



International Association of accuDEXA™ Technicians

“Professional Certification of accuDEXA™ Technicians”

625 Lincoln Avenue ■ Marion, Virginia 24354-1663 ■ 276-243-8382

eMail: INAADT@healthprojectsusa.com

On The Internet: <http://www.healthprojectsusa.com/INAADT.html>

Certified accuDEXA™ Technician Training Guide

Lone Oak Medical Technologies

This International Association of accuDEXA™ Technicians Certified accuDEXA™ Technician Training Guide, and the Lone Oak Medical Technologies Manufacturer’s accuDEXA™ User Guide, are the Official Training Documents Authorized by Lone Oak Medical Technologies, the Manufacturer of the accuDEXA™ Bone Mineral Density Assessment System.

DISCLAIMER

All of the information provided by the International Association of accuDEXA™ Technicians, in any manner, is intended solely for general information and should NOT be relied upon for any particular diagnosis, treatment or care.

Decisions relating to the prevention, detection, and treatment of Osteoporosis should be made only after discussing the risks and benefits with your Health Care Provider, taking into account one’s Personal Medical History, Current Health Situation, and Future Health Risks and Concerns.

The International Association of accuDEXA™ Technicians strongly encourages patients and their families to consult with qualified Health Care Providers for treatment advice on individual cases.



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INTRODUCTION

The INAADT accuDEXA™ Technician Certification Guide has been developed to provide a study of Osteoporosis, including causes, treatments, and assessment techniques, and a comprehensive study of the accuDEXA™ Bone Mineral Density Assessment System, including actual use of the accuDEXA™ Bone Mineral Density Assessment System.

This Guide prepares an individual to successfully take the INAADT accuDEXA™ Technician Certification Examination. Upon completion of this Guide, the student can take the INAADT accuDEXA™ Technician Certification Examination. Those students who pass this Examination will be awarded the professional designation of *Certified accuDEXA™ Technician*.

The International Association of accuDEXA™ Technicians (INAADT) is a Program-Related Enterprise of ACTUSA-Health Projects USA. Health Projects USA is the largest Preventative Healthcare Provider of Mobile accuDEXA™ Bone Mineral Density Screenings using Certified accuDEXA™ Technicians.

accuDEXA™ Bone Mineral Density (BMD) Screenings provide one of the most accurate peripheral screenings for Osteoporosis. And the Health Projects USA accuDEXA™ Bone Mineral Density Screenings Project provides one of the least costly accuDEXA™ BMD Screenings available in the United States.

Health Projects USA has been providing accuDEXA™ BMD Screenings throughout the United States for the past twelve years to help men and women determine how much at risk they are regarding having a Fracture caused by Osteoporosis.

According to the National Osteoporosis Foundation, in the United States today, 10 million individuals already have the disease, and 34 million more have low bone mass, placing them at increased risk for Osteoporosis.

One out of every two women and one in five men, over the age of 50, will have at least one Osteoporosis-related fracture in their lifetime. While Osteoporosis is often thought of as an older person’s disease, *Osteoporosis can strike at any age*.

The information obtained from a BMD screening should be a part of a complete medical evaluation by a knowledgeable Health Care Provider. However, **a BMD screening is the only way to detect low bone density**, and is presently the only reliable way to predict the chances of a fracture in the future. If Osteoporosis is detected early, a program of diet and exercise, and possibly medication, can be prescribed, and the risk of fracture reduced.



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Nature Of Osteoporosis

OSTEOPOROSIS DEFINED

The World Health Organization (WHO) defines OSTEOPOROSIS as “a skeletal disorder characterized by compromised bone strength, predisposing a person to an increased risk of fracture.” It is the most common bone disease. Osteoporosis is a “silent” disease because it produces no noticeable symptoms until it progresses to the point of a fracture.

The word “Osteoporosis” is Greek and means “porous bone”. All bone consists of a framework structure of bands and plates forming openings that are normally filled with cells and blood. When viewed under the microscope bone looks like a “honeycomb” structure. The blood deposits Calcium into the bone up to about age 20 to 30 years. Calcium is also required for “remodeling” – removing old bone and replacing it with new bone at the same site. This repairs and maintains the bone. Bone is replaced totally throughout the body over a period of 10 years.

If Calcium is needed in other parts of the body, it can be removed by the blood and transferred to be used elsewhere. Bones become less dense. The size of the pores or holes inside the bone structure increases if Calcium is removed from the bones and not subsequently replaced from the blood stream. These increasingly larger holes reduce the strength of the bone, eventually resulting in “fragility fractures” - fractures resulting from little pressure or trauma.

These fractures can occur in any bone but are most prominent in the Wrist, Spine, and Hip. 24% of women who suffer a Hip fracture die within one year of the fracture.

CAUSES OF OSTEOPOROSIS

There are various causes of “poor bone quality”. They include family genetics, poor nutrition and poor exercise habits, and a history of certain diseases that require certain types of medication that rob the bones of Calcium. Generally, a combination of these factors is involved in making the bones fragile. In the past, a diagnosis of Osteoporosis was not made until a “fragility fracture” or a series of small vertebral “compression fractures” occurred. The series of vertebral fractures produces a phenomenon called a “Dowager’s Hump” often seen in the elderly.

