the fewest, and did not provide any for two of the three years reviewed (1998 and 1999). Table 14 provides a list of all VA facilities that provided cochlear implants and the volume of activity at each, as reported through NPPD and PTF.

Table 14—Volume of Cochlear Implantations, Per Year and Per Facility

VISN	VA FACILITY	1998	1999	2000	TOTAL
22	Long Beach, CA	4	7	8	**19**
20	Seattle, WA	1	5	6	**12**
11	Ann Arbor, MI	2	3	4	**9**
7	Birmingham, AL	1	4	3	**8**
16	Houston, TX	0	3	3	**6**
23	Iowa City, IA	5	0	1	**6**
7	Atlanta, GA	0	2	3	**5**
8	Miami, FL	3	1	1	**5**
4	Pittsburgh, PA	0	0	3	**3**
3	New York, NY	0	0	2	**2**
9	Nashville, TN*	0	0	1	**1**
	Total	**16**	**25**	**35**	**76**

** Nashville does not operate a CIC*

The trend throughout VA indicates an increase in the overall number of cochlear implants performed each year. A review of individual facilities supports this increase in the number of cochlear implants

performed. Most facilities show a gradual increase in the number of implants performed in 2000 as compared to 1998 and 1999. Overall, nearly half (46%) of all the cochlear implants performed were done in 2000, the last year of our three-year review period.

Discrepancies were found between data analysis volume and reported procedure volume from staff

As part of data gathering efforts in site visits and telephone interviews, volume data was requested from Audiology staff at each CIC on the number of cochlear implantations performed at each center for fiscal years 1998, 1999 and 2000. Analysis of this volume data indicates discrepancies between the volume CIC staff report for procedures performed and what is reported through the PTF/OPC databases. Details of the differences in volume are provided in Table 15, below.

Table 15—Data Discrepancies In Volume Between Reports From CIC Staff and Database Results

CIC SITE	TOTAL VOLUME FROM CIC CHIEFS	TOTAL VOLUME FROM DATA ANALYSIS	DIFFERENCE IN VOLUME
Ann Arbor	12	9	- 3
Atlanta	10	5	- 5
Birmingham	10	8	- 2
Houston	6	6	0
Iowa City	9	6	- 3
Long Beach	18	19	+ 1
Miami	6	5	- 1
New York	7	2	- 5
Pittsburgh	5	3	- 2
Seattle	13	12	- 1
TOTAL	***96***	***75****	***-21***

** The total volume resulting from data analysis is actually 76. Nashville provided one implant but does not have a CIC and is not reflected in the total volume listed here*

The only site with volume data matching our data analysis is Houston. Volume reported by staff from each of the other CICs does not correlate with the data analysis on volume of implantation per fiscal year. The discrepancy in data indicates a general pattern of under-reporting of cochlear implant procedures through VA database systems, with the exception of Long Beach, which appears to have implantation volume in excess of what staff report.

In an attempt to clarify these data discrepancies, the Booz Allen team interviewed Ear, Nose and Throat (ENT) Surgical staff at each CIC to further research the volume of procedures reportedly performed for FYs 1998, 1999 and 2000. Most sites were not able to provide concrete data, and our team was sporadically successful in contacting representatives from ENT who are knowledgeable and experienced in cochlear implants. Below are summaries of the interviews with ENT staff.

- We contacted a Physician Assistant from the Puget Sound ENT Clinic who stated that she was fully confident in the volume information provided by the Cochlear Implant Chief within the Audiology department.

- The ENT Coordinator at the Pittsburgh CIC stated that there was only one cochlear implant procedure performed in the 3 years specified, although the CIC chief reported a total of 5 procedures performed.
- An ENT surgeon at the Houston CIC stated that 3-4 procedures are performed every year, and was not able to provide more specific data.
- An Operating Room Program Assistant at the Birmingham VAMC provided the following volume data for cochlear implant procedures: 4 in FY 1998, 7 in FY 1999, and 3 in FY 2000. This total of 14 procedures for the three study years is greater than what was reported through the databases as well as by the CIC chief.
- An ENT Case Manager from the Iowa City CIC provided volume information based on the Annual Report of Surgical Procedures. This volume data reflected that Iowa City performed 9 cochlear implant procedures in FY 1998, 1 in FY 1999 and 3 in FY 2000. This data, reported through the Surgical service, indicates that 13 procedures have been performed, as compared to 6 procedures reported through VA databases and 9 procedures reported by the CIC Chief.

In addition to the five examples listed here, our team also attempted to contact a representative of the "implanting team" from the other five CICs, with minimal success. Many times the surgeons were in surgery and otherwise seeing patients, and we did not receive return calls from their staff or from the ENT clinic representatives. Some contacts stated they would research the number of procedures performed for the three years in question, yet did not call back or return phone calls.

Analysis of the cost per cochlear implant produced some variation based on location

Data for the cost analysis was based on records from NPPD only, as the PTF data does not provide cost information. The NPPD data includes 43 records from 8 VA facilities (one record from the NPPD file did not contain any cost information). Of the 43 items with related cost data, the range varied from a low of $5,450 (in Long Beach) to a high of $26,900 (in Seattle). We believe the low outlier of $5, 450 is an error, since our findings from research and interviews with staff indicate that the typical device costs more than $15,000. Therefore, we excluded this outlier from Table 16 below.

Data from Atlanta and Birmingham showed the average cost of a cochlear implant to be below $10,000. Results from our telephone interviews reveal that the cost associated with the device within NPPD does not reflect the total cost of the implant. At both of these facilities, the cost data in NPPD captures only the cost of the external component, which is funded by PSAS. The cost of the internal component is covered by the Surgery department, and is not part of the NPPD cost. Therefore the costs and numbers of cochlear implants at these two sites were excluded from the calculation of "cost per item" as shown in the table below. Excluding volume from these two CICs, we calculated the total average cost for 36 implants provided between 1998 and 2000 to be $18,611. This amount covers the cost of the device package: external and internal components. Table 16 provides cost data for each of the remaining six CICs.

Table 16—Cost of Cochlear Implants

FACILITY	TOTAL COST	NUMBER OF CIS	PER ITEM COST
Seattle, WA	$191,760.00	12	$15,980.00
Long Beach, CA*	$185,222.50	9	$19,067.25
Ann Arbor, MI	$149,362.50	8	$18,670.31
Houston, TX	$65,972.50	3	$21,990.83
Pittsburgh, PA	$56,737.50	3	$18,912.50
New York, NY	$20,950.00	1	$20,950.00
Total	$670,005.00	36	$18,611.25

**Excludes the 1 cochlear implant which had the outlier cost of $5,450.*

Atlanta and Birmingham are listed separately, since their cost data reflects the external component only.

Table 17—Cost of Cochlear Implants (Shared with Surgery)

FACILITY	TOTAL COST	NUMBER OF CIS	PER ITEM COST
Atlanta, GA	$38,295.00	4	$9,573.75
Birmingham, AL	$18,920.00	2	$9,460.00

We interviewed VA staff to determine potential reasons why the cost of cochlear implant devices may vary among CICs. Most interviewees reported that the cost of the device typically includes the entire cochlear implant package, consisting of the microphone, implant, coil and processor. Staff reported that variances are probably due to market differences and differences in cost between vendors. Atlanta and Birmingham seem to be unique in the way that the cost of the cochlear implant device is shared between Surgery and PSAS. Both CICs are in the same VISN. We did not see this type of cost sharing at any of the other CICs within VA.

Data analysis revealed that the majority of cochlear implant procedures are being performed on veterans who have a CIC at their local medical center

Based on records found in NPPD & PTF/OPC databases, only 11 facilities reported cochlear implant surgeries. Of these eleven facilities, one facility does not have a CIC. That facility, Nashville, TN performed one cochlear implant surgery in 2000. The remaining 75 procedures were performed at a VAMC with a CIC.

The NPPD and PTF data used in our analysis did not have completed fields for the veteran's "home station" for the majority of patients identified as having received an implant. The Booz Allen team searched the outpatient clinic file (OPC) by each implanted veteran's scrambled social security number to identify the home station. Following this step, out of the 76 patients who received a cochlear implant, home station data fields for 3 records were blank, and 1 implantation was performed at Nashville, which does not operate a CIC. Therefore, we removed these 4 implantations from the total for analysis purposes. All analysis on home station was performed utilizing 72 as the total number of cochlear implantations performed at VA CICs.

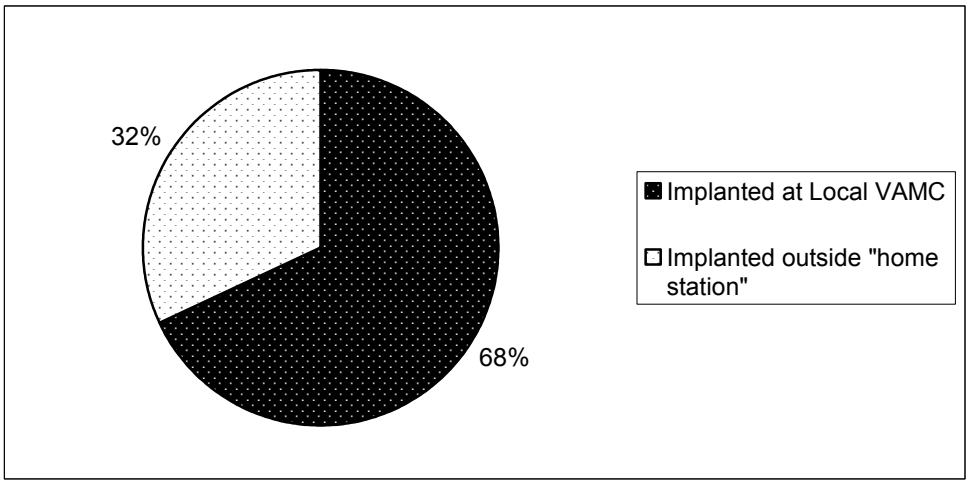
49 out of 72 implants (68%) were provided to veterans who have a CIC at their local VA medical center.

Only 23 veterans receiving the implant (32%) traveled to a medical center different from their "home station" to be implanted at a CIC. Some of these patients who traveled to a different medical center remained within their VISN. Only 10 veterans (14%) traveled outside of their VISN to receive an implant.

CICs at Houston, Miami, Atlanta and Pittsburgh implanted patients from within their own VISN only. CICs at Ann Arbor, Iowa City, Seattle, New York, and Birmingham implanted patients outside of their VISN, although each site implanted no more than 2 patients each from outside of their VISN.

Data analysis indicates that the majority of cochlear implantations performed at VA CICs are performed on local veterans, and while some patients are implanted from outside the medical center's catchment area, very few are performed on patients outside of the CIC's VISN.

