

Chapter 6

ASTHMA AND ITS IMPLICATIONS FOR MILITARY RECRUITS

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INTRODUCTION

The Department of Defense (DoD) sets regulatory standards for the basic entrance qualifications for enlistment, appointment, and induction of men and women into the US armed forces.¹⁻³ These standards establish the age, citizenship, education, aptitude, physical fitness, dependency status, and moral character requirements for service, as well as disqualifying conditions that cause rejection from service. Specifically, through its Directives and Instructions, the DoD sets forth very clear medical standards for service,^{4,5} and each military service implements the DoD regulations as well as any service-specific requirements.⁶

DoD medical standards directly address the qualification of recruits with a current or past history of asthma. Asthma is a unique medical condition that can potentially have a profound effect on the active duty military population. Standards that are too inclusive may allow the military to accept recruits who may be unable to perform their required missions, even putting the asthmatic recruits and members of their units at risk; however, too rigid standards barring those with any history of asthma may eliminate potentially successful military candidates and increase the difficulty and expense of recruiting.

PROBLEMS IN DEVELOPING ASTHMA REGULATIONS

Accession standards for the military services are intended to protect both the potential service member and the military organization. A primary goal of accession standards is to ensure that soldiers are capable of performing their military duties without undue risk to themselves or to others. The unique military purpose of these standards is to physically and mentally prepare and maintain combat-ready military service members.⁷ This is the reason why potential recruits with medical problems such as asthma are turned away from recruiting stations.⁸

Military regulatory standards for asthma have been particularly troublesome because the diagnosis of asthma is not clearly defined. Asthma may present as a waxing and waning condition and can have long asymptomatic periods. Some children have been thought to "outgrow" their asthma before they reach their late teens and later become eligible applicants for accession into the military. Press coverage of the issue has expressed concern about the fairness and appropriateness of DoD's accession medical standards.^{9,10}

In the 21st century, asthma, although still somewhat difficult to diagnose, is generally considered a manageable disease. Physicians typically tell their asthmatic patients to do whatever they want, as long as they take medication to control symptoms; patients should be fine even under conditions of high stress such as football and basketball.¹¹⁻¹³ These patients and their families are frustrated when they attempt to join the military and are rejected because of current asthma or a history of asthma. This frustration is compounded by the increasing incidence of asthma in American youth.¹⁴ Recently, the occurrence of asthma was reported to be as high as 7.9% among US children generally, with even higher numbers found in urban centers.^{15,16} Moreover, the incidence of asthma has been increasing worldwide.¹⁷

Those who believe the military's asthma accession standards are either too strict or unnecessary often cite examples of outstanding athletes who have competed successfully with asthma. In 1984 for example, 11% of the US Olympic team had some degree of asthma, and asthmatic athletes won 41 medals. A more recent review of the 196 American athletes in the 1998 Olympic winter games revealed that 43 (21.9%) of the athletes had a previous diagnosis of asthma and 34 (17.4%) were taking an asthma medication at the time of competition.¹⁸ The physical and emotional stress of Olympic competition and training can appear to equal or even surpass that of military training. However, the two environments are not comparable. The military environment is very unique with its mandatory equipment and additional cumbersome and restrictive protective masks and gear, potential exposure to dusty, humid, freezing or smoky environments, required presence in hostile and austere environments, and a lack of readily available asthma medications and treatments. One of the most stressful factors of the military environment is its unpredictability. A soldier patrolling a street in Baghdad, whose peaceful surroundings suddenly erupt into a dusty, smoke-filled, and emotionally stressful environment, has no time to take a beta-agonist to counter the effects of sudden stress. There is no way for an individual soldier to know exactly when hostile action will occur, or how long it will last. These factors make military physical exertion and the military mission completely different from any type of Olympic competition, where periods of peak stress are scheduled and preexertional medication use is possible.¹⁹⁻²¹

Further complicating the military's regulatory provisions, asthma is frequently underdiagnosed or incorrectly diagnosed.²² Potential recruits may be concerned that an incorrect diagnosis of asthma may be placed in

their records and prevent them from having a military career; conversely, well-meaning physicians may be reluctant to diagnose asthma due to the potentially negative implications.²²

Some potential service members have learned how to conceal their history of asthma to gain entrance into the military. Moreover, as pressures to meet recruiting goals mount, some recruiters are tempted to encourage and even coach potential recruits to lie about their history of asthma and other medical conditions.²³⁻²⁵ Three recruits testified in court that their Air Force recruiter used such tactics in a 1999 Florida case. One recruit testified that her recruiter hinted that she should lie about her asthma; she dropped out of basic training when she had trouble meeting running requirements.²⁶

Accession regulations concerning applicants with a history of asthma are reevaluated on a periodic basis and changed when indicated. Before the Persian Gulf War (1990–1991), the regulation for accession excluded only people with childhood asthma who had not been asymptomatic and medication free since age 12. During the war, the high rate of medical evacuations for the diagnosis of asthma sparked a demand for tighter accession regulations. In response, the DoD rewrote the accession medical regulation in 1994 to disqualify an applicant who had any history of asthma at any

age. However, post-1994 asthma studies provided the necessary factual information for the DoD to relax the regulations without undue risk to the recruits or to the military. These recent studies looked specifically at the incidence of asthma in adults who had childhood asthma followed by a long asymptomatic period; the research provided data to at least stratify those with a history of childhood asthma into groups based on risk of recurrence in adulthood. As a result of the new information, the DoD changed the accession regulations in 2004,²⁷ maintained this change in the 2005 edition of the regulation,⁵ and the guidance now more closely reflects the pre-1994 standards.

However, there are still many people who enter the military each year with undiagnosed asthma that subsequently limits their performance of duty.¹⁴ In spite of the large volume of research on asthma, the full scope of the implications of childhood asthma for adult performance is unknown. To date there remains no absolute standard for the diagnosis of asthma and no objective screening test that can predict the risk or potential severity of future asthma attacks. With continued analysis of data and the development of new tests, however, the DoD will be better positioned to improve asthma identification and screening strategies in recruits.

DEFINITION AND DIAGNOSIS OF ASTHMA

The word “asthma” was derived from the Greek word “azein,” which means to breathe hard or pant; it originally was a nonspecific word to designate difficulty with breathing. By the 17th century the concept of asthma had become more specific, and the effects of dust, climate, and weather were recognized as triggers that made the condition worse. By the mid-18th century, the term began to describe the specific symptom complex currently known as asthma.