A diagnosis of Osteoporosis can be made by a regular X-ray of the bones, but this cannot be done until 30% of bone has been lost. Once a fracture occurs, there were few effective

treatments. These treatments are very costly to both the person's physical, emotional, and financial well-being.

In 1984, the National Institute of Health held a conference of bone experts to discuss possible ways to prevent osteoporosis. They suggested that factors such as Family History were important, but also adding more Calcium to one's diet could help. This resulted in an increase in the sale of Calcium supplements and increased the interest of the media.

QUANTITATIVE DEFINITION OF OSTEOPOROSIS

In 1992, the World Health Organization, collaborating with the International Osteoporosis Foundation (NOF), organized a conference on Osteoporosis diagnostic methods to discuss the possibility of diagnosing Osteoporosis earlier and treating the bone loss before a fracture occurs. This was aimed at saving health costs. Since these fractures are related to the amount of Calcium in the structure of the bones, it was decided that predicting Osteoporosis could be accomplished by the measurement of the concentration of Calcium in the bones called the Bone Mineral Concentration (BMC). This would redefine "Osteoporosis" on a quantitative level.

The reference levels developed are called the T-Score and the Z-Score. These levels are evaluated by using a method of Statistical Analysis of Standard Deviations of change. The BMC is measured for a person, and then compared to readings made on a Standard Group of 200 Young Healthy Normal people, age 25-35 years old.

X-rays are used to measure the amount of Calcium in a specific area of bone. This is called the Bone Mineral Density (BMD). This is then compared first to the average BMD sample of the Young Healthy Normal Mean BMD). This produces the T-Score. The BMD is then compared to the average BMD of a sample of people who are of the same Age, Gender and Ethnicity as the Client. This produces the Z-Score.

A Z-Score of less than one Standard Deviation from the Norm and a T-Score of <-2.5 Standard Deviations from zero indicate the possibility of increased incidence of fractures.

OSTEOPENIA CREATED

In order to begin treatment before full Osteoporosis has developed, a new diagnosis called "Osteopenia" was also recognized by the conference. A T-Score of -1 to -2.5 Standard Deviations indicates that the BMC is getting lower and the strength of the bones is deteriorating. If some change does not occur, the possibility of the development of Osteoporosis is indicated. This condition is called "Osteopenia".

After the 1992 conference formulated its conclusions and established quantitative methods to help healthcare providers in early diagnosis of Osteoporosis, a renewed interest in the development of treatments and new methods of diagnosis began. Drug companies saw a new market and began to develop drugs that increase bone density.

PREVALENCE OF OSTEOPOROSIS

Osteoporosis is the most common bone disease. Osteoporosis affects an estimated 75 million people in Europe, USA, Japan and Southeast Asia. The World Health Organization issued a study relating the estimated number of osteoporotic fractures reported in the year 2000 in men and women aged 50 years or more to the area of the world where they occurred. There were 8,959,000 fractures studied and the following percentages were found:

Europe 34.8% Western Pacific 28.6%
Southeast Asia 17.4 % Americas 15.7%
Eastern Mediterranean 2.9% Africa 0.8%

For the year 2000, there were an estimated 9 million new osteoporotic fractures, of which 1.6 million were at the hip, 1.7 million were at the forearm and 1.4 million were clinical vertebral fractures. Europe and the Americas accounted for 51% of all these fractures, while most of the remainder occurred in the Western Pacific region and Southeast Asia.

The World Health Organization study of fractures and osteoporosis indicated:

The lifetime risk for a wrist, hip or vertebral fracture has been estimated to be in the order of 30% to 40% in developed countries – in other words, very close to that for coronary heart disease. Osteoporosis is not only a major cause of fractures, it also ranks high among diseases that cause people to become bedridden with serious complications. These complications may be life-threatening in elderly people.

In women over 45 years of age, osteoporosis accounts for more days spent in hospital than many other diseases, including diabetes, myocardial infarction and breast cancer.

A 10% loss of bone mass in the vertebrae can double the risk of vertebral fractures, and similarly, a 10% loss of bone mass in the hip can result in a 2.5 times greater risk of a hip fracture.

The combined lifetime risk for hip, forearm and vertebral fractures coming to clinical attention is around 40%, equivalent to the risk for Cardiovascular Disease.

By 2050, the worldwide incidence of hip fracture in men is projected to increase by 310% and 240% in women.

OSTEOPOROSIS IN THE UNITED STATES

In the United States, the National Osteoporosis Foundation (NOF) estimates that by the year 2010, 12 Million Americans will have the disease, and more than 40 Million will be at high risk. And by the year 2020, 14 Million Americans will have the disease, and more than 47 Million will be at high risk.

1 in 2 women, and 1 in 4 men, age 50 and older, will suffer a fracture due to Osteoporosis in their lifetime. A woman's risk of Osteoporosis is greater than her combined risk of Breast, Ovarian, and Uterine Cancer. The probability of developing the disease is related to both the Ethnicity and the Gender of the person. According to the

American College of Rheumatology, non-Hispanic Caucasian and Asian people are most likely to develop Osteoporosis and have Osteoporosis-related fractures.