Figure E—Home Stations of Veterans Receiving Cochlear Implant



The average age of veterans who received a cochlear implant was 66.8 years old

Data regarding a patient's age was available primarily from the NPPD file only, with a few records available from the PTF/OPC database. In short, NPPD provided age data on 21 patients, and PTF/OPC provided this variable for 3 patients. Therefore, we are providing analysis on the 24 records available to us. Based on these 24 patients, the average age of a patient that received a cochlear implant was 66.8 years old. The oldest patient who received an implant was 80 years old. At the other extreme, the youngest patient to receive an implant was 51. This data shows that VA doctors provide cochlear implants to a wide range of age groups.

The Booz Allen team reviewed cost data obtained through the Decision Support System (DSS) database

We reviewed the cost information available in DSS to determine its application to our data analysis. It was determined that the DSS data reports provided to Booz Allen did not include information on all cochlear implantation procedures performed within VA. Rather than using the cost data to draw comparisons, we decided to provide examples of cost per cochlear implant case, to illustrate variance in cost among different facilities.

Table 18—Total Procedure Cost For Cochlear Implant, Based On Selected Individual Patient Cases

SITE	YEAR	COST
Ann Arbor, MI	1998	$39,672
Miami, FL	1998	$27,849
Birmingham, AL	1999	$42,341
Ann Arbor, MI	1999	$49,001

The data from DSS included the cost of the implant device as well as other costs associated with an implantation. Cost calculations included variables such as operating room, direct and indirect nursing costs, laboratory, radiology, pharmacy, physician fees (staff and contracted), supplies, etc. The cost data in DSS includes hospital overhead and depicts a picture of "total" cost for the procedure. These costs represent individual patient cases, which will vary according to the different ancillary services provided to the patient. The costs would be further impacted by the patient's health status and any complications that may have occurred while hospitalized, requiring additional care and services. Many records were excluded from our analysis because the field for cost of implant was blank.

Data issues impeded our ability to provide more substantial data analysis on various patterns of utilization of cochlear implant technology

The Booz Allen team noted several discrepancies in the data utilized for our analysis. Databases were incomplete for important demographic information, volume data did not match with that reported by CIC staff, and there was a paucity of accurate cost information in any one database. Examples of the data integrity issues we faced are provided below:

- We identified a total of 76 cochlear implantation procedures, yet only 44 of the devices were recorded in the NPPD. For the other 32 cases, we did not have cost data for the implant device.
- Discrepancies in volume between data analysis and volume data reported by CIC staff suggest a difference of 21 procedures that are not reflected in the data we analyzed
- The PTF included the age variable for only 3 patients, while NPPD provided age data on 21 patients. Analysis on the average age of a cochlear implant patient was possible on less than 32% of patients receiving an implant.
- Efforts to obtain cost information for the total case of a cochlear implantation from DSS resulted in sporadic data extraction, as several patients were unable to be matched due to inconsistent dates of service. Many of the records that were identified had missing fields, such as the cost of the surgical implant or the home station of the patient

Incomplete, inconsistent and inaccurate data resulted in various limitations to the data analysis findings. The Booz Allen team was unable to provide substantial comparable analyses on the utilization of cochlear implant technology within VA.

IX. Summary of Cochlear Implant Findings

In summary, the Booz Allen team addressed the performance measures given by VA by determining results to applicable analysis metrics.

Performance Measure - Rate of cochlear implants in patient who would benefit by implantable rehabilitative devices

What is the percent of VA patients who receive cochlear implants compared to those who would benefit?

We were able to determine ranges of percentage of utilization, based on different numbers for the "eligible" population. It is difficult to identify the number of potential candidates, due to the highly variable clinical presentations of patients who may or may not benefit from a cochlear implant. Candidacy is often determined through scores on hearing tests, speech recognition capability and the absence of precluding factors such as cochlear nerve disease or medical instability.

We also identified discrepancies in the volume data for cochlear implantation, and chose to rely on the volume reported by Audiology staff at each of the ten Cochlear Implant Centers. According to these reports, VA provided a total of 96 cochlear implants during fiscal years 1998, 1999 and 2000. A total of 37 procedures were performed in 1999 and a total of 33 in 2000.

We estimated the number of veterans who may suffer from severe to profound hearing impairment by applying prevalence rates of severe hearing impairment in the general population to the enrolled veteran patient population. Industry representatives estimate that 10-25% of the severely to profoundly hearing impaired are likely to be cochlear implant candidates. We applied this range of percentage rates to the estimated number of veterans with severe hearing loss and then applied the actual utilization rate reported by CIC Chiefs. The number of enrolled veterans for 1998 is not available. Based on these estimates, the percentage of patients aged 45 and older receiving cochlear implants for 1999 and 2000 is as follows:

Table 19—Rate of Implantation in Veterans 45 and Older

YEAR	# IMPLANTED	ESTIMATED NUMBER OF SEVERELY TO PROFOUNDLY HEARING IMPAIRED VETERANS	ESTIMATED RANGE OF ELIGIBLE COCHLEAR IMPLANT CANDIDATES IN VA	RATE OF IMPLANTATION
1999	37	40,249	4,025 – 10,062	0.4 – 0.9%
2000	33	45,572	4,557 – 11,393	0.3 – 0.7%

By VISN-

Rather than presenting this data by VISN, we have opted to answer this question per CIC, since all implantations, with the exception of one, were performed at a CIC. Also, since we cannot determine the "eligible" population by VISN, we provide reported volume information below.

Table 20—Reported Volume of Cochlear Implantation in VA

CIC SITE	FY 1998	FY 1999	FY 2000	TOTAL VOLUME REPORTED BY CIC CHIEFS
Ann Arbor	2	7	3	12
Atlanta	3	4	3	10
Birmingham	4	4	2	10
Houston	2	1	3	6
Iowa City	5	1	3	9
Long Beach	4	7	7	18
Miami	3	2	1	6
New York	2	3	2	7
Pittsburgh	0 *	2	3	5
Seattle	1	6	6	13
TOTAL	***26***	***37***	***33***	***96***

*** The total volume resulting from data analysis is actually 76. Nashville provided one implant but does not have a CIC and is not reflected in the total volume listed here*

Compare with non-VA percent of patients

The Booz Allen team identified volume data on the number of cochlear implant devices sold in the U.S. as of June 2002. We also obtained data on the number of cochlear implants sold in 2000. Findings from literature review provided estimates of the potential number of cochlear implant candidates in the US. However, the studies do not provide a definition for candidacy. It would be inaccurate to draw comparisons between VA and the general population based on these numbers. However, we created a rate of utilization based on these estimates to be used as general guidelines. We have developed estimates based on data obtained through studies and data gathered from cochlear implant manufacturers to estimate the number cochlear implant candidates in the U.S. There are an estimated 46,400 to 184,500 candidates currently. It has been reported that 3,000 cochlear implant devices were sold in the U.S. during 2000. We estimate the utilization rate of cochlear implants in the general population to be between 1.6% to 6.4%.

Performance Measure - How does cost affect the availability of cochlear implants provided to veterans?

Is there a pattern in the rate of new technology provision (receivers vs. those who could benefit) by VISN for cochlear implants?

68% of all cochlear implants were provided to veterans who have a CIC at their local VA medical center. 32% traveled to a medical center different from their "home station" to be implanted at a CIC. Data analysis indicates that the majority of cochlear implantations performed at VA CICs are performed on local veterans. While some patients are implanted from outside the medical center's catchment area, very few are performed on patients outside of the CIC's VISN. VISNs 22, 5 and 20 had the most number of patients to receive a cochlear implant during our 3-year review period.

* *No CIC at this time*

Interviews with various representatives from the VHA system support the premise that there are multiple issues affecting the provision of cochlear implants. Many of these issues relate to the fact that veterans must travel to one of ten cochlear implant centers to be implanted within the VHA system. The provision of cochlear implant technology through one of ten centers within the country pose potential barriers to access, including the following:

- The veteran's ability or desire to undergo long distance travel, as well as the level of effort required by the veteran and his/her family to accommodate the multiple visits required for full assessment, implantation and programming of the device, and
- The potential burden of travel cost on the veteran, should the veteran not be eligible for travel benefits.

Characterize the responses about the role of cost in the provision of new technologies.

During onsite visits and telephone interviews, VA staff reported that there may be access issues related to cost and budget constraints. Some centers have been restricted from performing implants, and a few centers have been given annual limits of implantation.

Performance Measure - How are decisions made on the availability of cochlear implants?

Characterize the decision making process across VISNs

Patients are referred by local Audiologists to CICs, to be evaluated for implantation. Patients are typically sent to a CIC within their VISN if one exists. If not, the veteran is usually sent to the closest CIC, but only if that CIC is accepting patients from outside their VISN and if the CIC has no local restrictions in place. Once a patient is deemed clinically-eligible based on FDA and VA criteria, he or she may receive the surgery through a cochlear implant center or may be placed on a waiting list to be implanted at a CIC. Individual patient-specific decisions on referral and implantation seem to be made by clinicians. Restrictions on the number of procedures seem to be based on local medical center policy.

Characterize the criteria used across VISNs

VA has established candidacy criteria for implantation of cochlear implants. The criteria for a cochlear implant are based on certain medical and audiological criteria, as well as FDA guidelines. The criteria listed below are widely accepted across VA as the guide by which to measure potential candidates.

MEDICAL CRITERIA	AUDIOLOGICAL CRITERIA	OTHER CRITERIA
• No medical contraindications for anesthesia or surgery	• Derives marginal benefits from conventional amplification	• Patient has the cognitive and emotional capacity to adapt to and benefit from implantation
• No active middle-ear disease or infection	• Bilateral severe to profound hearing loss	• Patient displays reasonable and appropriate expectations of potential benefit
• No evidence of disease of Cranial Nerve VIII (Cochlear nerve)	• Speech recognition for open-set sentence identification of 50% or less in the implanted ear or 60% or less binaurally or in the non-implanted ear	• Patient agrees to participate in the treatment and rehabilitative protocol

Performance Measure – Are cochlear implants available to VA patients commensurate with the private sector or other government entities?

How does the rate of cochlear implant provision compare to the non-VA rate?

The estimated rate of provision in the general population is 1.6% to 6.4% compared to a VA percentage range of less than 1%. As stated earlier, we do not know what definition of "eligible" population was used to determine the potential number of candidates in the general population, nor do we know how this subset would compare to the composition of the veteran population.

X. Next Steps

- VA should consider an in-depth analysis of the data reporting systems involved in the capture of clinical procedures such as cochlear implantation. VA should validate the systems in place to identify gaps in the reporting of services provided and procedures performed. Data discrepancies extend from data captured in databases to data collected by Audiology and Surgery.
- VA should continue with national education efforts targeted at Audiologists and the VA medical community to promote awareness and training in cochlear implantation technology and identification of potential candidates.