Today, asthma is recognized as the most common chronic childhood disease in the United States. In 2001, 8.7% of American children in the United States were diagnosed with asthma, and the incidence of asthma worldwide was increasing.²⁸ The incidence of childhood asthma is even higher in some major cities; for example, New York and Detroit have reported asthma rates as high as 20%.^{15,16} Asthma is unpredictable in presentation, with a waxing and waning course, and even mild asthmatics can have a severe exacerbation of symptoms, which can potentially lead to hospitalization or death. In the United States, in spite of the introduction of increasingly effective asthma medications, the number of deaths secondary to asthma has steadily increased from 2,891 in 1980 to 4,657 in 1999.²⁹

Although most clinicians recognize the clinical syndrome of asthma, the condition has been and remains difficult to define and diagnose. Many clinicians equate wheezing with asthma, but “not all asthma wheezes, and not all that wheezes is asthma.” Asthma presents in many forms and varying degrees of severity, from unremitting disease with permanent disability, to a form that is only evident with exercise (exercise-induced asthma). Moreover, asthma does not always cause wheezing and may manifest primarily as a cough (cough-variant asthma). Nevertheless, in general terms, asthma is a condition of reversible hyperactivity of the trachea and bronchi to various stimuli, leading to airway obstruction and a feeling of shortness of breath. The airway hyperreactivity leads to difficulty in getting air out of the lungs, which results in the typical expiratory wheezing of asthma. There are two components of the airway obstruction of asthma: (1) bronchospasm, the constriction of the smooth bronchial muscle resulting in rapid changes in the diameter of the lumen of the airways and consequently in the resistance to airflow, and (2) inflammation, which results in edema of the mucous membrane lining the airways and increased secretion of mucus. The edema and the increased mucus secretions both cause obstruction of airflow in the lungs.³⁰

THE NATURAL HISTORY OF ASTHMA

Understanding the natural history of asthma is a necessary prerequisite in the development of effective accession medical regulations. Military health care practitioners are constantly challenged to ensure that regulatory guidance concerning asthma reflects the most recent medical data. Several recent studies have shed new light on asthma. Asthma can begin at any age but is usually diagnosed in childhood; the majority of those with asthma are diagnosed within the first few years of life.³¹ The Centers for Disease Control and Prevention National Health Interview Survey, which provides specific statistics for the rate of asthma in the United States population as a whole, shows that prevalence of asthma is increasing. Between 1928 and 1931, the prevalence of asthma was approximately 0.5% in children and 0.1% to 1% in adults.³² By 1987 the prevalence of asthma had increased to 4.01%. The largest increase in prevalence was among those younger than 20. In that age group the prevalence was 5.99% for males and 4.10% for females. The increase was slightly higher in blacks than whites.³³ The most recent data, from January to June 2004, reveals a prevalence of 7.9% in children and 7.2% overall. The highest rate was among males aged 0 to 14 at 9.9%, with females aged 0 to 14 at 5.8%.³⁴

The studies showing an increased incidence in asthma in the United States and other countries are compelling. Translating a childhood diagnosis of asthma into the risk of having asthma as an adult is not as clear. In spite of a number of studies that will be reviewed here, there are confounding factors that challenge researchers. These factors include the variability of asthma, which makes it difficult to characterize or to predict in any individual; genetic factors; and the environment.

In general, approximately 50% of patients with childhood asthma become asymptomatic in adulthood. The less severe the childhood asthma, the less likely a recurrence becomes after remission. There seems to be a slight remission in symptoms particularly between the ages of 5 and 15, and the only measurable childhood symptom shown to predict adult pulmonary function levels in a statistically significant way is forced expiratory volume in 1 second (FEV1).³⁵ Therapeutic interventions such as allergen immunotherapy may modify the natural history of asthma to reduce rates of symptomatic asthma later in life.³⁶ The risk of developing adult asthma is higher in those who had childhood asthma than in those who did not.

To corroborate the data predicting continued or

recurrent asthma symptoms in adulthood based on childhood asthma severity, one study showed that only 20% of those with frequent wheezing in childhood had a remission in adolescence, and virtually all children with persistent wheezing in childhood continued to wheeze into adult life, with only 25% wheeze free at age 21. The authors feel that a persistent wheeze at age 14 was predictive of adult symptoms.³⁶ Another study showed that symptomatic asthma in midlife is frequently associated with asthma symptoms before age 3 and with more than three symptomatic episodes of asthma exacerbation at age 11. Rates of symptomatic asthma at age 35 based on childhood asthma patterns are shown in Table 6-1.³⁷ Among all those whose symptoms started before age 7, 74% had remission by age 16 and another 16% by age 23. However, there was a resurgence of symptoms (up to 27%) by age 33 among this group.

In a study of 406 children initially evaluated at age 8 to 12, 76% of the 348 who were followed up 11 to 19 years later still had respiratory symptoms. The initial evaluation included both pulmonary function and histamine challenge tests on each child, and these tests were repeated on 285 of the 348 follow-up participants. The remaining 63 participated in the follow-up by questionnaire only.³⁵

Further information about the long-term outcome of childhood asthma and its progression into adulthood comes from the extensive Melbourne, Australia, asthma study. The authors first noted the difficulty of obtaining a clear diagnosis of childhood asthma, concluding that "bronchitis," "wheezy bronchitis," and asthma are all actually asthma. The authors concluded that children with infrequent childhood wheezing were free of wheezing in early adult life in over 50% of the cases, while most of the remainder had only infrequent wheezing.³⁸

Other large prospective asthma studies are underway. In 2003 the Tucson Children's Respiratory Study reported on 974 children it has followed since birth, the oldest of which are now reaching their 25th birthday. The study revealed that although many children wheeze during the first few years of life, they do so episodically and stop wheezing by the time they are 3 years old. These same children were no more likely to wheeze at ages 11 and 16 when compared to children who did not wheeze before age 6. These children are called transient wheezers.³⁹

Children who have wheezing that persists beyond the third year fall into two groups, those who are atopic at age 6 and those who are not. The nonatopic children

TABLE 6-1
PERSISTENCE OF CHILDHOOD ASTHMA

Childhood Asthma Pattern	Percentage Who Have Frequent or Persistent Asthma at Age 35
Mild, wheezy bronchitis at age 7 (fewer than five episodes associated with upper respiratory tract infections)	23%
Asthma at age 7 (wheezing not associated with upper respiratory tract infection; definite clinical diagnosis of asthma)	50%
Severe asthma at age 10	75%

Data source: Phelan PD. Hyperresponsiveness as a determinant of the outcome in childhood asthma. *Am Rev Respir Dis.* 1991;143:1463-1467.

have a tendency to develop acute airway obstruction in the setting of a viral illness, which may decrease with age. The atopic children can be further divided into two groups: (1) those whose wheezing started in the first 3 years of life and (2) those whose wheezing started after age 3. The children whose symptoms began before age 3 have the lowest lung function at ages 6 and 11 and develop recurrent episodes of airway obstruction.³⁹

A follow-up subgroup analysis of the children ages 6 to 16 from the Tucson study did not support the

commonly held belief that the majority of children with asthma enter remission during adolescence. Fifty-eight percent of the children who had diagnoses of asthma before puberty continued to have symptoms during puberty. The risk factors identified for unremitting asthma after puberty were frequent wheezing before puberty, obesity, early onset of puberty, active sinusitis, and skin test sensitivity.³⁸ Therefore, a history of childhood wheezing and a diagnosis of asthma made before age 3 does not clearly predict the future airway reactivity in any given child. However, wheezing persisting beyond age 6 with an atopic history should be a warning sign for potential asthma in adulthood.