Hispanic and Non-Hispanic Black people are less likely to develop fractures, but they are still at significant risk.

The United States *Surgeon General's Report on Bone Health and Osteoporosis*, released in October 2004, emphasized the need for more public attention to bone health. The report stated that an estimated 10 million Americans over age 50 have osteoporosis, while another 34 million are at risk. It stated that by the year 2020, half of all Americans older than age 50 will be at risk for fractures from osteoporosis. If lifestyle changes are not made by women now age 50 or older, the report predicts that 40 percent will suffer a fracture of the hip, wrist, or spine at some point in their lives. To emphasize this need for changes, President H.W. Bush declared 2002-2011 the *Decade of the Bone and Joint* to promote bone health and prevention of fractures.

In the Americas and Europe osteoporotic fractures account for 2.8 million disability-adjusted life years (DALYs) annually, somewhat more than accounted for by hypertension and rheumatoid arthritis (2), but less than diabetes mellitus or chronic obstructive pulmonary diseases... Collectively, osteoporotic fractures account for approximately 1% of the DALYs attributable to noncommunicable diseases. (Osteoporotic Fractures Report. WHO, 2007)

OSTEOPOROSIS IN MEN

About 20-25% of hip fractures occur in men. The overall mortality is about 20% in the first 12 months after hip fracture and is higher in men than women.

It is estimated that the lifetime risk of experiencing an osteoporotic fracture in men over the age of 50 is 30%, similar to the lifetime risk of developing prostate cancer.

Vertebral fractures may cause equal morbidity in men and women. Hip fractures in men cause significant morbidity and loss of normal functioning.

Although the overall prevalence of fragility fractures is higher in women, men generally have higher rates of fracture related mortality.

As in women, the mortality rate in men after hip fracture increases with age, and is highest in the year after a fracture. Over the first 6 months, the mortality rate in men approximately doubles that in similarly aged women.

COST OF OSTEOPOROSIS

In 2005, fractures associated with osteoporosis cost an estimated \$19 Billion Dollars, according to the National Osteoporosis Foundation. The report also stated that by 2025 these costs are predicted to reach about \$25 Billion \$300 Hundred Million Dollars.

According to the publication, "*Osteoporosis in the Workplace*":

"The social, economic and human costs of osteoporosis on employees, employers and governments, estimates that the annual direct cost of treating osteoporosis fractures of

people in the workplace in the USA, Canada and Europe alone is approximately \$48 Billion Dollars. This amount is similar in scope to the estimated \$53.7 Billion Dollars spent annually on global foreign development aid.”

Pierre D. Delmas, President of International Osteoporosis Foundation (IOF), stated in “*Invest in Your Bones-Prevent The First Fracture*”: “This huge cost does not include the indirect economic costs, and the huge emotional price, that has to be paid by someone who has broken a vertebra or hip.”

With all this overwhelming projected cost, the United States government has also decreased the reimbursement for osteoporosis testing by 50%. This increases the stress placed on the person dealing with the loss of independence and the loss of quality of life as well as the huge emotional price paid by the fracture sufferer and their family. Of those who suffer a hip fracture, after 6 months, 15% cannot walk across a room unaided. Medical experts agree that *prevention of osteoporosis*, and the fractures caused by them, is a most important method to avoid the emotional, physical and financial costs.

TYPES OF DIAGNOSTIC MACHINES

BMD Testing uses X-rays to evaluate the Calcium content of the bones. Through this, the possibility of future bone fractures can be predicted. This BMD can be used to assist Healthcare Providers in diagnosis, and in tracking the recovery of patients using their treatment methods.

The BMD can then be used by a Healthcare Provider, along with other factors to determine the possibility of a Client developing fragility fractures in her lifetime. Other factors used include a family history of Osteoporosis, the person’s ethnicity, gender, body mass index, lightness of skin and hair, medical history, previous fractures, smoking, excessive intake of alcohol, use of certain prescribed or illicit drugs, and nutrition. Types of diagnostic machines are the Central DXA, Peripheral DEXA, and Ultrasound.

The most comprehensive test is the Central DXA, which measures bone density in the lower back, hip joints, and arm or wrist. It is the most expensive test. It requires that the Client go to a radiological testing site.

Peripheral screenings can be done away from a radiology center, are less expensive, and these tests can test an ankle or finger. The Ultrasound requires a gel medium for transmission of the ultrasound, and has the lowest percentage agreement with the central testing.

The accuDEXA™ Bone Mineral Density Assessment System measures the BMD of the middle finger of the hand, and requires less than a minute to perform the test. It is the most accurate, and one of the least expensive, peripheral tests.

PREVENTION OF OSTEOPOROSIS

Exercise, nutrition, and correcting poor habits are steps toward preventing or slowing down the onset of osteoporosis.

Exercise should be weight bearing to stimulate bone structure. Such things as walking, jogging, lifting weights and dancing are a few ways to do weight bearing exercise. Strength training exercise also can improve the quality of the bones.