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XI. AICDs—Introduction

The Booz Allen team evaluated the Automated Implantable Cardiac Defibrillator (AICD) as one of the new technology items utilized in VA

The AICD is a small, lightweight electronic device that is surgically implanted forming a pocket in the chest wall under the skin. It is made up of a pulse generator that delivers a powerful shock to the heart muscle, electrodes to sense the rhythm of the heart and a computer that tells the AICD when to discharge the shock. The pulse generator is inserted under the skin in the chest wall, the electrodes are inserted into the heart through veins, and the pulse generator is surgically placed under the skin of the abdomen or chest.

The typical candidate for an AICD is assessed with an electrophysiological study (EPS) to measure the vulnerability of the heart. An "EPS" is a test that evaluates the electrical system of the heart. The electrical system is a network or pathway through which impulses pass that direct the heart rate and rhythm of the heart. This procedure is nonsurgical and performed under X-ray, typically in an "EPS" Laboratory or in a Cardiac Catheterization Lab. The doctor stimulates the heart with small electrical signals to make it beat at various rates. If an irregular heart rhythm is induced in the patient and deemed to be dangerous, such as ventricular tachycardia, the patient may be considered for either antiarrhythmic drug therapy or an AICD implantation. If there is a recurrent tachycardia (rapid heart rate) that is poorly controlled by drugs, then an AICD becomes an option. Ventricular tachycardia is widely noted for being the forerunner to sudden death. Other potential candidates have structural defects of the heart, including massive dilation or excessive thickening of the heart muscle, i.e., hypertrophic cardiomyopathy (HCM), and are at high risk for arrhythmias.

When a life threatening rhythm is detected, the AICD sends an electrical shock to restore a normal rhythm. It will continue to monitor the heart's rhythm, but does not cure the heart rhythm disturbance. AICDs have been used for over 20 years, and have proven to be 99% effective in restoring the heart rhythm to normal, and in preventing sudden death.[1] The newer AICD units can be implanted without major surgery, and the cardiologist typically evaluates whether the risks outweigh the benefits.

AICDs prolong life for those at high risk for sudden death, thereby improving the overall quality of life. Many of these recipients do not require additional drugs which can cause side effects, and many have a peace of mind knowing that their hearts' rhythm will be restored to normal with an AICD. However, according to Duru F et al., some AICD recipients do experience anxiety about the technical problems.[2] In addition, according to the Antiarrhythmics vs. Implantable Defibrillator (AVID) study investigators, AICD treatment results in lower mortality than antiarrhythmic drug therapy among patients resuscitated from ventricular fibrillation or sustained ventricular tachycardia.[3] AICDs are considered a life-saving device for those with hypertrophic cardiomyopathy, and may be considered the treatment of choice for patients who are at high risk for sudden cardiac death. [4]

XII. AICDs—Methodology

The AICD study methodology includes literature review, interviews with VA staff and data analysis

The Booz Allen team conducted a literature review to determine prevalence rates of medical conditions that would warrant an AICD implantation. We also researched the utilization of AICD technology in the general population. We explored journal research to identify potential barriers to access in the non-VA sector. To compare utilization of AICD implantation in VA to that of the general population, the Booz Allen team developed a methodology in collaboration with the Program Chief for Cardiovascular Diseases at VA Central Office. Together, we defined the "eligible" population that may benefit from an AICD implantation by utilizing the clinical criteria applied by both the Medicare program and VA. These clinical criteria have corresponding patient diagnosis codes, and patient record information can be tracked within VA databases by these codes, which are recorded as variables.

We also created a list of patients who had received an AICD by searching the data by procedure code and by the NPPD code for an AICD device. We compared the estimated number of patients who could benefit from an AICD to the number of patients who had received an AICD during fiscal years 1998, 1999 and 2000 to develop an estimated rate of utilization for this technology within VA.

In addition to the literature review and data analysis, the team spoke with various representatives from PSAS, Cardiology and Electrophysiology services through site visits and telephone interviews. The Booz Allen team visited the following VAMCs:

- Hines, IL
- Atlanta, GA
- New York, NY
- Richmond, VA
- Seattle, WA
- Miami, FL
- West Palm Beach, FL

We identified limitations in our methodology related to both literature review and data analysis

Our literature review indicates a lack of data on prevalence rates for a combination of all of the diagnoses that we have defined as our "eligible" population. While prevalence rates for individual cardiac conditions exist, a truly comparable population of patients who suffer from any one of the selected diagnoses is not available in the literature.

Furthermore, a diagnosis of any one of the Medicare covered criteria does not necessarily mean an individual is a likely candidate. It provides a snapshot of all people who could *potentially* benefit, but without a review of the patient's clinical record, one cannot assume that the individual would be an appropriate candidate for implantation. For example, significant co-morbidities such as terminal cancer or severe pneumonia would preclude a patient from being a candidate for implantation. The number of records of patients within VA who had at least one of the defined Medicare-approved diagnoses exceeded 25,000 per year.

The Booz Allen team developed additional measures to address these limitations. We met with the National Program Chief of Cardiology to further refine the "eligible" population by extracting patients based on diagnoses that would preclude implantation, such as terminal cancer and dementia. The number of patients with these types of diagnoses was insignificant, compared to the total number of patients

already identified. We did not continue with this extraction, due to the lack of impact on the total number.

The team then extracted patients who have had a diagnosis of "cardiac arrest" to provide a considerably refined number of veterans who could benefit from an AICD. While this number does not include all potential candidates, it does provide an indication of the number of veterans who have already suffered cardiac arrest, the prevention of which is a major goal of AICD implantation. Furthermore, by selecting a specific diagnosis, we are able to analyze literature review findings on cardiac arrest prevalence rates and utilization of AICDs in the general population. This affords a more reasonable comparison of prevalence and utilization rates between VA and general populations.

XIII. AICDs—Findings

FINDINGS FROM LITERATURE REVIEW

The Booz Allen team reviewed literature related to the prevalence, utilization, and issues affecting utilization

The Booz Allen team reviewed medical journals regarding public- and private-sector studies and identified several themes related to AICDs including: prevalence, utilization and issues affecting utilization.

Prevalence and Utilization

The AICD protects those at risk from severe ventricular tachycardia, which kills 500,000 people in a year in the U.S.[5] During ventricular tachycardia, the 2 bottom chambers of the heart beat too quickly, which results in a lethal irregularity in the heart's rhythm (arrhythmia) and can lead to sudden cardiac death. The rapid arrhythmia of the ventricles leads to a decreased blood flow throughout the body, which often results in loss of consciousness and death. It is estimated that 450,000 to 500,000 people in the U.S. die from sudden cardiac death annually.[6]

People who suffer from both coronary artery disease and an arrhythmia are at higher risk for sudden cardiac death and may benefit from an AICD, according to Dr. Prystowsky of the North American Society of Pacing and Electrophysiology.[7] Patients with an arrhythmia may have an irregular heart rhythm and show no symptoms. For patients who have had heart attacks, electrophysiology studies can determine the level and type of a patient's arrhythmia. An AICD implantation is considered "primary" prevention of sudden death for patients who are considered high-risk: patients with a history of coronary heart disease and a detectable arrhythmia of ventricular tachycardia.[7] Patients who have already suffered cardiac arrest would be strong candidates for AICDs, and an implantation for these patients is considered "secondary" prevention, as the AICD would prevent a subsequent cardiac arrest.[7]

Currently, more than 500,000 Americans have hypertrophic cardiomyopathy (HCM), and nearly 50,000 of them are at risk for sudden cardiac death.[8] In 1998, there were 30,000 new AICDs implanted in the U.S. [9] A different source estimates that in 1998, 25,973 AICD implantation procedures were performed on Medicare patients.[10] The Cardiac Arrhythmia Patient Outcomes Research Team (PORT) documented increases over time in specialized testing and use of the AICD in arrhythmia patients. They found that AICDs and the drug Amiodarone both improved survival, yet those treated with an AICD had an

improved quality of life. [11] The number of AICDs implanted are expected to increase based on the several studies demonstrating the survival benefit of AICDs in specific high-risk patients. One source from 2000 reported an estimated 250,000 AICD procedures performed in the U.S.[10]

Issues affecting Utilization

There have been several randomized clinical trials that have affected the utilization of AICDs. These trials also clarify the roles of AICDs and drug therapy in the prevention of sudden cardiac death, and make several conclusions relating to cost, mortality rates, and alternative options. AICDs were initially considered a treatment of last resort, but as a result of several important research studies, indications for AICD therapy have greatly expanded, thereby extending insurance coverage as well.

CIDS (Canadian Implantable Defibrillator Study): This study reported patients with coronary heart disease, a reduced left ventricular ejection fraction and inducible sustained ventricular tachyarrhythmias benefited from the prophylactic implantation of the defibrillator.[12]

MADIT (Multicenter Automatic Defibrillator Implantation Trial): The study examined patients who received an AICD or amiodarone therapy. A cost benefit analysis was conducted showing a very high cost per year of life saved by AICD. In patients with resuscitated ventricular fibrillation or ventricular tachycardia, use of an AICD was less economically attractive for prolonging survival than was the use of amiodarone. [13, 14]

AVID (Antiarrhythmics vs. Implantable Defibrillator): This study showed that ICD therapy was superior to drug therapy for reducing death in survivors of ventricular fibrillation.[15] This study is also the first study to prospectively examine the cost-effectiveness of ICDs for secondary prevention in the U.S. The study concluded that ICDs are moderately cost-effective, but stated that further study is necessary in order to determine best practices.

CABG (Coronary Artery Bypass Graft) Patch Trial: Patients in this study had not experienced a sustained ventricular tachycardia (VT), but were thought to be high risk for sudden death. They had coronary artery disease and severely suppressed left ventricular ejection fraction. These patients did not benefit from an AICD due to the influence of revascularization on ischemic and left ventricular function. [16]

CASH (Cardiac Arrest Study in Hamburg): The purpose was to compare the incidence of recurrence of cardiac arrest, sudden cardiac death, cardiac mortality, and total mortality in patients treated with antiarrhythmic drugs versus AICDs. Preliminary results showed that propafenone treatment is less effective than AICD treatment. No sudden death or cardiac arrest occurred in the AICD group compared with sudden deaths or cardiac arrests in the propafenone group. This clinical trial revealed that AICD therapy significantly reduced sudden cardiac deaths compared with conventional drug therapy in patients who had survived a prior episode of cardiac arrest. [17]

MUSTT (Multicenter Unsustained Tachycardia Trial): This trial included patients with a history of coronary heart disease, decreased heart function and nonsustained ventricular tachycardias. Study results demonstrated a reduction in sudden cardiac death in high-risk heart attack patients who had undergone EPS testing and received a cardiac defibrillator, compared to patients who receive medications only. The study indicated that AICDs may be considered in some populations as a first line therapy to prevent sudden cardiac death.[18]

MADIT II: The study showed that the AICD was beneficial when it was added to effective drug therapy for heart failure. The substantial benefit of the prophylactic implantation of a defibrillator was smaller than in other trials because it used inducible sustained ventricular tachyarrhythmias as a selection criterion. However, researchers concluded that the mortality rate in the cohort who received an AICD was 31% lower than those who received conventional drug therapy, indicating that AICD treatment prolongs survival in patients.[14] The results of this study promote the prophylactic use of defibrillators.