Allergen sensitization before age 3 is associated with a greater prevalence of persistent asthma. Level of exposure to such sensitizing antigens as dust mites and cockroaches may correlate with the clinical expression of asthma in certain subpopulations. The natural history of asthma may be modified with early intervention with allergen immunotherapy.³⁶

The pattern of asthma between 7 and 14 years of age is a good predictor of symptomatic adult asthma. Over 50% of children with infrequent asthma during these years are asymptomatic at age 21. However, persistent asthma during this period is associated with symptomatic disease at age 21 in over 90% of cases.⁴⁰

There are conflicting reports regarding ethnic differences in childhood asthma rates.^{41,42} Therefore, there are not enough data to support imposing ethnicity or socioeconomic criteria for asthma screening strategies. Military medicine must keep abreast of the emerging data from these studies to ensure that DoD regulatory guidance remains current.

ASTHMA AND THE MILITARY ENVIRONMENT

The military has attempted to come to terms with asthmatics in the potential pool of recruits and to determine the implications of a diagnosis of asthma or a history of asthma to military service. Many situations can arise in the battlefield environment that could exacerbate asthma: chemically and physically irritating agents such as smoke and dust, increased physical demands, lack of sleep, stress, emotional turmoil, increased incidence of disease due to close quarters and decreased ability to maintain personal hygiene, inability to access medications, and physical barriers such as protective masks through which medication cannot be delivered.

How military accession regulations address the "asthmatic" recruit also affects many other people, including recruiters, commanders, medical staff, and

other recruits. Exhibit 6-1 illustrates the perspectives of others involved. The complexity of the implications of an asthmatic recruit challenges military healthcare practitioners to ensure the most current medical data are available and considered in developing any changes in guidance.

With the increasing incidence of asthma worldwide, other nations must also confront the problem of asthmatic recruits.⁴³⁻⁴⁶ Australia,⁴⁵ Belgium,⁴⁷ Canada,⁴⁶ Great Britain,⁴⁸⁻⁵¹ Israel,⁵²⁻⁵⁴ Italy,⁵⁵⁻⁵⁸ and Sweden^{59,60} have studied and continue to address the implications of the asthmatic military recruit. Moreover, asthma is also an issue for those seeking employment in civilian law enforcement and fire-fighting agencies, which also have rigorous physical, emotional, and environmental requirements.⁶¹⁻⁶³

EXHIBIT 6-1

PERSPECTIVES OF PERSONNEL AFFECTED BY ASTHMA ACCESSION REGULATIONS

The potential recruit: "Sure, I had asthma as a kid, but I played high school football and basketball without problems, and almost never need my inhaler. What if I just 'forget' to tell them I ever had any asthma?"

The recruiter: "Do you realize how many kids have had wheezing or asthma? Soon there won't be anyone left to recruit!"

The recruit's civilian specialist: "Of course he can join the Army! Modern medicines are wonderful. Soldiers with asthma can do anything their nonasthmatic counterparts can do!"

The commander of the basic training unit: "I need to fill my company rosters, but don't send me someone who will only make it to week four before having to be recycled, and then discharged. All that does is take away from everyone else's training!"

The other recruits: "We are always waiting for Johnny to catch up. He is always short of breath. I don't want to be his battle buddy."

The deployed field commander: "My concern is for unit readiness. Bottom line: I can't afford to lose a trained soldier! My troops trained together, worked together and they finally are beginning to act like they can think together. If I lose a soldier for any reason, the replacement will most likely be green, and won't know our methods. It will bring down the group effectiveness. If you suspect a recruit won't make it in the combat environment, don't send him to me. If we lose someone to a predictable problem just when the going gets toughest, it means I lose him just when I need him the most!"

The medical commander: "My deployed assets are designed to provide medical care to soldiers in combat. I don't keep all the medicines needed for soldiers with asthma, and have barely the evacuation assets needed to take care of injuries. We need to do everything we can to keep disease and non-battle injury evacuations to a minimum."

The military comptroller: "Do you have any idea how much it costs to train someone, deploy them, evacuate them back from a deployment, treat them and send a replacement? Life-long disability payments are even worse! If you don't think they will make it, don't bring them in!"

HISTORY OF ASTHMA AND THE US MILITARY

The importance of physical standards for those who enter the military has long been recognized. In the US military, these standards have changed as personnel requirements have changed. When personnel requirements were high and it was difficult to obtain enough recruits to fill the ranks, accession standards were lowered. Asthma has been a recognized hazard for deployed troops since at least the Civil War. The significance of asthma in deployed troops increases as the environment becomes more extreme. The US military has fought in nearly every type of environment known, from hot, dry, and sandy deserts to humid, swampy jungles to snow covered, freezing mountains and windy plains. Modern warfare has added the rigors of chemical protective suits to the already difficult wartime environment.

The Civil War

At the end of the Civil War, the Army surgeon general compiled a medical history of the war and the medical care given to the soldiers of the Union Army.⁶⁴ During the war, the incidence of asthma was 0.04%. A total of 1,220 discharges for asthma among white troops were recorded. This compares to 3,872 discharges for epilepsy, 2,138 for fractures, 1,204 for dysentery, 1,779 for syphilis, 1,138 for ulcers, and 909 for typhoid fever. Recorded discharges from all causes totaled 215,312; asthma accounted for approximately 0.57% of all discharges. The most disabilities, 33,458 or 15.5% of the total, came from gunshot wounds.⁶⁴

World War II

During the large mobilization for World War II, acceptable physical condition for troops changed depending upon the need for personnel. In October 1942, War Department Circular No. 349 lowered physical standards to allow maximal numbers of men to be classified for general service, thus making them available for assignment to combat units. These instructions, as amended by another circular issued in March 1943, also authorized the use of Army Specialist Corps officers who did not meet the standards for general service. Officers who were classified for limited service could proceed overseas provided that the physical defect causing the classification was of a static nature, nonprogressive, and not subject to the development of complications.⁶⁵

Even when personnel demands reached their peak in early 1944, there were still limitations on accepting soldiers with asthma—any history of severe asthma during active service precluded soldiers from overseas duty. The policy on limited service officers was liberalized in War Department Circular No. 102, issued in March 1944, which lowered the physical capacity requirements. The circular delineated asthmatic conditions that disqualified limited service officers and warrant officers for overseas service as follows: “3. Asthma which has been incapacitating anytime during military service; also bronchiectasis.”