To improve nutrition, a person needs to increase the Calcium intakes along with Vitamin D₃, Magnesium, Phosphorus and Zinc. Some foods that contain these are milk, yogurt, orange juice, cereal, vegetables, enriched whole grain bread, and avocado. Supplements can also be taken if it is not possible to consume the amount of vitamins and minerals needed.

Poor habits that affect the bones are Smoking and Drinking Alcohol in excess. These things affect the bones as well as other parts of the body. Drinking Carbonated Beverages in excess will introduce Phosphoric Acid that will take Calcium from the bones, as well as be substitute liquids that do not contain Calcium when a person could be drinking milk.

In the same way, fast food does not provide many of the vitamins and minerals needed by the bones, while providing an increased amount of Fat. Changing these poor eating habits can help a person improve health in general, and bone health in particular.

Drinking enough Water during the day also contributes to improved health.

OSTEOPOROSIS TREATMENT MEDICATIONS

Medications are available now to help those who have been diagnosed with either Osteopenia or Osteoporosis. These over-the-counter (OTC) medications include Vitamin D₃, and the Minerals Calcium, Magnesium, Magnesium, Phosphorus and Zinc.

In addition, there are many types of Calcium supplements, some with other vitamins and minerals, and some containing only the Calcium. The type of Calcium compound can make a difference in the absorbability of the Calcium. Also, the dosage needs to be controlled since the body will only absorb a certain amount at a time. If a woman over the age of 65 is taking 1200mg of Calcium a day, it cannot be taken in one dose, but divided into at least 2 doses to be useable.

The first prescription drug for the treatment of Osteoporosis was Fosamax™, produced by Merck & Company (Merck) which was approved by the Food and Drug Administration in 1995. This drug helps the body to add mineral Calcium to the bones making them denser. Merck had been focusing on expanding the market for the drug.

Prescription medications will either prevent Calcium from being removed from bone (antiresorptive drugs) or stimulate new bone formation (teriparatides).

Teriparatides are the newest of these types of pharmaceuticals. Some of the most commonly prescribed antiresorptives are Fosamax™, Boniva™, and Actonel™.

Calcitonin™ slows bone loss and has been prescribed for many years. It is similar to a thyroid-produced hormone. Hormone-Replacement Therapy (HRT) is prescribed for some people because estrogen and testosterone are hormones that contribute to slowing of Calcium-loss from bones and stimulate bone growth. These medications require that the Healthcare Provider follow the patient's progress with additional BMD Screenings.



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accuDEXA™ Bone Mineral Density Assessment System

HISTORY

One of the major advancements in the diagnosis of Osteoporosis is the Dual Energy X-ray Absorption (DEXA) machine. This estimates Bone Mineral Density (BMD) by detecting the extent to which bone absorbs photons that are generated by very low-level X-rays.¹ This information is evaluated and the T-score and Z-score are produced. This indicates the BMD of the position being evaluated and helps the Healthcare Provider to evaluate the risk of fracture due to Osteoporosis.²

Schick Technologies, Inc., located in Long Island City, New York, developed a compact-sized portable Dual Energy X-ray Absorptiometer unit in 1997. This accuDEXA™ Bone Mineral Density Assessment System (accuDEXA™) applies the very sensitive “camera on a chip” sensor technology, developed by a NASA division - the Jet Propulsion Laboratory, to produce high-quality images. The accuDEXA™ is a mobile unit that is faster and less expensive than Central DXA machines. It uses a peripheral area of the body (the middle finger of the non-dominant hand) to perform a more convenient test, and gives the BMD at the site of the test. It can also indicate the BMD of other areas of the body.² The Healthcare Provider can use this information to help indicate future fracture risk due to loss of calcium and to follow the progress of treatment.

The accuDEXA™ is now being manufactured, leased, sold, and maintained by Lone Oak Medical Technologies, in Doylestown, Pennsylvania. The principals of this company worked with Schick Technologies in the initial development of the accuDEXA™.

accuDEXA™ User Guide

Lone Oak Medical Technologies provides a Manufacturer's User Guide for the Certified accuDEXA™ Technician to understand the correct operating procedures needed. Every Certified accuDEXA™ Technician must study completely this User Guide to be prepared to confidently serve the Client.

The accuDEXA™ User Guide is available to be Downloaded from the Lone Oak Medical Technologies Website at:

http://www.loneoakmedical.com/accuDEXA_Model_7100_User_Guide.pdf.

Using the accuDEXA™ Bone Mineral Density Assessment System

An accuDEXA™ can be used to screen up to 12 people in one hour. This can be done on a Walk-In Basis or by Appointment. Since the Screening produces a detailed Report, the person screened can take their Report to their Healthcare Provider for follow-up. A Certified accuDEXA™ Technician may be employed in a Healthcare Provider's office, a Radiology Laboratory, or at an Outside Event, as in a Health Fair. The accuDEXA™ machine is a precision instrument containing a Radiation source. It is very important that care is taken in transporting and using it.

Radiation and Safety

Radiation involves the transfer of energy from a source outward in all directions. Ionizing radiation transfers energy into matter as it passes through and electrons are removed producing ions. The original measuring unit of X-ray radiation, the roentgen, is based upon the amount of electrons (electrical charge) produced when the energy passes through air. Under normal conditions one roentgen will produce a charge of 2.54×10^{-4} coulomb in one kg of air.