Four of these trials found strong evidence that the AICD reduces mortality in those with heart failure who have experienced a cardiac arrest. The AVID, MADIT and MUSTT studies showed that patients would benefit from an AICD. The CABG-Patch Trial found that the AICD had no benefit, showing that an AICD is not advantageous in every high-risk coronary subgroup. The MADIT II, the most recent trial, showed that the AICD is beneficial when it was added to effective drug therapy for heart failure. According the New England Journal of Medicine, the trial represents a substantial advance for AICDs, yet indicates that more careful screening of potential candidates for the AICD would decrease risk of complications, inconvenience, and expense.[14]

Cost

AICDs have proven to be moderately cost-effective among patients trying to avoid another life threatening event. [19] One study compares the use of AICDs with drug therapy among patients who had at least one life threatening heartbeat irregularity. After examining costs for initial and additional hospitalizations, surgery costs and antiarrhythmic drugs, the inpatient costs were the most costly. However, cost-effectiveness was measured against survival rates; therefore, the longer the life expectancy associated with AICDs, the more cost-effective the AICD became. According to Larsen, a Portland VA Medical Center cardiologist, "Anything below $50,000 per year of life saved is generally considered a bargain." He believes that AICD therapy remains costly, but not out of reason relative to its benefits. [19] The AICD was proven more cost effective compared to amiodarone drug therapy among patients who had experienced an episode of ventricular tachycardia or fibrillation when considering the survival rate and number of years added to one's life expectancy. [11, 12, 20]

According to presenters at the 23rd Annual Scientific Sessions of the North American Society of Pacing and Electrophysiology (NASPE), telemedicine home monitoring can be provided to those who receive an AICD by transmitting routine and urgent information about their cardiac health through the telephone. Such transmissions can replace some device checkups. The new home monitoring technique presented could potentially save millions of healthcare dollars. [21]

Insurance Coverage

Insurance coverage plays a role when the patient and physician are deciding whether or not to utilize an AICD. According to Richard N. Fogoros, M.D., insurance companies do not want to spend additional healthcare dollars on treatment of sudden death, as the options are extremely costly.[1] Yet, Medicare does cover an AICD when patients meet specific clinical conditions.

If a patient has any complications following implantation, Medicare will also provide coverage if the device needs need to be removed or replaced. All EPS evaluations related to the AICD are also covered. Medicare regulations stipulate that the AICD utilized be approved by the FDA. [22] Aetna U.S. Healthcare's policy also covers FDA-approved AICDs for similar conditions as Medicare. Aetna's coverage goes into more detail than Medicare, specifically addressing those criteria that preclude a patient from receiving an AICD. [23]

Although Medicare reimbursement for AICDs has increased over time, AICD manufacturers still consider the current payment rate inadequate, especially for the newer technology, and anticipate that the most advanced products will still be underpaid.[10] Since Medicare beneficiaries tend to be at higher risk for heart disease than younger populations, indications for Medicare payment have important implications for overall patient access to AICDs.

In summary, health insurance coverage from the private and public sectors impacts the utilization rates of AICD recipients. If health insurance did not provide coverage, the high cost of an AICD, as well as the high costs related to possible complications, could deter a patient from choosing this option. In addition, these factors also influence providers who may offer this option to a potential candidate. However, there has been considerable growth in volume of initial and replacement AICD procedures performed for Medicare patients, indicating that although reimbursement may be considered inadequate, it does not seem to restrain utilization.[10]

FINDINGS FROM VA DOCUMENTATION/POLICY REVIEW

VA has not established formal guidelines for AICD candidacy, however staff closely follow Medicare criteria for implantation

Although VA has no formal or specific written criteria on candidacy for AICDs, VA follows coverage criteria similar to that of the Medicare program, according to the Program Chief for Cardiovascular Diseases at Central Office. VA also follows guidelines established by the American College of Cardiology and the North American Society of Pacing Electrophysiology. The clinical requirements currently recognized by Medicare require eligible candidates for AICD implantation to have one of the following diagnoses, and each diagnosis can be classified by a diagnosis code:

- A documented episode of life-threatening ventricular tachyarrhythmia or cardiac arrest not associated with myocardial infarction
- A documented episode of cardiac arrest due to ventricular fibrillation not due to a transient or reversible cause
- Ventricular tachyarrhythmia, either spontaneous or induced, not due to a transient or reversible cause
- Familial or inherited conditions with a high risk of life-threatening ventricular tachyarrhythmias such as long QT syndrome or hypertrophic cardiomyopathy
- Symptomatic, drug refractory, paroxysmal atrial fibrillation

AICDs are provided to veterans at VA medical centers that have the appropriate technological capability, such as electrophysiology services and trained medical and surgical staff. If a veteran's local medical center does not provide the service, veterans may either be referred to another VA medical center that provides this service, or, depending on the patient's medical status and need for the procedure, the implantation may be performed at a local private medical center through fee basis or a sharing agreement. The cost of the AICD device typically comes out of the PSAS budget.

FINDINGS FROM SITE VISITS

The Booz Allen team conducted site visits to the seven VA medical centers listed and conducted telephone interviews with cardiology and electrophysiology staff from selected medical centers across the country. During our site visits we interviewed both PSAS and Cardiology staff about the process of AICD implantation and potential barriers to access. The findings from these interviews were similar across sites, and further input from the National Program Chief for Cardiovascular Diseases suggested that contacting staff from each VISN might not yield any new information. As a result we did not interview staff from each VISN, as the responses to our questions were nearly identical.

The decision to implant a veteran is based on clinical criteria

Each staff member interviewed from the Cardiology and Electrophysiology service reported that the clinical eligibility criteria used by their medical services were identical to those covered by Medicare. Cardiology staff at sites that do not perform AICD implantation reported that they are aware of the clinical indicators that indicate a need for AICD implantation, and refer the patient accordingly.

Veterans may receive AICD services through non-VA providers, when necessary

Not all VA medical centers have the capability of providing AICD services. If a veteran needs electrophysiology diagnostic services to determine clinical need for an AICD, or if a veteran is in need of the implantation procedure, he or she may be referred to another VA medical center with the appropriate AICD service offering. Cardiology staff at various medical centers report that a member of the referring Cardiology service communicates with staff at the Cardiology service of the implanting site to facilitate the medical and surgical care of the veteran. If travel is required, the veteran is also referred to the travel benefits program at the referring medical center.

VA staff report that in some cases, the patient's medical status may be too urgent and would not withstand the travel necessary to obtain AICD services from a VA facility. For these patients, AICD services are provided on a fee-basis, in which the entire procedure is performed at a private hospital and VA pays for the service. Other staff reports that their medical centers have established "sharing agreements" with local teaching hospitals, in order to provide their veterans with services that are not available at their facility. These sharing agreements vary depending on the medical center, but many involve the shared provision of services between VA and the teaching hospital. Staff reports that the benefits of such sharing agreements are typically shared by both sides. In some cases the teaching hospital may benefit from special VA discounted rates for the cost of implants and other medical devices. In other cases VA medical staff are able to utilize resources of the private hospital to provide services they otherwise may not be capable of providing through VA, such as electrophysiology capabilities to perform AICD implantations.

Staff report that travel requirements in some areas may deter some veterans from seeking an AICD implant

Cardiology staff from a few sites reported that for those veterans who are not in urgent need of an AICD and could medically handle the travel necessary to reach a VA facility that does provide AICD services, the cost and extent of travel could become an onerous burden. Although these staff members report that they intercede on the veteran's behalf to seek travel benefits, they claim that this is often time-consuming and not always successful. One staff member reported that the nearest VA center providing AICD services is a 10 hour drive or a 1 hour flight, and for veterans who cannot afford the airfare and do not

have the ability to travel by car for 10 hours, access can be an issue. According to this Cardiology representative, the veteran may choose to not pursue the implantation, despite the fact that an AICD can serve as a significant prevention tool for cardiac arrest.

Both PSAS and Cardiology/Surgery staff reported on issues relating to NPPD

PSAS staff from a few sites reported that data on AICD devices is not being captured in the NPPD, because the non-PSAS staff ordering the device is not entering data into the prosthetics database. They report that the failure to capture accurate volume data within NPPD will impact cost reports and budget projections. They further suggested that this impact could be large, considering the high cost of AICDs. One PSAS staff member stated that a representative from the Surgical team was trained by PSAS staff on entering data into NPPD, but the data is still not being captured.

Some Surgery staff offered their views on the requirement to enter data into NPPD. These staff members reported that their service was lacking clerical support and that they had significant patient care responsibilities, preventing them from prioritizing data entry into NPPD. They reported that they enter the data as time permits, but that the current structure of data reporting does not seem practical.

Other sites reported no issues at all with entering AICD data into NPPD. These sites typically had a PSAS liaison who worked with the Surgical service, or a Surgical liaison who worked with the PSAS service, to ensure that all data was entered appropriately.

FINDINGS – DATA ANALYSIS

Booz Allen reviewed various VA databases to obtain information on the provision of AICDs for fiscal years 1998, 1999 and 2000

Booz Allen received patient records from VA's NPPD, PTF, and OPC files. These files represent care, treatment and supplies provided to veterans for fiscal years 1998 through 2000. All data was merged into one file and analysis was conducted on the aggregate. Care was taken to eliminate overlap between different databases, and to ensure an accurate total of VA patients who received an AICD. The team worked with the Program Chief for Cardiovascular Diseases at VA Central Office to determine the appropriate procedure codes by which to identify an AICD implantation procedure. We searched the PTF and OPC databases to produce a list of patients for fiscal years 1998, 1999 and 2000 who had undergone the implantation procedure. Furthermore, we searched for patients who had received an AICD device through the NPPD for the same years, to supplement our data.

We also searched both the PTF and OPC databases on diagnosis information for the number of patients who may qualify as an AICD implant candidate based on the existence of selected diagnosis codes, and unduplicated the records to create a catalog of patients who would serve as our "eligible" population.

Fewer than three percent of "eligible" veterans received an AICD when using Medicare coverage criteria as the definition of eligible population

Within the three-year period reviewed by Booz Allen, VA provided 2,392 AICDs. For fiscal years 1998, 1999 and 2000, extraction of data on patients who have been diagnosed with any one of the six diagnoses approved by Medicare as a covered condition for AICD implantation, the "eligible" population produced

over 87,000 patients. [1] The percentage of veterans who receive an AICD has been stable across the years reviewed. Table 21 provides the total number of veterans receiving an AICD by year.