By April 1944 additional policy changes increased restrictions on those with a history of asthma. Asthma no longer had to be incapacitating; a simple history of asthma could keep a soldier from deploying overseas. Overseas service physical standards for enlisted men were established in an April 1944 circular (revised in June 1945). Defects that would disqualify personnel for shipment overseas were listed as “10. Allergic states, such as asthma, severe hay fever, or severe skin sensitivity.”⁶⁶

In the period between 1942 and 1945, 215 men (1 officer and 214 enlisted men) were discharged from the Army for bronchial asthma, with an annual rate of discharge for disability of 0.02 per 1,000 strength. These data appear to indicate that the Army had little problem with asthma during World War II, but a review of hospital admissions for the same years, 1942 to 1945, reveals a total of 87,454 hospital admissions for bronchial asthma, with 13 deaths and 6,184 readmissions. Soldiers admitted for treatment of asthma had an average of 39 days of noneffective time per admission. This translates into over 10,000 man-years of lost duty time due to asthma alone.

Vietnam

During the Vietnam War, the US Army relearned its medical lessons regarding asthma. Brigadier General Andre J. Ognibene, the Army medical consultant for Vietnam, stated in a 1969 report “despite recommendations following World War II that ‘irrespective of the cause or causes, tropical service appears to be contraindicated for individuals giving a history or presenting symptoms of asthma’... no absolute restriction applied to the Vietnam conflict.”^{67(p262)} The military enjoyed more complete and comprehensive medical coverage in Vietnam than in earlier wars. Field hospitals were more robust and helicopters quickly transported soldiers with any injury or disease to medical care.

Patients with asthma generally were considered fit for duty in Vietnam; however, if repeated hospitalization was required or if the patient failed to respond to conventional therapy, medical evacuation was considered. The consulting internist’s findings and documentation provided by the unit physician were the basis for the decision. “A major portion of the evacuations from Vietnam in the chest disease category were for asthma; at the peak of troop concentration, at least 15 patients monthly were removed from duty there because of it.”^{67(p262)}

This would equate to approximately 180 soldiers evacuated from Vietnam for asthma in 1969 alone. Brigadier General Ognibene discussed the impact of these evacuations: “If induction rates of 1 per 1,000 for asthma in World War II (God and Basemore, 1944) remained valid, approximately 500 asthmatics were on duty in Vietnam during 1969 and approximately 320 completed their tour. Whether the 320 additions to troop strength justified the medical effort expended on the 180 evacuees is difficult to ascertain, but the Vietnam experience may provide a basis for further decisions about asthma and the combat soldier.”^{67(pp262-263)} It is clear that during the Vietnam War asthma was a significant problem, and during that time consideration was given to tightening the standards for duty in jungle combat.

Vietnam’s climate was difficult on asthmatic soldiers. “The high ambient temperature and humidity adversely affect the efficiency and health of US troops fighting in this area, and the medical personnel supporting them. These also make it difficult to preserve and maintain medical supplies and sophisticated medical equipment. South Vietnam’s terrain, with its waterways and jungles, impedes patient evacuation and supply distribution, even without the interference of combat operations.”⁶⁸

Persian Gulf War

The Persian Gulf War was fought under conditions of intense desert heat, dust storms, and exposure to pollutants from burning oil wells. Added to this was concern about chemical attacks. Chemical protective masks and gear were always at hand. Also, many deployed troops took pyridostigmine, a pretreatment for nerve agent poisoning.

The US Army Medical Research Institute of Chemical Defense (USAMRICD) studied soldiers with asthma in the chemical environment. USAMRICD Technical Memorandum 90-4, *Clinical Notes on Chemical Casualty Care*, outlines the use of pyridostigmine and lists asthma as a preexisting medical condition that may subject the soldier to a pyridostigmine–medical-condition interaction. This document states, in part, that “A known asthmatic is not worldwide deployable, however, a desert environment and /or pyridostigmine may unmask a previously undiagnosed individual with hyperreactive airways.”⁶⁹

The use of pyridostigmine may worsen asthmatic symptoms; wearing a gas mask also exacerbates symptoms in asthmatic troops.⁷⁰ Gulf War troops trained extensively with gas masks. Wearing gas masks made breathing more difficult, because air had to be drawn through filters. A study⁷¹ revealed that physicians caring for soldiers during the war noted that “masks, MOPP [mission-oriented protective posture] gear not well tolerated, even by mild asthmatics,” and felt asthmatic troops were at risk in a potential chemical or biological environment.

In this survey, 56% of 70 Gulf War military physicians stated asthma should be a bar to enlistment, and 41% felt asthma should mandate separation from service. These same physicians listed the specific precipitants they felt contributed to the symptomatic asthma during and after the war. The results are shown in Figure 6-1.

Kosovo, Operation Enduring Freedom, Operation Iraqi Freedom

The authors are currently conducting a voluntary questionnaire-based survey of respiratory symptoms and performance of soldiers returning from Kosovo, Operation Enduring Freedom, and Operation Iraqi Freedom to study the effect of asthma on Army soldier performance.⁷² The objective of this study is to compare the performance levels of US Army soldiers self-reporting a prior history of asthma or reactive airway disease to those reporting no such history. Initial results from 283 surveys reveal that a self-reported history of asthma did not translate into performance failure in the desert environment.

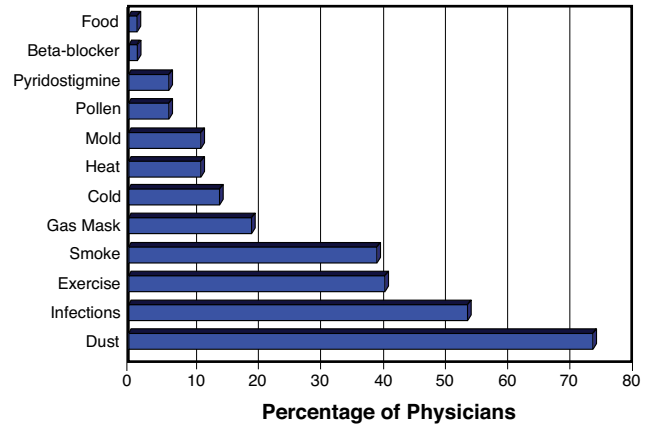


Fig. 6-1. Asthma precipitants in the Persian Gulf War. Percentage of physicians who believed that the specified item contributed to the symptomatic asthma among deployed service members during and after the war.

Data source: Spaulding HS, Goodman, DL. “Study of Allergic Conditions in Operation Desert Storm” presented at the American College of Allergy and Immunology Annual Meeting, Chicago, November 1991.