There are 4 types of ionizing radiation – photons, alpha particles, beta particles, and neutron particles. Beta and alpha particles interact with matter by their mass, charge, and energy. Neutrons interact by mass and energy but have no charge. Photons have no charge or mass but have very high energy. They also have very high penetrating power.

X-rays are photon radiation. They are part of the electromagnetic spectrum of light. When X-rays penetrate matter they can damage the cells they come into contact with. When a cell is hit it can become highly energized. Electrons can be removed and ionized particles produced which behave differently from the original atoms. Damage occurs to cellular processes. This damage can possibly be repaired by the body, the cell can mutate and divide, or the cell can die. The part of the cell where most damage may occur is the DNA.

Radiation is measured by detectors, such as the Geiger-Mueller counter, in units based upon the amount of radiation produced by the source per unit of time or in units based upon the amount of radiation absorbed by the target material per unit of time. Each of these types of units is defined in SI units used internationally and Special Units used generally within the United States.

For our purposes we can limit our discussion to the System Internationale (SI) units of absorbed radiation. There are two units with which a Certified accuDEXA™ Technician should be familiar – the Gray³ and the Sievert⁴. The Gray measures the amount of energy deposited in matter. The Sievert pertains specifically to the amount of biological damage caused by different types of ionizing radiation absorbed by different types of human tissues. The accuDEXA™ produces about 4 µSv (microsieverts) per scan. The general public receives a total of about 3 mSv (millisieverts) annually from radiation in the environment.⁵

The amount of radiation absorbed depends upon the type of radiation and the type of tissue receiving the radiation. The amount of a particular type of radiation must be multiplied by a

quality weighting factor (determined by the type of tissue irradiated to allow for the relative biological effectiveness (RBE) of the dose.

The actual damage done to the tissues is also affected by whether the source of the radiation is taken internally or is acting externally and by the type and amount of tissue exposed.

The accuDEXA™ machine uses a source of radiation that produces X-rays. Working with radiation can be done successfully if the Certified accuDEXA™ Technician has basic knowledge and is aware of the guidelines that will protect both the Client and the Certified accuDEXA™ Technician.

Radiation is a common part of our daily environment. There are measures to help block some of this radiation. Every time we step outside we are exposed to the radiation from the sun. Sunscreens are used to block UVA and UVB rays. Inside buildings we get radiation from the building materials and foundation rock. Many people use Radon Kits to determine if the house foundation is producing radon gas that seeps up into the house causing radiation exposure to the family. Preparations can be made under the house to shield against this radiation. Smoke detectors use radioactive materials to operate and warn about the presence of smoke and fire. Disposal of these detectors must follow specific guidelines to avoid radiation exposure. Being aware of radiation and procedures to deal with it can help reduce the annual dose.

X-rays used in radiology departments of hospitals to determine breaks in bones and other medical problems are the same as the ones used in the accuDEXA™ except for the strength of the X-ray. The source in the accuDEXA™ machine produces 50 kVp and 70 kVp X-rays. (The kVp⁶ indicates the energy of the radiation being used to produce the contrast on an X-ray image.) All X-rays have the potential to be used safely or to be deadly. Safety is always a priority when using any radiation source. The Certified accuDEXA™ Technician assumes the responsibility for working safely to protect the Client, themselves, and the people around them. Knowing the correct procedures and complying with all regulations is very important.

One of the major guidelines in the use of radioactive sources is ALARA (As Low As Reasonably Achievable). The Osteoporosis Screening cannot be achieved without some exposure to radiation, but the accuDEXA™ machine is designed to deliver a very precise, low dose of the two energies of X-rays. In working with radiation damage done to the tissues exposed depends on several factors:

1. the type of radiation
2. the type and strength of the source
3. distance from the source
4. type of tissues exposed
5. length of time of exposure

The hand is positioned an exact distance from the source in the machine and the time of exposure for each strength of X-ray precisely controlled by the accuDEXA™ machine. The times are 60 milliseconds and 90 milliseconds respectively. The tissue of a small part of the middle finger of the non-dominant hand is exposed.

Radiation spreads out all around from a source. The way that it can be aimed at an exact place is by using a shield with a “gate” that can be opened to release the radiation in an exact

direction and for a precise time period. X-rays are highly penetrating but can be stopped by lead shielding.

The lead shield used in the accuDEXA™ contributes to the high weight of the machine. The shield means that the Certified accuDEXA™ Technician is not required to wear a detection device such as a dosimeter or a film badge. The lead protects the Certified accuDEXA™ Technician, Client, and other people standing near the machine. A small amount of scatter radiation does occur, about 6.1 millirem per hour at 1 meter distance (about 0.0061mSv).

One of the most important guidelines in the User Guide is that the Certified accuDEXA™ Technician should not remove the exterior cover of the machine to try to do any maintenance. This can only be done safely by a manufacturer service representative. See Appendix C of the User Guide for maintenance that can be performed by the Certified accuDEXA™ Technician and those that may not be.

It is important to check carefully two areas of the information sheet completed by the Client – Age and Is or Can A Female Client B Pregnant. Radiation is more damaging to children because they are generating new cells at a high rate. People under 20 years of age, and women who are or may be pregnant, are not to be Screened without their HealthCare Provider's Written Order.