Table 21—AICDs Provided By Year

YEAR	ELIGIBLE VETERANS	VETERANS RECEIVING AN AICD	% OF VETERANS WHO RECEIVED AN AICD
1998	26,990	753	2.8%
1999	28,163	740	2.6%
2000	32,070	899	2.8%
Total	87,223	2,392	2.7%

Without a comparable utilization rate of AICDs in the general population, we cannot determine whether these rates of utilization are realistic. Literature review findings suggest that true candidacy is based on individual medical conditions, such as each patient's clinical picture, and is more complex than assignment of established diagnosis codes. The implantation of patients with Medicare-approved diagnoses would be considered "primary" prevention, as described in the literature review. These patients may opt for antiarrhythmic drug therapy, or may choose to monitor the arrhythmia over time and do nothing. Therefore, we project that the "eligible" population presented here grossly overestimates the number of veterans who may be appropriate candidates for an AICD.

The distribution of AICDs is relatively constant across VISNs. Each of the 21 VISNs within VA's network provided veterans with AICDs. VISN 2 provided the fewest number of AICDs (29, and VISN 16 provided the most (349). The remaining 19 VISNs all fall within one standard deviation (60.9) of the mean (114). The range of these remaining values is 61 to 151. **Appendix E** provides a detailed breakdown of the distribution of AICDs by year and by VISN.

Little Rock Arkansas provided more AICDs than all other VISNs

Seven individual facilities accounted for over one third of all AICDs distributed. These seven facilities provided 810 of the 2,392 AICDs released between 1998 and 2000. By itself, Little Rock performed more AICD implantations than all of the VISNs (except VISN 16 to which Little Rock belongs). The breakdown of the volume per year for these seven facilities is presented in Table 21 on the following page.

[1] *Eligible population was based on qualifying diagnosis codes, and did not include the elimination of patients who had a co-occurring disqualifying diagnosis. Patients with a disqualifying diagnosis were not removed because their number was too small to have an impact on our analysis. Results from a partial review of the eligible population (>30,000 within each year) indicated removal of these patients would result in less than .01 of a percent change in our results*

Table 22 – VAMCs with High Volume of AICD Implantation

VISN	STATION	1998	1999	2000	TOTAL
16	Little Rock, AK	45	65	56	166
16	Houston, TX	17	44	66	127
6	Richmond, VA	31	34	42	107
17	Dallas, TX	40	30	35	105
19	Salt Lake City, UT	43	23	37	103
20	Portland, OR	38	31	33	102
4	Pittsburgh, PA	16	42	42	100

A slightly greater number of AICDs were distributed in 2000 than was distributed in the two preceding years

Overall data suggests that the number of AICDs provided increased over time. In 2000, 899 AICDs were distributed in contrast to 753 in 1998 and 740 in 1999. An in-depth view of this trend indicates that the facilities performing the highest volume of AICD implantation showed an increase in the number of AICDs distributed between 1998 and 2000. However, there were several facilities whose volume remained equal or were reduced during this time period. This data as well as VISN and Year totals are provided in Appendix E.

The average age of veterans receiving AICDs is 66 years

Data fields for age were complete for 54% of patients identified as having received an AICD implant. The oldest AICD recipient during the 3-year review period was 88 years, while the youngest was 23 years. Very few implant recipients were under the age of 40 (0.8%) and the majority of AICD recipients were over the age of 65 (58%). A significant portion of veterans fell into the 45-64 age group (39%).

The average cost per item of the AICD device was $19,950

Cost data for the implant device was present for 1% of the total number of records associated with an AICD implant. Cost of the device is not available in the PTF, and AICDs were not consistently recorded in NPPD prior to 2000. The number of records available in NPPD was small, and the average cost provided here may not be a strong indicator, as the average represents a very small percentage of the total implants distributed by VA.

Despite the paucity of cost data related to the device, our research shows that the average cost of an AICD device in the private sector is approximately $20,000, which is similar to the VA cost data.

The Booz Allen team reviewed cost data obtained through the Decision Support System (DSS) database

We reviewed the cost information available in DSS to determine its application to our data analysis. It was determined that the DSS data reports provided to Booz Allen did not include information on all AICD implantation procedures performed within VA. Rather than using the cost data to draw comparisons, we decided to provide examples of cost per AICD implant case, to illustrate variance in cost among different facilities.

AICDs

The data from DSS included the cost of the implant device as well as other costs associated with an implantation. Cost calculations included variables such as direct and indirect nursing costs, laboratory, radiology, pharmacy, physician fees (staff and contracted), supplies, etc. The cost data in DSS includes hospital overhead and depicts a picture of "total" cost for the procedure. These costs represent individual patient cases, which will vary according to the different ancillary services provided to the patient. The costs would be further impacted by the patient's health status and any complications that may have occurred, which required additional care and services. Many records were excluded from our analysis because the field for cost of implant was missing.

Table 23 – Sample cost data for AICD procedures

SITE	YEAR	COST
Ann Arbor HCS	1998	$43,531
Omaha Division--Central Plains Heath Network (includes Lincoln)	1998	$79,952
Central AR Veterans HCS Little Rock	1999	$51,895
Upstate NY--Buffalo, Batavia	1999	$28,508
Dallas, TX	1999	$47,322
Durham, NC	1999	$52,007
Ann Arbor HCS	2000	$69,186
Salt Lake City HCS	2000	$23,417

Data limitations and issues with data integrity should be considered when reviewing data analysis findings

Any correlations or conclusions developed through our data analysis should take into consideration certain VA data limitation issues that were identified as part of our review. Several analyses have been qualified with constraints of incomplete data. For example, VA provided AICD device cost data for only 1% of the total volume of implants. It is our understanding that the volume of AICD implants was not tracked in NPPD until 2000, yet the 2000 records are also incomplete.

For total AICD case cost as tracked in DSS, the majority of records did not include the cost of the implant, which can be a significant portion of the total case. We did not use these incomplete records when reporting on procedural costs. The DSS reports also did not include many patients identified as having received an implant, because the dates of service used to match those patients' scrambled social security numbers with encounters with the system did not correlate.

Additionally, we had data on patient's age for 54% of the total number of patients implanted. Data from both NPPD and PTF were used to glean age-related information. Neither database consistently captured age data.

XIV. Summary of AICD Findings

In summary, the Booz Allen team addressed the performance measures provided by VA by determining results to applicable analysis metrics.

Performance Measure - Rate of AICDs in patients who would benefit by implantable rehabilitative devices

What is the percent of VA patients who received AICDs compared to those who would benefit?

We developed an estimate of the number of patients who may benefit from an AICD using the diagnosis codes approved by Medicare for coverage of an AICD implant. This estimate may be greatly overstated, as it is impossible to know a patient's true candidacy without examining the medical record for each patient's history and clinical picture.

Table 24 – Percent of Eligible Veterans Receiving AICD

YEAR	ELIGIBLE VETERANS	VETERANS RECEIVING AN AICD	% OF VETERANS WHO RECEIVED AN AICD
1998	26,990	753	2.8%
1999	28,163	740	2.6%
2000	32,070	899	2.8%
Total	87,223	2,392	2.7%

By VISN.

Our estimates of "eligible" veterans were derived from the combination of various inpatient and outpatient databases at a national level. Actual utilization by VISN is provided below to illustrate the distribution of AICD patients across VISNs.

Table 25 – AICD Utilization by VISN

VISN	TOTAL
All VISNs	*2392*
VISN 1	123
VISN 2	29
VISN 3	109
VISN 4	112
VISN 5	61
VISN 6	141
VISN 7	77
VISN 8	108
VISN 9	112
VISN 10	118

VISN	TOTAL
VISN 11	151
VISN 12	107
VISN 15	69
VISN 16	350
VISN 17	136
VISN 18	68
VISN 19	109
VISN 20	103
VISN 21	91
VISN 22	108
VISN 23	110

Compare with non-VA percent of patients.

While there are several studies on the efficacy of AICD implantation and several more on arrhythmias, there are no established prevalence rates for patients who may benefit from an implant. We estimated utilization of AICDs in the general population by using the number of people in the US who die of severe ventricular tachycardia a year (500,000) and applied the number of patients in 1998 who received an AICD (30,000).

Although severe ventricular tachycardia is a common thread in the clinical criteria established by the FDA for clinical candidacy, our use of this number underestimates the true number of potentially eligible people in the US, since this is the number of people who died from this diagnosis. A direct comparison to VA rates of utilization would be inaccurate. Our estimate of the utilization rate of AICDs in the general population is 6%.

Performance Measure - How does cost affect the availability of AICDs provided to veterans?

Is there a pattern in the rate of new technology provision (receivers vs. those who could benefit) by VISN for AICDs

Each of the 21 VISNs within VA's system provided veterans with AICDs. VISN 16 provided the greatest number of AICD implants, with medical centers in Houston, TX and Little Rock, AK providing the highest volume within the VISN. VISN 16 provided more than twice the number of AICDs as that of the VISN with the next highest volume, VISN 11. VISN 2 provided the fewest AICDs.

Characterize the responses about the role of cost in the provision of new technologies.

During interviews, several staff members stated that cost does not appear to play a role in the decision making process. PSAS staff reported that they typically are not aware of AICD implantations until the patient has already been implanted. If a medical center does not have the capability to implant a patient, veterans are referred to other VA medical centers. If the distance is too great or the patient cannot tolerate the travel, the veteran may be referred to non-VA providers, and the procedure is paid on a fee basis.

Performance Measure - How are decisions made on the availability of AICDs?

Characterize the decision making process across VISNs

Clinical staff within VA consistently reported that the decision to implant a patient is based on medical necessity and clinical criteria. The primary decision maker is the veteran's physician, who refers the patient to the appropriate EPS or Cardiology service for workup and implantation.

Characterize the criteria used across VISNs

VA clinicians utilize Medicare coverage criteria. Once a patient is identified as a candidate for implantation, the appropriate clinical specialties communicate with each other to make the appropriate referrals or to provide the procedure. All criteria are clinical in nature.

Performance Measure - Are AICDs available to VA patients commensurate with the private sector or other government entities?

How does the rate of AICDs provision compare to the non-VA rate?

The estimated rate in the general population is 6% as compared to less than 3% in VA. However, the estimate used for the general population included a potentially underestimated eligible population, while the estimate for VA included an overestimated eligible population.

XV. Next Steps

- VA should conduct data integrity reviews of clinical databases to ensure accurate recording of procedures and implant devices.

- VA should establish formal guidelines for AICD candidacy to standardize the selection of candidates across the VHA system. These formal guidelines should incorporate published guidelines which are currently followed by VA, including those established by the American College of Cardiology, the North American Society of Pacing Electrophysiology and Medicare criteria for implantation.
- VA should evaluate the establishment of clinical practice guidelines advocating AICD implantation as the treatment of choice for veterans presenting with sudden cardiac death.