Interestingly, 5% of soldiers answering the survey report a history of asthma. This is 2% higher than what would be estimated based on the predicted effectiveness of screening out asthmatic soldiers, accounting for waivers, and accounting for those who developed asthma while on active duty. Five of the twelve asthmatic soldiers (42%) reported they were able to accomplish 100% of all assigned tasks without difficulty breathing. Another four of the twelve reported an ability to complete between 75% and 99% of assigned tasks, with the remaining three stating the ability to complete between 50% and 74% of tasks assigned.

Although recognized as a problem for soldiers in the field since the 1860s, and currently the subject of a number of new therapeutic modalities, asthma continues to result in disease and non-battle injury evacuations. Problems associated with the presence of asthmatic soldiers on the battlefield revolve around six major issues:

1. Increased risk of asthma attack in the potentially contaminated battlefield environment.
2. Utilization of scarce evacuation assets to transport asthmatic soldiers to rear area medical facilities.
3. Loss of trained personnel from a unit at a time when they are needed most, and subsequent requirement for unit-level training of replacement personnel.

4. Increased theater requirements for replacement personnel if asthmatic personnel are evacuated out of theater.
5. Increased risk to the asthmatic soldier presenting to austere medical facilities not prepared to care for those with chronic diseases.
6. Increased disease and non-battle injury rates in theater.⁷³

CURRENT REGULATION ON ASTHMA AND ACCESSIONS

In practical terms, military fitness regulations are formulated to help make determinations as to who should or should not serve. If the qualifying regulations are too stringent, then very few will be eligible and it will be hard to recruit. The difficulty of addressing asthma in the military is exemplified by changes in the Department of Defense Instruction (DoDI) regarding appointment, enlistment, and induction into the armed forces of individuals with a history of asthma. The DoD updated regulatory guidance concerning asthma with DoDI 6130.4, *Criteria and Procedure Requirements for Physical Standards for Appointment, Enlistment, or Induction in the Armed Forces*, April 2, 2004. (DoDI 6130.4 was reissued on January 18, 2005⁵; however, the regulatory guidance concerning asthma remained unchanged from the 2004 issuance.) The 2004 Instruction²⁷ states:

E1.22. LUNGS, CHEST WALL, PLEURA, AND MEDIASTINUM

The causes for rejection for appointment, enlistment, or induction are:

...

E1.22.4. *Asthma* (493). Including reactive airway disease, exercise induced bronchospasm or asthmatic bronchitis, reliably diagnosed and symptomatic after the 13th birthday. Reliable diagnostic criteria may include any of the following elements: Substantiated history of cough, wheeze, chest tightness and/or dyspnea which persists or recurs over a prolonged period of time, generally more than 12 months.

The 2004 change is a substantial relaxing of standards from May 2, 1994, DoD Directive 6130.3, *Physical Standards for Appointment, Enlistment, and Induction*,⁷⁴ which provided:

U. LUNGS, CHEST WALL, PLEURA, AND MEDIASTINUM

The causes for rejection for appointment, enlistment, and induction are:

...

4. Asthma, including reactive airway disease, exercise induced bronchospasm or asthmatic bronchitis, reliably diagnosed at any age. Reliable diagnostic criteria should consist of any of the following elements: (1) Substantiated history of cough, wheeze, and/or dyspnea which persists or recurs over a prolonged period of time, generally more than 6 months. (2) If the diagnosis of asthma is in doubt, a test for reversible airflow obstruction (greater than a 15 percent increase in forced expiratory volume in 1 second (FEV1) following administration of an inhaled bronchodilator), or airway hyperactivity (exaggerated decrease in airflow induced by standard bronchoprovocation challenge such as methacholine inhalation or demonstration of exercise induced bronchospasm) must be performed.

The regulations are reviewed on a regular basis in order to make sure they are based on the best possible data.

COST OF ASTHMA TO THE MILITARY

Over 3,000 applicants are disqualified from military service every year because of chest and lung problems, making evident the very real challenge of asthma to the military. Of these, approximately 1,500 receive waivers for a history of asthma, of whom approximately 750 actually enter military service. At the same time, approximately 1,000 recruits are released from the military services during basic training with an existed-prior-to-service (EPTS) discharge because of current asthma symptoms.⁷⁵⁻⁷⁷ An EPTS discharge is defined as a medical discharge no more than 180 days after entry into active duty for a condition verified to have existed before the recruit began military service.⁷⁸⁻⁸⁰ The majority of these recruits are found to have concealed a history of a diagnosis of asthma at the entrance examination.^{76,77,81,82} These early discharges from the military services due

to asthma have cost the DoD between \$10 million and \$42 million each year.^{76,77}

The indirect costs of asthma to the military are different from indirect costs in the civilian sector, including such items as the cost of evacuation, lost duty time, cost of deploying replacements, cost of life long care for those medically disqualified secondary to asthma, increased risk to service members exposed to "non-OSHA approved environment" which may exacerbate disease, lack of a full line of medications for chronic disease in forward deployed medical units, and the cost to unit morale if some service members are felt to avoid unpleasant duty by using their diagnoses of asthma. Clearly, there is a need to systematically accumulate data on asthma in the recruit population over time in order to better manage the costs associated with asthma.

ONGOING ANALYSIS OF ASTHMA IN THE DEPARTMENT OF DEFENSE

The needs and requirements of the military develop continuously, the physical requirements of the individual service member evolve over time, and the population pool from which applicants are selected also changes throughout the years. Likewise, the medical management of asthma steadily improves, permitting normal physical activity with proper treatment. The net effect of these factors is that predicting the outcome of newly accessioned recruits with asthma and properly evaluating the effectiveness of recruit screening strategies is a moving target. The challenge in applying data from prior “point in time studies” is that these dated constructs do not reflect today’s military.

Accordingly, the DoD Accession Medical Standards Analysis and Research Activity (AMSARA) was commissioned in 1996 within the Division of Preventive Medicine at the Walter Reed Army Institute of Research to support the DoD Accession Medical Standards Working Group and Steering Committee.^{77,83} AMSARA’s mission includes supporting the development of evidence-based standards by guiding the improvement of medical and administrative databases, conducting epidemiologic analyses, coordinating related research, and integrating into policy recommendations relevant operational, clinical and economic considerations.