¹ "Indications for Use", Preface, accuDEXATM User Guide

² User Guide, "Indications for Use"

³ A Gray is a unit of absorbed energy. 1 gy = 1 joule/kg.

⁴ A Sievert is equal to a dose that produces an equivalent damage in human tissue to one Gray.

⁵ kVp is peak kilo voltage.

Care and Maintenance of the accuDEXA™ Unit

When cleaning the accuDEXA™ Machine, follow the instructions from the User Guide for the external cleaning of the machine (page 42). Never spray or pour liquid cleansers into the machine. Always use a lint free cloth and avoid static generating materials.

The machine goes through a System's Check at start up each time it is set up. Periodically the machine must be checked for accuracy using the Phantom Test. Certified accuDEXA™ Technician either needs to perform this Test or ascertain that the Test has been performed as scheduled. Use the Checkout Sheet or Maintenance Record for each machine to determine what is needed.

Anytime the machine is moved, care must be taken to keep it Stabilized and to Maintain the Temperature as the User Guide directs. The machine must be set up on a table capable of supporting about one hundred pounds, at a convenient height for a Client's hand to be placed into the machine. It must be close to an adequate electrical outlet. Attach the Printer Cable to the Printer and the Machine, Plug both units into an electrical outlet, and turn on the Printer, then the accuDEXA™ machine.

When starting up the machine, if the error message indicates that the temperature is not within specifications, turn off the machine. Adjust the room temperature, and allow the accuDEXA™ time to come to the correct temperature.



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Certified accuDEXA™ Technician Guidelines

A Certified accuDEXA™ Technician's (CaDT) job includes operating the accuDEXA™ Bone Mineral Density Assessment System (accuDEXA™) in a careful and efficient manner, and working with the person having the test done (Client). The physical and emotional comfort of the Client is very important.

The CaDT should begin by making sure that s/he is personally Neat and Clean. Clothing should be without tears or missing buttons and be clean.

From the first greeting, the CaDT should be professional in speaking with the Client. As you greet the Client, introduce yourself by name, and explain simply how the test is completed. Ask the Client to remove jewelry from their non-dominant hand, and sit in comfortable position in front of the accuDEXA™.

Check the Authorization Form to be sure it is complete, and begin to enter the Client's Information by using the Touch Screen. Follow the prompts on the screen. When the Personal Information Summary Screen appears, make sure that you have the Client check the accuracy of the information entered. Calling the Client by name is generally reassuring when giving instructions.

When the screen appears that instructs you to place the hand into the machine, raise the lever and explain to the Client how to position their middle finger. Move the lever down to engage the device to hold the finger steady. Be sure the Client is comfortable before continuing. Follow the Touch Screen to complete the test.

When the Report has printed, Record the necessary information into the record, and then explain the Report to the Client. Be as simple as possible, while being accurate. The definition of the T-score and Z-score are printed on the back of the Report for the Client if needed later. Generally, the graph and the percentages will be sufficient. If the Client asks for information such as “What should I do?” instruct them to take the Report to their Healthcare Provider for a more thorough explanation. **You cannot give any medical advice.**

When the test and explanation are completed, thank the Client for their cooperation.



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Suggested Bone Mineral Density Screening Script

“Hi! My name is _____.

Today, we are going to determine your Bone Mineral Density for Osteoporosis.

We do this screening by taking an X-Ray of the middle finger of the hand you don't write with.

Please remove any rings.

This screening DOES NOT HURT, and takes only 10 seconds.

And the radiation is less than one one-hundredth of a dental x-ray. You get more radiation walking to your car in the sunlight.

First, I'm going to program the computer with your information, and then we will put your hand into the machine.

OK, I have programmed the computer. Is this information correct?

Now, please put your hand in the machine, with your middle finger through the “Goal-Post”, and all the way to the back as far as it will go in.

You are going to feel a little pressure on your finger.

The computer is checking its sensors.

And now, we will hear two beeps.

That's one beep; and that's two. We are all done; you may remove your hand. Thank You!”

Now the computer will process your information, and provide us with a print-out in less than two minutes.

Then, I am going to record your information, and we will discuss it. OK?”



International Association of accuDEXA™ Technicians

“Professional Certification of accuDEXA™ Technicians”

625 Lincoln Avenue ■ Marion, Virginia 24354-1663 ■ 276-243-8382

eMail: INAADT@healthprojectsusa.com

On The Internet: <http://www.healthprojectsusa.com/INAADT.html>

Glossary

Actonel (risedronate sodium) tablets inhibits osteoclast-mediated bone resorption and modulates bone metabolism. Actonel and Actonel with Calcium are prescription medications to treat and prevent postmenopausal Osteoporosis.

American College of Rheumatology An organization of and for physicians, health professionals, and scientists that use programs of education, research, advocacy and practice support that foster excellence in the care of people with arthritis and rheumatic and musculoskeletal diseases.