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Appendix A- Number of Blind Veterans Per Facility By Year *

VISN	Location	Home Station	1998	1999	2000	Total Blind
1	***Total***		***27***	***87***	***97***	***211***
	Togus, ME	402	5	3	6	14
	White River Jct., VT	405	0	1	2	3
	Boston, MA	523	13	38	42	93
	Brockton, MA	525	0	1	0	1
	Manchester, NH	608	1	5	6	12
	Northampton, MA	631	0	0	2	2
	Providence, RI	650	2	12	3	17
	West Haven, CT	689	6	27	36	69
2	***Total***		***9***	***23***	***15***	***47***
	Albany, NY	500	2	8	6	16
	Bath, NY	514	0	1	0	1
	Buffalo, NY	528	5	6	4	15
	Syracuse, NY	670	1	8	2	11
	Bath, NY	757	1	0	3	4
3	***Total***		***6***	***16***	***16***	***38***
	Brooklyn, NY	527	2	4	0	6
	East Orange, NJ	561	1	2	6	9
	New York, NY	630	2	9	7	18
	Northport, NY	632	1	1	3	5
4	***Total***		***5***	***31***	***34***	***70***
	Coatesville, PA	542	0	1	1	2
	Erie, PA	562	0	1	0	1
	Lebanon, PA	595	1	7	12	20
	Philadelphia, PA	642	2	12	11	25
	Pittsburg, PA	646	1	4	7	12
	Wilkes Barre, PA	693	1	6	3	10
5	***Total***		***10***	***19***	***22***	***51***
	Baltimore, MD	512	6	9	7	22
	Martinsburg, WV	613	1	0	0	1
	Washington, DC	688	3	10	15	28
6	***Total***		***18***	***21***	***36***	***75***
	Beckley, WV	517	0	1	1	2
	Durham, NC	558	3	10	13	26
	Fayeteville, NC	565	2	1	9	12
	Hampton, VA	590	6	2	5	13
	Asheville, NC	637	0	0	1	1
	Richmond, VA	652	3	2	3	8
	Salem, VA	658	3	1	1	5
	Salisbury, NC	659	1	4	3	8
7	***Total***		***38***	***78***	***76***	***192***
	Atlanta, GA	508	8	16	16	40
	Augusta, GA	509	4	13	14	31
	Birmingham, AL	521	18	24	24	66
	Charleston, SC	534	5	12	14	31
	Columbia, SC	544	0	5	5	10
	Des Moines, IA	555	1	6	2	9
	Montgomery, AL	619	2	1	0	3
	Tuscaloosa, MS	679	0	1	1	2
8	***Total***		***51***	***92***	***122***	***265***

VISN	Location	Home Station	1998	1999	2000	Total Blind
	Bay Pines, FL	516	10	25	38	73
	Miami, FL	546	2	12	13	27
	West Palm Beach, FL	548	11	11	6	28
	Gainesville, FL	573	18	29	30	77
	Lake City, FL	594	1	0	0	1
	San Juan, PR	672	6	6	13	25
	Tampa, FL	673	3	9	22	34
9	***Total***		***26***	***38***	***45***	***109***
	Huntington, WV	581	5	9	17	31
	Lexington, KY	596	2	1	5	8
	Louisville, KY	603	11	16	8	35
	Memphis, TN	614	5	6	1	12
	Mountain Home, TN	621	0	2	5	7
	Nashville, TN	626	3	4	9	16
10	***Total***		***9***	***17***	***31***	***57***
	Chilicothe, OH	538	0	2	0	2
	Cincinnati, OH	539	0	1	2	3
	Cleveland, OH	541	7	12	25	44
	Dayton, OH	552	2	2	4	8
11	***Total***		***12***	***26***	***21***	***59***
	Ann Arbor, MI	506	2	1	4	7
	Danville, IL	550	1	1	3	5
	Detroit, MI	553	2	12	7	21
	Indianapolis, IN	583	6	11	7	24
	Ft. Wayne, IN	610	1	1	0	2
12	***Total***		***9***	***24***	***25***	***58***
	Chicago (Westside), IL	537	0	5	4	9
	Hines, IL	578	9	19	18	46
	Tomah, WI	676	0	0	2	2
	Milwaukee, WI	695	0	0	1	1
15	***Total***		***18***	***29***	***37***	***84***
	Wichita, KS	452	2	6	2	10
	Columbia, MO	543	0	0	1	1
	Kansas City, MO	589	14	10	27	51
	Marion, IL	609	0	5	1	6
	St. Louis, MO	657	2	8	4	14
	Topeka, KS	677	0	0	2	2
16	***Total***		***27***	***40***	***75***	***142***
	Biloxi, MS	520	0	2	0	2
	Houston, TX	580	18	11	29	58
	Jackson, MS	586	0	3	3	6
	Muskogee, OK	623	4	5	11	20
	New Orleans, LA	629	1	11	14	26
	Oklahoma City, OK	635	3	5	13	21
	Shreveport, LA	667	1	3	5	9
17	***Total***		***9***	***10***	***115***	***134***
	Dallas, TX	549	5	5	27	37
	San Antonio, TX	671	4	2	85	91
	Waco, TX	674	0	3	3	6
18	***Total***		***22***	***28***	***27***	***77***
	Albuquerque, NM	501	8	6	6	20
	Amarillo, TX	504	1	2	3	6

VISN	Location	Home Station	1998	1999	2000	Total Blind
	Phoenix, AZ	644	7	6	4	17
	Prescott, AZ	649	0	0	1	1
	Tucson, AZ	678	6	14	13	33
19	***Total***		***18***	***24***	***47***	***89***
	Ft. Harrison, MT	436	2	1	2	5
	Cheyenne, WY	442	0	1	0	1
	Denver, CO	554	12	14	29	55
	Grand Junction, CO	575	0	0	1	1
	Salt Lake City, UT	660	4	8	15	27
20	***Total***		***22***	***74***	***66***	***162***
	Anchorage, AK	463	0	0	2	2
	Boise, ID	531	3	4	3	10
	Portland, OR	648	5	13	8	26
	Roseburg, OR	653	0	2	0	2
	Seattle, WA	663	7	35	34	76
	Spokane, WA	668	6	15	12	33
	Walla Walla, WA	687	0	4	6	10
	White City, OR	692	1	1	1	3
21	***Total***		***28***	***51***	***48***	***127***
	Honolulu, HI	459	0	1	0	1
	Fresno, CA	570	7	14	7	28
	Martinez, CA	612	0	3	3	6
	Palo Alto, CA	640	7	14	15	36
	Reno, NV	654	2	4	12	18
	San Francisco, CA	662	12	15	11	38
22	***Total***		***63***	***94***	***80***	***237***
	Las Vegas, NV	593	2	3	11	16
	Long Beach, CA	600	7	10	10	27
	Loma Linda, CA	605	23	32	12	67
	San Diego, CA	664	12	24	7	43
	Sepulveda, CA	665	9	0	3	12
	Los Angeles, CA	691	8	20	24	52
	Sioux Falls, SD	756	2	5	13	20
23	***Total***		***3***	***0***	***58***	***61***
	Sioux Falls, SD	438	0	0	0	*0*
	Ft. Meade, SD	568	0	0	2	*2*
	Iowa City, IA	584	0	0	2	*2*
	Minneapolis, MN	618	2	0	49	*51*
	St. Cloud, MN	656	0	0	1	*1*
	Lincoln, NE	636	1	0	4	*5*
	TOTALS		430	822	1093	2345

** Total number of legally blind veterans is 2,358. Home station data was unavailable for 13 veterans.*

Appendix B- Number of Computer Readers Per Facility By Year *

VISN	Location	Home Station	1998	1999	2000	Total
1	***Total***		*12*	*15*	*21*	*48*
	Boston, MA	523	5	1	1	*7*
	Manchester, NH	608	1	2	3	*6*
	Providence, RI	650	2	1	0	*3*
	Togus, ME	402	1	0	1	*2*
	West Haven, CT	689	3	11	16	*30*
2	***Total***		*5*	*5*	*4*	*14*
	Albany, NY	500	1	2	0	*3*
	Bath, NY	514	0	1	0	*1*
	Bath, NY	757	0	0	1	*1*
	Buffalo, NY	528	3	0	3	*6*
	Syracuse, NY	670	1	2	0	*3*
3	***Total***		*3*	*5*	*6*	*14*
	Brooklyn, NY	527	0	2	0	*2*
	East Orange, NJ	561	1	0	1	*2*
	New York, NY	630	1	3	3	*7*
	Northport, NY	632	1	0	2	*3*
4	***Total***		*3*	*10*	*4*	*17*
	Erie, PA	562	0	1	0	*1*
	Lebanon, PA	595	1	0	1	*2*
	Philadelphia, PA	642	1	6	1	*8*
	Pittsburg, PA	646	0	0	2	*2*
	Wilkes Barre, PA	693	1	3	0	*4*
5	***Total***		*6*	*5*	*7*	*18*
	Martinsburg, WV	613	1	0	0	*1*
	Baltimore, MD	512	3	4	0	*7*
	Washington, DC	688	2	1	7	*10*
6	***Total***		*11*	*9*	*12*	*32*
	Beckley, WV	517	0	0	1	*1*
	Durham, NC	558	3	6	6	*15*
	Fayeteville, NC	565	1	1	4	*6*
	Hampton, VA	590	4	1	0	*5*
	Richmond, VA	652	1	1	0	*2*
	Salem, VA	658	2	0	0	*2*
	Salisbury, NC	659	0	0	1	*1*
7	***Total***		*19*	*27*	*26*	*72*
	Atlanta, GA	508	3	7	9	*19*
	Augusta, GA	509	2	4	3	*9*
	Birmingham, AL	521	10	10	8	*28*
	Charleston, SC	534	3	4	6	*13*
	Montgomery, AL	619	1	1	0	*2*
	Tuscaloosa, MS	679	0	1	0	*1*
8	***Total***		*20*	*33*	*37*	*90*
	Bay Pines, FL	516	6	9	7	*22*
	Gainesville, FL	573	6	12	10	*28*
	Miami, FL	546	0	5	6	*11*
	San Juan, PR	672	5	3	7	*15*
	Tampa, FL	673	2	2	4	*8*
	West Palm Beach, FL	548	1	2	3	*6*
9	***Total***		*9*	*15*	*15*	*39*