AMSARA’s six primary objectives are to

1. validate current and proposed standards;
2. validate assessment techniques;
3. perform quality assurance;
4. optimize assessment techniques;
5. track the impact of policies, procedures, and waivers; and
6. recommend changes to enhance readiness, protect health, and save money.⁷⁷

Asthma was one of the conditions for which waivers were most often considered between 1997 and 2002, as shown in Table 6-2.⁷⁶ During this time period, waiver applications for asthma ranked first for the US Navy and Marines, second for the Air Force, and third for the Army. However, the Air Force was approximately two-fold less likely to grant waivers than the other services. Hearing deficiency and disorders of refraction were the other two most common waiver conditions.⁷⁶

Records from all EPTS discharges are forwarded through the United States Medical Entrance Processing Command to AMSARA. For the period from 1998 to 2002, asthma was categorically the most common condition cited as reason for EPTS discharge of enlisted service members,⁷⁶ as shown in Table 6-3. Asthma ranked first for the Army and Air Force in all 5 report years, and first in 2 of the 5 years for the

**TABLE 6-2
ASTHMA WAIVERS GRANTED FOR ACTIVE DUTY ENLISTED APPLICANTS, 1997–2002**

	Applied		Granted	
	Count*	% of Total No. of Waivers	Count*	% of Total No. of Waivers
Army	7,450	14	5,492	15
Air Force	1,221	10	324	6
Navy	3,339	11	1,284	8
Marine Corps	2,280	13	1,238	12

* Numbers of waiver applications and approvals for which a medical diagnosis code was provided, which may be less than the total numbers of considerations (ie, a small percentage had no medical code included, especially for those denied). Totals are for applicants with a Department of Defense code, not the total waiver applicants.
Data source: *Accession Medical Standards Analysis and Research Activity 2003 Annual Report*. Silver Spring, Md: Walter Reed Army Institute of Research; 2003: 59–62. Report AD-4A27738.

**TABLE 6-3
RANK AND PERCENTAGE OF ASTHMA AS EPTS DISCHARGE DIAGNOSIS, 1998–2002**

	1998, Rank (%)	1999, Rank (%)	2000,* Rank (%)	2001,* Rank (%)	2002, Rank (%)
Army	1 (15.7)	1 (13.4)	1 (15.5)	1 (18.3)	1 (20.3)
Air Force	1 (22.3)	1 (19.8)	1 (16.7)	1 (30.7)	1 (36.1)
Navy	4 (9.9)	1 (15.0)	1 (11.0)	2 (6.5)	4 (8.1)
Marine Corps	3 (8.9)	2 (11.2)	1 (11.9)	1 (17.4)	2 (15.1)

*Incomplete data sets for some years, especially 2000 and 2001 Air Force data; rank and percentages of representative data were used.
EPTS: existed prior to service
Data source: *Accession Medical Standards Analysis and Research Activity 2003 Annual Report*. Silver Spring, Md: Walter Reed Army Institute of Research; 2003: 63–64. Report AD-4A27738.

TABLE 6-4

EPTS DISCHARGE COUNTS AND PERCENTAGES BY MEDICAL CATEGORY FOR ENLISTED PERSONNEL, 1995–1998

Medical Category	Count*					Percentage of all EPTS discharge				
	1995–1998	1995	1996	1997	1998	1995–1998	1995	1996	1997	1998
Psychiatric—other	6,920	223	1,337	2,792	2,568	24.5	4.4	19.6	35.7	30.1
Lungs/chest—asthma	3,699	678	969	961	1,091	13.1	13.5	14.2	12.3	12.8
Orthopedics—knee	2,809	752	774	641	642	10.0	15.0	11.3	8.2	7.5
Orthopedics—other	2,732	690	734	680	628	9.7	13.7	10.8	8.7	7.4
Orthopedics—feet	2,663	594	740	554	775	9.4	11.8	10.8	7.1	9.1
Orthopedics—back	2,117	504	576	472	565	7.5	10.0	8.4	6.0	6.6
Neurology—other	979	267	203	261	248	3.5	5.3	3.0	3.3	2.9
Genitourinary system	823	218	224	201	180	2.9	4.3	3.3	2.6	2.1
Vision	728	152	230	195	151	2.6	3.0	3.4	2.5	1.8
Abdomen and viscera	622	149	177	190	106	2.2	3.0	2.6	2.4	1.2
Cardiovascular—other	478	102	115	126	135	1.7	2.0	1.7	1.6	1.6
Skin and lymphatic	378	93	96	103	86	1.3	1.8	1.4	1.3	1.0
Chest—other	363	125	81	48	109	1.3	2.5	1.2	0.6	1.3
Neurology—seizure disorder	233	47	50	67	69	0.8	0.9	0.7	0.9	0.8
Hearing	235	61	63	77	34	0.8	1.2	0.9	1.0	4.0
Ears—other	181	46	67	46	22	0.6	0.9	1.0	0.6	2.6
Hypertension	153	42	37	39	35	0.5	0.8	0.5	0.5	0.4
Eyes—others	100	6	7	16	71	0.4	0.1	0.1	0.2	0.8
Psychiatric—schizophrenia	67	8	21	16	22	0.2	0.2	0.3	0.2	0.3

*The difference in counts of EPTS discharges by medical categories may be due to increased reporting compliance.

EPTS: existed prior to service

Reproduced from: *Accession Medical Standards Analysis and Research Activity 1999 Annual Report*. Silver Spring, Md: Walter Reed Army Institute of Research; 1999: 45.

Navy and Marines. Overall, these figures represent an interval increase in the percentages of asthma EPTS discharges compared to the mid-1990s (shown in Table 6-4).⁸⁴

Asthma is thus repeatedly one of the single most common diagnoses designated for both enlistment waivers and EPTS discharges. Citing this trend, AMSARA has identified asthma as an area of focus, sponsoring several studies to closely evaluate screening strategies and the impact of asthma on current service members who are asthmatic.^{81,82}

AMSARA recently studied Army recruits undergoing EPTS discharges at Fort Jackson, South Carolina,

and Fort Knox, Kentucky, both large basic training facilities.^{76,77,81,82} The study's primary objectives were to better understand how the recruit entered active duty with asthma (eg, condition was waived, concealed, or unknown) and to determine whether asthma was affecting his or her performance. Eighty-six percent (3,275) of all military personnel undergoing EPTS discharges between January 1, 2002, and December 31, 2003, completed questionnaires at the time of discharge. The most striking finding is that Fort Jackson, which trained ~2.7 times more recruits than Fort Knox, had four times fewer asthma-related EPTS discharges (21.5% vs 79.5%). Perceived severity of asthma leading

to EPTS discharge was lower at Fort Knox than at Fort Jackson (55% vs 69%). Few of those discharged for asthma felt they could have completed basic training (9.9% at Fort Jackson and 4.9% at Fort Knox). According to the study sponsors, the significant difference between these two posts is likely because of differences in the standards used to initiate a discharge due to asthma, the medical evaluation process, and the command environment. Concealment of the condition at the time of the military entrance processing station (MEPS) examination was reported for 52.5% of all asthma-related discharges, as opposed to 81.7% of discharges for other reasons, highlighting the problem of concealment of medical conditions among military applicants during the MEPS process.⁷⁶

This objective confirmation of concealment of asthma as a major contributing factor to EPTS discharges prompted the search for improved screening strategies that would identify asthmatic applicants at the time of enlistment, rather than after an initial investment in training. One such strategy includes screening applicants with newer diagnostic tests such as exhaled nitric oxide (ENO). ENO is emerging as a useful test to measure ongoing lung inflammation, a hallmark of current asthma. A study funded by the US Army Accessions Command was initiated in 2003 at the Baltimore, Maryland, MEPS station, consisting of a questionnaire, ENO testing, and select interviews.⁷⁶ Of the 1,591 applicants enrolled, only 2.2% (35) revealed asthma before the ENO testing, a figure that increased to 7.3% (116) after ENO results consistent with asthma were revealed to the participants. Seventy-seven percent of individuals who reported having asthma symptoms after age 12, and 60% who reported symptoms consistent with exercise-induced bronchospasm, had nitric oxide levels greater than 14 ppb. However, 20% of all asymptomatic and history-negative participants had levels greater than 100 ppb. Additionally, only 29% of those with a history of asthma were detected by the current MEPS exam. These results show promise in the development of an objective test that may help identify those with asthma at the time of application. Additional study is needed to identify appropriate cut-off points that will serve as reliable predictive values.