Antiresorptive Medications that slow down bone breakdown are antiresorptive drugs. Standard pharmacological antiresorptive therapy for the prevention and/or treatment of postmenopausal Osteoporosis now consists of four categories of drugs: estrogens, a selective estrogen receptor modulator (SERM), bisphosphonates, and calcitonin.

Background Radiation Radiation commonly found in the environment.

Body Mass Index Body Mass Index is the statistical measurement which compares a person's weight and height.

Bone Mineral Density (BMD) Density of Calcium in a bone by comparing the Mass (grams) of Calcium to the Volume of the bone.

Boniva A prescription medication used for Osteoporosis treatment in women after menopause.

Calcitonin A hormone secreted by the *thyroid gland*. Calcitonin can help slow bone removal, which improves *bone mineral density*. It can also help relieve pain associated with fractures. It is available as a medication in two forms: injection or nasal spray.

Calcium (Ca) is the most abundant Mineral in the human body and most important for preventing and treating Osteoporosis.

Caucasian A human racial classification distinguished especially by very light to brown skin pigmentation and straight to wavy or curly hair, and including peoples indigenous to Europe, northern Africa, western Asia, and India or relating to a racial group having white skin, especially one of European origin; white.

Central DXA Medical Devices used to measure Bone Mineral Density in the hip and spine, and are usually located in diagnostic centers, hospitals and medical offices. Central devices have a large, flat table and an "arm" suspended overhead.

Chronic Obstructive Pulmonary Disease (COPD) is not one single disease, but an umbrella term used to describe chronic lung diseases that cause limitations in lung airflow.

Concentration The amount of a specified substance in a unit of another substance.

Diabetes Mellitus A disease, often referred to simply as diabetes, in which the body does not produce or properly use insulin, a hormone produced in the pancreas. Insulin is needed to turn sugar and other food into energy. In diabetes, the body either doesn't make enough insulin or can't use its own insulin as well as it should, or both. This causes sugar to accumulate in the blood, leading to various potential complications.

Diagnosis The act or process of identifying or determining the nature and cause of a disease or injury through evaluation of patient history, examination, and review of laboratory data.

Disease A medical condition that is abnormal and impairs bodily functions, associated with specific symptoms and signs.

Dowager's Hump An abnormal outward curvature of the upper spine with round shoulders and stooped posture caused by bone loss and compression of the vertebrae in the spine.

Drug Any substance that, when absorbed into the body of a living organism, alters normal bodily function.

Estrogen A hormone that stimulates the development of female secondary sex characteristics. Estrogen levels decline in Menopause.

Ethnicity Characteristics of a sizable group of people sharing a common and distinctive racial, national, religious, linguistic, and/or cultural heritage.

Food and Drug Administration (FDA or USFDA) An agency of the United States Department of Health and Human Services that is responsible for regulating and supervising the safety of foods, dietary supplements, drugs, vaccines, biological medical products, blood products, medical devices, radiation-emitting devices, veterinary products, and cosmetics.

Fosamax A Prescription Medication that treats postmenopausal Osteoporosis.

Fragility A term that implies that something may be easily broken, damaged or destroyed.

Genetics The branch of Biology that deals with heredity, especially the mechanisms of hereditary transmission, and the variation of inherited characteristics among similar or related organisms.

Gray (Gy) A unit of measurement of absorbed radiation energy that is deposited in matter.

Hormone Chemicals released by cells that affect cells in other parts of the body.

Hypertension A term referring to High Pressure (tension) in the arteries.

International Osteoporosis Foundation (IOF) The largest global non-governmental organization dedicated to the diagnosis, prevention and treatment of Osteoporosis.

Magnesium (Mg) A Mineral that is necessary for bone, protein, fatty acid formation, cell generation and activating B Vitamins.

Medication A medicine that is either Prescribed by a Healthcare Provider, or available Over-The-Counter, used to treat Physical or Behavioral disorders.

Micro-Sievert A unit of measurement of One Millionth of a Sievert ($0.000001 \text{ Sv} = 1 \mu\text{Sv}$)

Millirem (mrem) A unit of measurement of One Thousandth of a Rem (0.001 rem).

National Institutes of Health (NIH) is the steward of Medical and Behavioral Research for the United States.

Nutrition The process of nourishing or being nourished, especially the process by which a living organism assimilates food and uses it for growth and tissue replacement.

Osteopenia A term used to describe a mild decrease in Bone Mineral Density.

Osteoporosis A skeletal disorder characterized by compromised bone strength, predisposing to an increased risk of fracture.

Peak kilovoltage (kVp) Unit of measure of the energy used to produce the contrast on an X-ray image.

Peripheral DEXA Medical Devices that use X-ray or Ultrasound on the finger, foot or wrist that are used to Screen for Low Bone Mineral Density.

Phosphoric Acid A clear, colorless liquid used in soaps and detergents, pharmaceuticals, food and beverage flavoring, and animal feed. It leaches Calcium from the bones of the body.

Predicting A Statement or Claim that a particular event will occur in the future in more certain terms than a Forecast. In a scientific context, a prediction is a rigorous, often quantitative, statement of what will happen under specific conditions.

Prescription (Rx) is a Healthcare program implemented by a Healthcare Provider in the form of instructions that govern the Plan of Care for an individual Patient. Commonly, the term *prescription* is used to mean an order to take certain medications.