VISN	Location	Home Station	1998	1999	2000	Total
	Huntington, WV	581	1	2	6	*9*
	Lexington, KY	596	1	0	0	*1*
	Louisville, KY	603	4	9	2	*15*
	Memphis, TN	614	2	2	0	*4*
	Mountain Home, TN	621	0	0	3	*3*
	Nashville, TN	626	0	2	4	*6*
10	***Total***		*1*	*6*	*8*	*15*
	Chilicothe, OH	538	0	1	0	*1*
	Cincinnati, OH	539	0	0	1	*1*
	Cleveland, OH	541	1	5	5	*11*
	Dayton, OH	552	0	0	2	*2*
11	***Total***		*4*	*10*	*7*	*21*
	Ann Arbor, MI	506	0	1	2	*3*
	Danville, IL	550	0	1	0	*1*
	Detroit, MI	553	1	2	2	*5*
	Ft. Wayne, IN	610	1	1	0	*2*
	Indianapolis, IN	583	2	5	3	*10*
12	***Total***		*2*	*4*	*6*	*12*
	Chicago (Westside), IL	537	0	2	0	*2*
	Hines, IL	578	2	2	5	*9*
	Milwaukee, WI	695	0	0	1	*1*
15	***Total***		*10*	*8*	*5*	*23*
	Columbia, MO	543	0	0	1	*1*
	Kansas City, MO	589	7	4	2	*13*
	Marion, IL	609	0	1	0	*1*
	St. Louis, MO	657	1	1	1	*3*
	Topeka, KS	677	0	0	1	*1*
	Wichita, KS	452	2	2	0	*4*
16	***Total***		*19*	*23*	*33*	*75*
	Biloxi, MS	520	0	1	0	*1*
	Houston, TX	580	14	9	16	*39*
	Muskogee, OK	623	3	3	3	*9*
	New Orleans, LA	629	0	5	2	*7*
	Oklahoma City, OK	635	2	4	12	*18*
	Shreveport, LA	667	0	1	0	*1*
17	***Total***		*3*	*2*	*23*	*28*
	Dallas, TX	549	1	1	10	*12*
	San Antonio, TX	671	2	0	12	*14*
	Waco, TX	674	0	1	1	*2*
18	***Total***		*12*	*24*	*22*	*58*
	Albuquerque, NM	501	4	4	5	*13*
	Amarillo, TX	504	1	1	2	*4*
	Phoenix, AZ	644	2	6	3	*11*
	Tucson, AZ	678	5	13	12	*30*
19	***Total***		*11*	*16*	*24*	*51*
	Cheyenne, WY	442	1	0	0	1
	Denver, CO	554	7	12	16	*35*
	Ft. Harrison, MT	436	1	0	1	*2*
	Salt Lake City, UT	660	2	4	7	*13*
20	***Total***		*9*	*12*	*12*	*33*
	Anchorage, AK	463	0	0	1	*1*
	Boise, ID	531	1	1	0	*2*

VISN	Location	Home Station	1998	1999	2000	Total
	Portland, OR	648	3	3	2	*8*
	Roseburg, OR	653	0	1	0	*1*
	Seattle, WA	663	3	3	8	*14*
	Spokane, WA	668	2	3	1	*6*
	White City, OR	692	0	1	0	*1*
21	***Total***		*11*	*16*	*11*	*38*
	Fresno, CA	570	4	4	3	*11*
	Martinez, CA	612	0	1	1	*2*
	Palo Alto, CA	640	1	4	2	*7*
	Reno, NV	654	1	0	0	*1*
	San Francisco, CA	662	5	7	5	*17*
22	***Total***		*31*	*55*	*41*	*127*
	Las Vegas, NV	593	2	3	6	*11*
	Loma Linda, CA	605	11	18	4	*33*
	Long Beach, CA	600	3	7	4	*14*
	Los Angeles, CA	691	2	10	9	*21*
	San Diego, CA	664	9	13	5	*27*
	Sepulveda, CA	665	4	0	1	*5*
	El Paso, TX	756	0	4	12	*16*
23	***Total***		*1*	*9*	*5*	*15*
	Des Moines, IA	555	1	2	1	*4*
	Ft. Meade, SD	568	0	0	1	*1*
	Iowa City, IA	584	0	0	1	*1*
	Minneapolis, MN	618	0	4	1	*5*
	Lincoln, NE	636	0	3	1	*4*
	TOTALS		**202**	**309**	**329**	**840**

Appendix C- Number of Veterans Receiving CCTVs Per Facility By Year

VISN	Location	Home Station*	1998	1999	2000	Total Blind
1	**Total**		***19***	***84***	***88***	***191***
	Togus, ME	402	4	2	4	**10**
	White River Jct., VT	405	0	2	4	**6**
	Boston, MA	523	10	45	50	**105**
	Brockton, MA	525	0	2	0	**2**
	Manchester, NH	608	0	4	4	**8**
	Northampton, MA	631	0	0	3	**3**
	Providence, RI	650	1	12	3	**16**
	West Haven, CT	689	4	17	20	**41**
2	***Total***		***4***	***20***	***15***	***39***
	Albany, NY	500	1	6	8	**15**
	Buffalo, NY	528	2	6	2	**10**
	Syracuse, NY	670	0	7	3	**10**
	Bath, NY	757	1	1	2	**4**
3	***Total***		***4***	***13***	***20***	***37***
	Brooklyn, NY	527	2	3	0	**5**
	East Orange, NJ	561	0	3	7	**10**
	New York, NY	630	2	6	12	**20**
	Northport, NY	632	0	1	1	**2**
4	***Total***		**4**	**37**	**45**	**86**
	Wilmington, DE	460	1	0	3	**4**
	Altoona, PA	503	0	1	0	**1**
	Butler, PA	529	0	1	0	**1**
	Clarksburg, WV	540	0	2	4	**6**
	Coatesville, PA	542	0	2	1	**3**
	Erie, PA	562	0	0	2	**2**
	Lebanon, PA	595	0	9	13	**22**
	Philadelphia, PA	642	1	8	10	**19**
	Pittsburg, PA	646	2	9	6	**17**
	Wilkes Barre, PA	693	0	5	6	**11**
5	***Total***		***4***	***18***	***16***	***38***
	Baltimore, MD	512	3	6	8	**17**
	Martinsburg, WV	613	0	2	1	**3**
	Washington, DC	688	1	10	7	**18**
6	***Total***		***8***	***19***	***22***	***49***
	Beckley, WV	517	0	1	0	**1**
	Durham, NC	558	0	8	4	**12**
	Fayeteville, NC	565	1	0	2	**3**
	Hampton, VA	590	2	2	5	**9**
	Asheville, NC	637	1	0	1	**2**
	Richmond, VA	652	3	2	3	**8**
	Salem, VA	658	1	2	2	**5**
	Salisbury, NC	659	0	4	5	**9**
7	***Total***		***31***	***74***	***66***	***171***
	Atlanta, GA	508	6	11	13	**30**
	Augusta, GA	509	4	20	13	**37**
	Birmingham, AL	521	13	18	22	**53**
	Charleston, SC	534	2	9	8	**19**
	Columbia, SC	544	1	9	4	**14**
	Des Moines, IA	555	0	5	3	**8**
	Dublin, GA	557	0	1	2	**3**

VISN	Location	Home Station*	1998	1999	2000	Total Blind
	Montgomery, AL	619	3	1	0	**4**
	Tuscaloosa, MS	679	2	0	1	**3**
8	***Total***		***42***	***78***	***123***	***243***
	Bay Pines, FL	516	1	22	38	**61**
	Miami, FL	546	2	7	10	**19**
	West Palm Beach, FL	548	8	9	4	**21**
	Gainesville, FL	573	19	22	26	**67**
	Lake City, FL	594	1	0	0	**1**
	San Juan, PR	672	1	5	12	**18**
	Tampa, FL	673	10	13	33	**56**
9	***Total***		***25***	***45***	***50***	***120***
	Huntington, WV	581	5	10	16	**41**
	Lexington, KY	596	2	2	7	**11**
	Louisville, KY	603	11	21	13	**45**
	Memphis, TN	614	3	4	4	**11**
	Mountain Home, TN	621	1	4	0	**5**
	Murfreesboro, TN	622	0	1	2	**3**
	Nashville, TN	626	3	3	8	**14**
10	***Total***		***12***	***18***	***30***	***60***
	Chilicothe, OH	538	0	1	2	**3**
	Cincinnati, OH	539	3	2	2	**7**
	Cleveland, OH	541	7	9	23	**39**
	Dayton, OH	552	2	6	3	**11**
11	***Total***		***13***	***24***	***20***	***57***
	Ann Arbor, MI	506	2	0	2	**4**
	Danville, IL	550	1	0	3	**4**
	Detroit, MI	553	3	15	9	**27**
	Indianapolis, IN	583	7	9	5	**21**
	Ft. Wayne, IN	610	0	0	1	**1**
12	***Total***		**14**	**39**	**25**	**73**
	Chicago (Westside), IL	537	4	8	5	**17**
	North Chicago	556	0	2	0	**2**
	Hines, IL	578	9	23	14	**46**
	Madison, WI	607	1	4	2	**7**
	Tomah, WI	676	0	0	3	**3**
	Milwaukee, WI	695	0	2	1	**3**
15	***Total***		***18***	***30***	***50***	***98***
	Wichita, KS	452	1	6	4	**11**
	Columbia, MO	543	0	1	2	**3**
	Kansas City, MO	589	12	10	35	**57**
	Marion, IL	609	1	4	1	**6**
	St. Louis, MO	657	2	8	7	**17**
	Topeka, KS	677	2	1	1	**4**
16	***Total***		***12***	***23***	***61***	***96***
	Alexandria, LA	502	0	0	1	**1**
	Biloxi, MS	520	1	1	0	**2**
	Fayetteville, AR	564	1	1	1	**3**
	Houston, TX	580	5	5	15	**25**
	Jackson, MS	586	0	3	5	**8**
	Little Rock, AR	598	0	0	3	**3**
	Muskogee, OK	623	2	5	12	**19**
	New Orleans, LA	629	0	5	13	**18**

VISN	Location	Home Station*	1998	1999	2000	Total Blind
	Oklahoma City, OK	635	2	0	6	**8**
	Shreveport, LA	667	1	3	5	**9**
17	***Total***		***16***	***39***	***149***	***204***
	Big Spring, TX	519	0	0	1	**1**
	Dallas, TX	549	3	5	20	**28**
	San Antonio, TX	671	12	30	122	**164**
	Waco, TX	674	1	4	6	**11**
18	***Total***		***10***	***5***	***5***	***20***
	Albuquerque, NM	501	4	2	2	**8**
	Amarillo, TX	504	0	1	1	**2**
	Phoenix, AZ	644	3	1	0	**4**
	Prescott, AZ	649	0	0	1	**1**
	Tucson, AZ	678	3	1	1	**5**
19	***Total***		***11***	***9***	***29***	***49***
	Ft. Harrison, MT	436	1	1	2	**4**
	Denver, CO	554	5	3	12	**20**
	Grand Junction, CO	575	0	0	1	**1**
	Salt Lake City, UT	660	5	5	13	**23**
	Sheridan, WY	666	0	0	1	**1**
20	***Total***		***14***	***79***	***64***	***157***
	Anchorage, AK	463	0	1	2	**3**
	Boise, ID	531	1	8	4	**13**
	Portland, OR	648	3	14	8	**25**
	Roseburg, OR	653	0	2	1	**3**
	Seattle, WA	663	5	36	31	**72**
	Spokane, WA	668	4	14	12	**30**
	Walla Walla, WA	687	0	4	6	**10**
	White City, OR	692	1	0	0	**1**
21	***Total***		***28***	***53***	***59***	***140***
	Honolulu, HI	459	0	1	0	**1**
	Fresno, CA	570	3	10	7	**20**
	Martinez, CA	612	1	6	4	**11**
	Palo Alto, CA	640	11	20	27	**58**
	Reno, NV	654	3	8	15	**26**
	San Francisco, CA	662	10	8	6	**24**
22	***Total***		***38***	***50***	***44***	***132***
	Las Vegas, NV	593	0	0	4	**4**
	Long Beach, CA	600	9	5	9	**23**
	Loma Linda, CA	605	9	16	7	**32**
	San Diego, CA	664	5	13	5	**23**
	Sepulveda, CA	665	4	0	2	**6**
	Los Angeles, CA	691	8	15	16	**39**
	Sioux Falls, SD	756	3	1	1	**5**
23	***Total***		***7***	***7***	***104***	***118***
	Sioux Falls, SD	438	1	1	0	**2**
	Ft. Meade, SD	568	0	1	1	**2**
	Iowa City, IA	584	1	1	1	**3**
	Minneapolis, MN	618	3	3	95	**101**
	St. Cloud, MN	656	0	0	6	**6**
	Lincoln, NE	636	2	1	1	**4**
	TOTALS		**334**	**764**	**1081**	**2189**