The US Navy's study "Retention of Mild Asthmatics in the Navy" (Project REMAIN) is a nested case-control cohort study examining the retention of 136 mildly asthmatic sailors first identified at recruit training at Great Lakes Naval Training Center, Illinois, from July 26, 2000, through July 25, 2002, compared to 404 controls.^{76,77,81,82} The asthmatic sailors were treated with standard therapy. Primary outcome measures were hospitalizations, clinic visits for asthma, and discharges through August 2003. Findings included

a significant increase in discharges before completion of recruit training (45% vs 16%), but no difference in discharges if recruits completed initial training (72% vs 71%). Although those with mild asthma were 2.8 times more likely to be discharged during basic training, approximately 40% of the enrolled cohort remained on active duty at the end of the study, resulting in a savings of \$1.6 million. The recent decrease in asthma EPTS discharges in the Navy, unlike in the other military services, is likely a direct result of this study and the retention of mildly asthmatic recruits at additional training sites.⁷⁶

This study represents the first scientific evaluation of proposed policy change prior to full implementation, demonstrating the cost-effectiveness of using this approach. It will be of great interest to gather longer-term prospective data on asthmatic service members retained on active duty, as well as data on those with more severe asthma. It will also be important to demonstrate in a similar evidence-based fashion that the practice of retaining mildly asthmatic recruits applies in services other than the Navy.⁷⁶

Asthma also affects those who make it through basic training, as shown in Table 6-5.⁸⁵ Although this table presents data only from the Army, the details are revealing. In 1992, following a perceived increase in the number of deployed service members being returned from theater for asthma during the Persian

TABLE 6-5
US ARMY ASTHMA DISABILITY DISCHARGES, 1992–2001

Year Separated	Average Years of Service	Average Age	Number
FY 1992	6.33	27.88	178
FY 1993	6.49	27.76	112
FY 1994	5.85	27.24	78
FY 1995	5.82	26.95	114
FY 1996	5.36	26.90	201
FY 1997	5.26	26.38	293
FY 1998	5.37	27.12	277
FY 1999	5.03	26.67	334
FY 2000	5.10	26.38	424
FY 2001	5.14	26.56	419

FY: fiscal year
Data source: Unpublished data. Department of the Army, Office of The Surgeon General.

Gulf War, the DoD tightened the accession medical standards for asthma. At the same time, between 1992 and 2002, the Army's end strength decreased. The combination of tighter regulations and decreasing overall numbers should lead to a decrease in discharges for asthma, but this did not happen. Disability

discharges (which do not include those who received an EPTS discharge) among Army soldiers increased from 178 in federal year 1992 to 419 in federal year 2001. The average years in service for these service members decreased from 6.33 years in 1992 to 5.14 years in 2002.

EVALUATION OF APPLICANTS WITH A POSSIBLE HISTORY OF ASTHMA

In terms of asthma, potential military recruits may be divided into three major groups: (1) those who never had asthma and are qualified, (2) those who have a history of asthma but are currently asymptomatic, and (3) those who have current symptomatic asthma and require medication on at least an intermittent basis. The most difficult group to evaluate is the second, those with a history of asthma who are currently asymptomatic. Current consensus is that most of these individuals are simply in a form of remission from symptomatic asthma and will have a recurrence later in life.

There is no perfect algorithm to predict which individual with a history of asthma now in remission will have a relapse, nor is there a gold standard to predict the severity of a relapse if it occurs. Without that prognostic ability, the military must rely on the best published predictive statistics. The medical history and physical, review of the medical record, and, when indicated, pulmonary testing should all be considered in determining an applicant's potential for respiratory success in the military. Reviewing the record serves to identify risk factors for undiagnosed asthma as well as

TABLE 6-6
ASTHMA SCREENING QUESTIONS FROM SURVEYS

No.	Question	Not at all	Mildly	Moderately	Severely	Very Severely
1	I have been troubled by a cough and/or wheezing and/or chest tightness and/or shortness of breath.					
2	Coughing and/or wheezing and/or chest tightness and/or shortness of breath limits my activity.					
3	Coughing and/or wheezing and/or chest tightness and/or shortness of breath wakes me up at night.					
4	Coughing and/or wheezing and/or chest tightness and/or shortness of breath limits my endurance and/or ability to run.					
5	I have felt congested in the morning in the past year.					
6	I avoid certain places because they cause coughing or shortness of breath or wheezing					
7	I have had episodes of difficulty breathing in the past year.					
8	I avoid competitive sports because of chest tightness if I push too hard.					
9	I have seen a doctor for any of the symptoms described in question 1-8.					

indications that a self-limited disease may have been mislabeled as asthma.

At the time of evaluation for entrance into the military, screening for a history of asthma should include these questions:

1. Have you ever been told you had asthma?
2. Have you ever wheezed?
3. Have you ever had a persistent cough, particularly a persistent nighttime cough?

A survey such as the one in Table 6-6 may be helpful. These questions are easy and quick, but more sensitive than specific, and therefore, can potentially over-identify applicants as having asthma. A review of the applicant's records will help sort out the significance of a positive answer to one of the screening questions. While reviewing the records, medical personnel should answer the following questions:

1. Did the applicant ever receive prescription drugs for asthma or use over-the-counter breathing medicines?
 - a. If yes, at what age was the last prescription given? Were there controller drugs involved?
 - b. For what period of time (over how many months or years) were the medications

used? Was there a defined seasonality to use that may indicate an allergic trigger?

- c. Is there any notation in the chart as to how often the drugs were actually taken? An often-heard complaint is that a medication was prescribed by an "overzealous" physician, but never taken by the patient, who "didn't need it."
2. Are there recurring diagnoses of bronchitis or wheezing bronchitis or nocturnal cough?
 3. Did the applicant easily keep up with peers in athletic competition and in day-to-day activities?