Probability A way of expressing knowledge or belief that an event will occur or has occurred. In mathematics, the concept has been given an exact meaning in probability theory, which is used extensively in such areas of study as mathematics, statistics, finance, science and philosophy to draw conclusions about the likelihood of potential events, and the underlying mechanics of complex systems.

Prostate Cancer A form of Cancer that develops in the Prostate Gland in the male reproductive system.

Quantitative The systematic scientific investigation of properties and phenomenon and their relationships.

Radiology The branch or specialty of Medicine that deals with the study and application of Imaging Technology like X-ray and Radiography to Diagnose and Treating Disease. Radiologists direct an array of Imaging Technologies (such as Ultrasound, Computed Tomography (CT), Computed Axial Tomography (CAT), Nuclear Medicine, Positron Emission Tomography (PET) and Magnetic Resonance Imaging (MRI)) to Diagnose or Treat Disease.

Relative Biological Effectiveness Using the Weighting factor for a material or tissue to derive the Dose Equivalent. This allows for how different types of Radiation exhibit differing abilities to affect tissue. Different types of tissues respond differently to Radiation.

Rem The acronym for Roentgen Equivalent Man is a Standard Unit of measurement of the effects of Ionizing Radiation on humans. Rem relates the Absorbed Dose in human tissue to the effective biological damage of the Radiation. The Rem is the traditional unit of equivalent dose, but it is being replaced by the Sievert (Sv), which is equal to 100 Rem.

Rheumatoid Arthritis (RA) is a chronic, systemic Inflammatory Disorder that may affect many tissues and organs, but principally attacks the joints.

Roentgen (R) A unit of measurement of Exposure to Ionizing Radiation (X-rays or Gamma Rays). One Roentgen is the amount of Ionizing Radiation needed to produce ions carrying 1 Electrostatic Unit of electrical charge in 1 cubic centimeter of dry air under standard conditions.

Sievert (Sv) A unit of measurement used to derive a quantity called Dose Equivalent. This relates the Absorbed Dose in human tissue to the effective biological damage of the Radiation. The basic unit in the SI system that is used to measure the amount of biological damage caused by various types of Ionizing Radiation, equal to the dose that produces the same amount of damage in human tissue as one Gray of X-rays (100 Rem).

Standard Deviation (SD) - A Standard Deviation is a consistent measure above or below the average of a comparison group. In a normal (or bell curve) distribution, 68% of all estimations lie within one standard deviation of the mean and 95% of all measurements lie within two standard deviations of the mean.

Statistical Analysis Statistical Analysis is the mathematics of the collection, organization, and interpretation of numerical data, especially the analysis of population characteristics by inference from sampling.

Supplements- Supplements are preparations intended to provide nutrients, such as vitamins, minerals, fiber, fatty acids or amino acids that are missing or are not consumed in sufficient quantity in a person's diet.

Surgeon General- The Surgeon General serves as America's chief health educator by providing Americans the best scientific information available on how to improve their health and reduce the risk of illness and injury.

Symptoms- A symptom is a departure from normal function or feeling which is noticed by a patient, indicating the presence of disease or abnormality. A symptom is subjective, observed by the patient, and not measured.

Teriparatides- Teriparatide (trade name Forteo) is a medication to treat Osteoporosis that works in a different way than other drugs for Osteoporosis. It is the first drug to cause new bone to be formed. Teriparatide has been FDA approved to treat Osteoporosis in postmenopausal women and in men.

Testosterone- Testosterone is a steroid hormone primarily secreted in the testes of males and the ovaries of females. It is the principal male sex hormone. In men, testosterone plays a key role in health and well-being as well as in Osteoporosis.

Thyroid- The thyroid is a small gland located in the lower part of your neck. The function of a gland is to secrete hormones which deliver energy to cells of the body.

T-Score- Osteoporosis experts consider normal bone density to be that of a normal, young adult, age 30. In the DXA test, this measurement is called a normal "T-score." A T-score of -1.0 or higher is in the normal range. A score between -1.0 and -2.5 means that your bone density is border line for Osteoporosis (osteopenia). A T-score of -2.5 or lower qualifies as Osteoporosis.

Ultrasound- High frequency sound waves used to image internal structures of the body.

Vertebral- The vertebral column encases and protects the spinal cord, which runs from the base of the cranium down the dorsal side of the animal until reaching the pelvis. From there, vertebra continue into the tail.

Vitamin D- Vitamin D is an essential vitamin that allows the bones to absorb *calcium*. Vitamin D allows calcium to leave the intestine and enter the bloodstream.

World Health Organization (WHO)- A specialized agency of the United Nations promoting technical cooperation for health among nations and the improvement in the quality of human life.

X-Ray- An x-ray (radiograph) is a noninvasive medical test that helps physicians diagnose and treat medical conditions. Imaging with x-rays involves exposing a part of the body to a small dose of ionizing radiation to produce pictures of the inside of the body. X-rays are the oldest and most frequently used form of medical imaging.

Z-Score- Z-score measures standard deviations for a specific group. A Z-score from a *DXA test* compares a person to controls matched for age, weight, gender, and race.

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