** Total number of veterans receiving CCTV's is 2,498. Home Station data was missing for 309 veterans.*

Appendix D- Percent of Blind Veterans Receiving Computer Reader Per Facility

Location	Home Station	Total Blind	Computer Reader	% Receiving
Boston, MA	523	93	7	8%
San Antonio, TX	671	91	14	15%
Gainesville, FL	573	77	28	36%
Seattle, WA	663	76	14	18%
Bay Pines, FL	516	73	22	30%
West Haven, CT	689	69	30	43%
Loma Linda, CA	605	67	33	49%
Birmingham, AL	521	66	28	42%
Minneapolis, MN	618	61	5	8%
Houston, TX	580	58	39	67%
Denver, CO	554	55	35	64%
Los Angeles, CA	691	52	21	40%
Kansas City, MO	589	51	13	25%
Hines, IL	578	46	9	20%
Cleveland, OH	541	44	11	25%
San Diego, CA	664	43	27	63%
Atlanta, GA	508	40	19	48%
San Francisco, CA	662	38	17	45%
Dallas, TX	549	37	12	32%
Palo Alto, CA	640	36	7	19%
Louisville, KY	603	35	15	43%
Tampa, FL	673	34	8	24%
Spokane, WA	668	33	6	18%
Tucson, AZ	678	33	30	91%
Augusta, GA	509	31	9	29%
Charleston, SC	534	31	13	42%
Huntington	581	31	9	29%
West Palm Beach, FL	548	28	6	21%
Fresno, CA	570	28	11	39%
Washington, DC	688	28	10	36%
Miami, FL	546	27	11	41%
Long Beach, CA	600	27	14	52%
Salt Lake City, UT	660	27	13	48%
Durham, NC	558	26	15	58%
New Orleans, LA	629	26	7	27%
Portland, OR	648	26	8	31%
Philadelphia, PA	642	25	8	32%
San Juan, PR	672	25	15	60%
Indianapolis, IN	583	24	10	42%
Baltimore, MD	512	22	7	32%
Detroit, MI	553	21	5	24%
Oklahoma City, OK	635	21	18	86%
Albuquerque, NM	501	20	13	65%
Lebanon, PA	595	20	2	10%
Muskogee, OK	623	20	9	45%
	756	20	16	80%
New York, NY	630	18	7	39%
Reno, NV	654	18	1	6%
Phoenix, AZ	644	17	11	65%
Providence, RI	650	17	3	18%
Albany, NY	500	16	3	19%

Location	Home Station	Total Blind	Computer Reader	% Receiving
Las Vegas, NV	593	16	11	69%
Nashville, TN	626	16	6	38%
Buffalo, NY	528	15	6	40%
Togus, ME	402	14	2	14%
St. Louis, MO	657	14	3	21%
Hampton, VA	590	13	5	38%
Fayeteville, NC	565	12	6	50%
Manchester, NH	608	12	6	50%
Memphis, TN	614	12	4	33%
Pittsburg, PA	646	12	2	17%
Sepulveda, CA	665	12	5	42%
Syracuse, NY	670	11	3	27%
Wichita, KS	452	10	4	40%
Boise, ID	531	10	2	20%
Columbia, SC	544	10	0	0%
Walla Walla, WA	687	10	0	0%
Wilkes-Barre, PA	693	10	4	40%
Chicago (Westside), IL	537	9	2	22%
Des Moines, IA	555	9	4	44%
East Orange, NJ	561	9	2	22%
Shreveport, LA	667	9	1	11%
Dayton, OH	552	8	2	25%
Lexington, KY	596	8	1	13%
Richmond, VA	652	8	2	25%
Salisbury	659	8	1	13%
Ann Arbor, MI	506	7	3	43%
Mountain Home, TN	621	7	3	43%
Lincoln, NE	636	7	4	57%
Amarillo, TX	504	6	4	67%
Brooklyn, NY	527	6	2	33%
Jackson, MS	586	6	0	0%
Marion, IL	609	6	1	17%
Martinez, CA	612	6	2	33%
Waco, TX	674	6	2	33%
Fort Harrison, MT	436	5	2	40%
Danville, IL	550	5	1	20%
Northport, NY	632	5	3	60%
Salem	658	5	2	40%
Bath, NY	757	4	0	0%
White River Jct, VT	405	3	0	0%
Cincinnati, OH	539	3	1	33%
Montgomery, AL	619	3	2	67%
White City, OR	692	3	1	33%
Anchorage, AK	463	2	1	50%
Beckley, WV	517	2	1	50%
Biloxi, MS	520	2	1	50%
Chillicothe, OH	538	2	1	50%
Coatesville, PA	542	2	0	0%
Hot Springs, SD	568	2	1	50%
Iowa City, IA	584	2	1	50%
Fort Wayne, IN	610	2	2	100%
Leeds, MA	631	2	0	0%
Roseburg, OR	653	2	1	50%

Location	*Home Station*	*Total Blind*	*Computer Reader*	*% Receiving*
Tomah, WI	676	2	0	0%
Topeka, KS	677	2	1	50%
Tuscaloosa, AL	679	2	1	50%
Sioux Falls, SD	438	1	0	0%
Cheyenne, WY	442	1	1	100%
Honolulu, HI	459	1	0	0%
Bath, NY	514	1	1	100%
Brockton, MA	525	1	0	0%
Columbia, MO	543	1	1	100%
Erie, PA	562	1	1	100%
Grand Junction, CO	575	1	0	0%
Lake City, FL	594	1	0	0%
Martinsburg, WV	613	1	1	100%
Asheville, NC	637	1	0	0%
Prescott, AZ	649	1	0	0%
St. Cloud, MN	656	1	0	0%
Milwaukee, WI	695	1	1	100%

Appendix E- Volume of AICD Implants Per Year, Per Facility

		1998	1999	2000	Total
		753	737	905	2395
VISN 1		38	36	49	123
523	Boston, MA	0	5	49	54
525	Brockton, MA	38	31	0	69
VISN 2		10	9	10	29
500	Albany, NY	2	2	0	4
528	Buffalo, NY	8	7	10	25
VISN 3		39	35	36	110
526	Bronx, NY	4	3	0	7
527	Brooklyn, NY	23	22	3	48
561	East Orange, NJ	6	4	3	13
630	New York, NY	6	6	27	39
632	Northport, NY	0	0	1	1
693	Wilkes-Barre, PA	0	0	2	2
VISN 4		17	45	50	112
562	Erie, PA	0	0	1	1
642	Philadelphia, PA	1	3	7	11
646	Pittsburg, PA	16	42	42	100
VISN 5		18	16	27	61
512	Baltimore, MD	8	6	11	25
688	Washington, DC	10	10	16	36
VISN 6		39	43	58	140
558	Durham, NC	7	9	16	32
565	Fayetteville, NC	1	0	0	1
652	Richmond, VA	31	34	42	107
VISN 7		30	18	29	77
509	Augusta, GA	16	7	5	28
521	Birmingham, AL	3	5	11	19
534	Charleston, SC	9	4	9	22
544	Columbia, SC	2	2	4	8
VISN 8		36	39	40	115
516	Bay Pines, FL	0	1	0	1
546	Miami, FL	25	18	15	58
548	Palm Beach, FL	0	1	7	8
573	Gainesville, FL	8	6	3	17
672	San Juan, PR	0	0	8	8
673	Tampa, FL	3	13	7	23
VISN 9		29	31	50	110
581	Huntington, WV	0	0	4	4
596	Lexington, KY	5	4	11	20
614	Memphis, TN	1	0	4	5
626	Nashville, TN	23	27	31	81
VISN 10		40	37	41	118
539	Cincinnati, OH	15	7	19	41
541	Cleveland, OH	25	30	22	77

		1998	1999	2000	Total
VISN 11		42	46	63	151
506	Ann Arbor, MI	21	24	22	67
553	Detroit, MI	4	2	13	19
583	Indianapolis, IN	17	20	28	65
VISN 12		43	32	32	107
578	Hines, IL	15	8	4	27
607	Madison, WI	4	2	3	9
695		24	22	25	71
VISN 15		26	26	17	69
543	Columbia, MO	20	15	10	45
609	Marion, IL	0	0	1	1
657	St. Louis, MO	5	11	6	22
677	Topeka, KS	1	0	0	1
VISN 16		74	128	147	349
580	Houston, TX	17	44	65	126
586	Jackson, MS	0	4	7	11
598	Little, Rock, AR	45	65	56	166
623	Muskogee, OK	0	0	6	6
635	Oklahoma City, OK	11	15	13	39
667	Shreveport, LA	1	0	0	1
VISN 17		48	38	50	136
549	Dallas, TX	40	30	35	105
671	San Antonio, TX	8	8	11	27
674	Waco, TX	0	0	4	4
VISN 18		29	13	26	68
501	Albuquerque, NM	26	9	19	54
678	Tucson, AZ	3	4	7	14
VISN 19		45	23	40	108
554	Denver, CO	2	0	2	4
575	Grand Junction, CO	0	0	1	1
660	Salt Lake City, UT	43	23	37	103
VISN 20		38	32	33	103
648	Portland, OR	38	31	33	102
663	Seattle, WA	0	1	0	1
VISN 21		35	22	34	91
640	Palo Alto, CA	7	9	18	34
662	San Francisco, CA	28	13	16	57
VISN 22		41	31	36	108
664	San Diego, CA	5	8	10	23
691	West Los Angeles, CA	36	23	26	85
VISN 23		36	37	37	110
568	Fort Meade, SD	0	1	0	1
618	Minneapolis, MN	16	15	19	50
584	Iowa City, IA	2	4	2	8
636	Omaha, NE	18	17	16	51