If the diagnosis of asthma remains in doubt, more specific testing may be in order. This may be performed by a specialist in asthma such as an allergist-immunologist or pulmonologist. Peak flow testing is the easiest and least expensive objective test of airway functioning. However, the test lacks reproducibility and is easily manipulated. Pulmonary function testing may also be performed. Even known asthma patients may have perfectly normal pulmonary function tests, so the primary purpose of the test is to identify candidates with below normal functioning. A candidate who tests below normal should be given a bronchodilator and retested. A change in FEV1 of greater than 12% and 200 mL is highly suggestive of asthma.

EVALUATION OF ASTHMA DURING RECRUIT TRAINING

During initial military training, recruits typically come to the attention of medical practitioners because of exertion symptoms or an inability to keep up with required exercise programs, particularly running. Some present due to lack of improvement in running times in spite of conditioning programs.

For those with normal pulmonary function testing whose diagnosis is still in doubt, a test for bronchial hyperreactivity may be done. There are a number of diagnostic tests for bronchial hyperreactivity, each with advantages and disadvantages. Although many people consider the methacholine challenge the gold standard, it is by no means a perfect test. There is some debate as to what constitutes a positive challenge and what the prognostic significance of a positive test may be. Therefore, each of these tests should be done and interpreted by a specialist such as an allergist-immunologist or a pulmonologist.

Available tests for the diagnosis of bronchial hyperreactivity include the following:

- Methacholine challenge. Increasing doses of methacholine are given via a nebulizer until

the FEV1 decreases by 20%, at which point the test is considered positive and stopped. The methacholine challenge is relatively easy to conduct, but is more sensitive than specific. (This test and its limitations are discussed in detail below.)

- Exercise challenge. Typically patients are tested by running. Running on a treadmill is more reproducible but tends to have fewer positive results than a free run. This test may be influenced by the amount of patient effort. Some have argued that the exercise challenge is more of a physiologic test for recruits than the methacholine challenge, because running is a large part of recruit physical conditioning and testing, but there is no definitive evidence for this assertion.⁸⁶
- Histamine challenge. Similar to the methacholine challenge, but the challenge agent is histamine.
- Hypocapnic hyperventilation. Hyperventilation with cold, dry air can induce bronchial hyperreactivity. In the United States this test

is used less commonly than the methacholine or exercise challenge.

- Exhaled nitric oxide. As discussed above, the ENO is an emerging test that shows promise.^{87,88}

Methacholine challenge has been used extensively as a screening test for patients with a history suggesting asthma but whose baseline pulmonary functions are normal. In patients with no history of asthmatic symptoms but with a history of allergic rhinitis or upper respiratory infections, the rate of positive challenges, particularly above 1 mg/mL, are high and are not predictive of asthma. In over 1,633 children screened by a questionnaire as well as a free run and methacholine inhalation challenge (MIC), clinical confirmation of an asthma diagnosis was best correlated with a positive MIC at 0.4 mg/mL up to 1.8 mg/mL. In children suspected of asthma by questionnaire, but only 9.7% of whom had a positive free-run challenge, MIC was positive at 0.5 to 3.1 mg/mL. Almost 10% of the control subjects had a positive free run and over 20% had a positive MIC, at over 4 mg/mL.⁸⁹ There was a nonconcordance of MIC with free run in about 10% of the subjects. In general, a reactive MIC is more sensitive than an exercise challenge but also has less specificity.⁹⁰

In a study of the prevalence of exercise-induced bronchospasm (EIB) in recruits and its effect on physical performance, 121 ethnically diverse recruits (53 men and 63 women) with no history of asthma or EIB underwent exercise testing on a treadmill. Eight of them were diagnosed with EIB. The subjects were then followed during their 8-week basic training, during which the EIB subjects and control subjects both showed statistically significant gains in performance on physical fitness test events. The authors concluded

that EIB should not be an absolute reason to exclude individuals from service.⁹¹

To determine the most appropriate test to assess airway hyperreactivity in recruits, Brown and colleagues performed both methacholine and exercise challenges on military patients referred for evaluation of dyspnea. Of 128 patients with a negative exercise challenge, 52 went on to have a positive methacholine challenge. The authors felt that the exercise challenge is potentially too insensitive for use as an initial diagnostic test for evaluation for asthma.⁸⁶

On the other hand, the methacholine challenge may be too sensitive, as illustrated in a study of 63 asymptomatic potential ROTC cadets (58 men, 5 women) with no history of asthma who underwent a methacholine challenge. Eight of them (12.7%) tested positive according to American Thoracic Society guidelines. Two of these were positive at 25 mg/mL, a dose generally accepted as a false positive, but four were positive at 10 mg/mL and two at 2.5 mg/mL. The authors concluded that asymptomatic cadets may have possible false positive methacholine tests at doses greater than 0.25 mg/mL.⁹²

Based on the 1999 American Thoracic Society guidelines for the methacholine challenge, the MIC has a negative predictive value of over 90% if the pretest likelihood of asthma is between 30% and 70%. There is a positive predictive value in this same population of 90% to 98% at a PC20 (concentration causing a 20% fall in HEV1) of 1 mg/mL and only 70% at a PC 20 of 4 mg/mL.⁹³ It is difficult to translate these statistics to a population of asymptomatic recruits. There remains no true standard test for the diagnosis of asthma, particularly mild asthma, even in a symptomatic population. In an asymptomatic population with a history of asthma, an accurate diagnosis is even more problematic.

SUMMARY

In spite of a number of adaptive changes in the regulations, asthma continues to be a leader among medical conditions associated with initial military service disqualifications, waivers, and EPTS discharges. Problems surround understanding the many factors that influence the impact of asthma, or a history of asthma, on any individual.

Recent studies have provided the following insights concerning asthma:

- Although there is no definitive way to determine whether a child with asthma will go on to have asthma as an adult, the degree of symptoms apparent between the ages of 7 and

14 is the most important predictor of adult asthma.

- Recruits should be thoroughly screened for possible asthma by reviewing their medical records, asking questions on their medical history, and potentially conducting peak flow and/or pulmonary function testing with and without bronchodilation.
- Those who have joined the service with a waiver for a history of childhood asthma and are currently asymptomatic are no more likely to leave the military before the end of their enlistment than those without a waiver.

- Those who receive a waiver for current asthma of any degree are more likely to leave the military before the end of their enlistment.
- It is currently possible to test for bronchial hyperreactivity using a variety of tests.
- Finally, new tests such as ENO may enhance current asthma identification and recruit screening strategies.^{76,81,94}

Ultimately, it is important for both recruits and the military that current scientific data is used to provide the best advice to those who determine accession standards. Regulatory standards exist today for the same reason that they existed in the past: to ensure that the US military force is ready to fight anytime, anywhere. Proper standards ensure that the military system identifies and disqualifies potential recruits with medical problems that would hinder themselves and others in the military, or that would be exacerbated by military service.

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