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Original Article

DXA Quality Matters

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Abstract

The proliferation of devices to measure bone mineral density (BMD), with large numbers of technologists operating these instruments and numerous physicians interpreting/reporting the results, raises concern regarding the quality of the studies. High quality BMD measurement and reporting is essential, since referring healthcare providers rely on these reports to make patient care decisions that include additional medical evaluation (laboratory or imaging tests), drug therapy (starting, stopping, or changing), and possibly referral to an osteoporosis specialist. Incorrect BMD acquisition or reporting may generate unnecessary medical expenses and result in therapeutic decisions that could be harmful to patients. Contrary to the common misperception that BMD measurement and interpretation is a simple procedure requiring no special expertise, densitometer maintenance/operation, data acquisition, and interpretation/reporting of the results are skills that must be acquired and maintained. We recommend that technologists and clinicians involved with performing or interpreting BMD tests be educated and trained in bone densitometry and that they update their skills regularly. We also suggest that they provide demonstration of proficiency in bone densitometry in order to assure patients, referring healthcare providers, and payers of medical services that these skills have been acquired and maintained.

Key Words: Osteoporosis; DXA; quality; pitfalls; standards.

Background

Osteoporosis is a disease characterized by diminished bone strength and increased risk of fracture. It is a common disease with serious clinical consequences. In the USA, there are about 44 million people with osteoporosis or low bone mass (osteopenia), with 1.5 million fragility fractures per year *(1)*. Fractures of the spine and hip are associated with increased morbidity (e.g., diminished quality of life, loss of independence, chronic pain) and an excess mortality of about 20% *(2)*. About 50% of patients with hip fractures will subsequently never be able to walk without assistance and 25% will require long-term care *(3)*. Treatment of high-risk patients reduces fracture risk by approximately 50% *(4)*. Bone mineral density (BMD) testing is a clinical tool that identifies patients at risk for fracture before the first fracture occurs, providing valuable information for selecting those most likely to benefit from therapy. In addition, it establishes diagnostic classification and can also be used to monitor changes in BMD over time. The ability to measure BMD accurately and precisely has advanced our knowledge of osteoporosis and has greatly enhanced the management of this disease, with benefits for patients and for society.

Misuse of BMD testing may have adverse effects on patient care, result in inappropriate clinical decisions, generate unnecessary healthcare expenses, and be harmful to patients. Examples of quality concerns with BMD testing include the following:

1. BMD testing for patients in whom the results are unlikely to alter clinical decisions. This is a diversion of limited healthcare resources from areas (e.g., immunizations or diabetes care) that may offer greater benefit to patient care.
2. Failure to do BMD testing for patients in whom the results are likely to alter clinical decisions. This may be

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a missed opportunity to identify and treat patients at high risk for fracture.

3. Misapplication of the World Health Organization (WHO) criteria for diagnostic classification. When these criteria are applied to inappropriate populations (e.g., premenopausal women), used with the wrong skeletal site (e.g., Ward's area), or applied to inappropriate technologies, then diagnostic classification and estimation of fracture risk may be incorrect, leading to faulty clinical decisions. ''Overdiagnosis'' may have adverse effects on insurability, trigger unnecessary medical work-up, and cause the patient to be treated with an expensive and potentially toxic drug. ''Underdiagnosis'' may fail to identify a patient at high risk for fracture who would benefit from treatment.
4. Invalid comparison of serial DXA studies. A report that incorrectly states that BMD has decreased, increased, or not changed may lead to costly medical evaluation, changes in therapy that are inappropriate or harmful, and unnecessary patient concern.

There are a plethora of BMD testing devices using a variety of technologies manufactured by many companies. Increasing numbers of facilities are purchasing these devices, which are operated by technologists with variable training and experience. There is usually no assurance that the instruments are maintained and operated according to the manufacturer's recommendations. The results may be interpreted and reported by physicians who are not adequately trained in bone densitometry. However, the reports are sent to referring healthcare providers who rely on the information provided to make treatment decisions. It may not be appreciated by patients, healthcare providers, or payers of medical services, that BMD testing is a technology requiring special expertise that must be acquired through dedicated initial and continuing education, training, and experience. When instruments are not maintained properly, patients are not positioned correctly, precision assessment is not done, acquisition or analysis is faulty, or DXA interpreters are not knowledgeable about bone densitometry issues, then reports may contain incorrect information that can lead healthcare providers to make poor clinical decisions.

Perceptions of DXA Quality

It is our experience that errors in DXA acquisition and reporting are not rare. To investigate this perception, a survey of members of the International Society for Clinical Densitometry (ISCD) was undertaken *(5)*. In the spring of 2006, clinician and technologist members of the ISCD were asked to complete an online survey evaluating the quality of DXA studies and reports received from other DXA facilities. Of the 3488 clinicians and 2362 technologist members who were sent an email request to participate in the survey, there were 743 (21.3%) clinician and 754 (31.9%) technologist responders. Most of these classified themselves as being in clinical practice that was not primarily devoted to osteoporosis and metabolic bone disease. The majority of technologists (55%) found demographic information incorrectly entered at least once a month, and the majority of clinicians (71%) found incorrect DXA interpretations at least once a month. Moreover, 27% of clinicians reported this to occur more frequently than once per week (Fig. 1). The vast majority (98%) of clinicians felt that poor quality DXA reports were harmful to patients and 59% believed this to be a moderate or major problem in terms of harm to patient care (Fig. 2). This survey suggests that the quality of DXA acquisition and reporting is variable, that poor quality reports are not rare, and that clinicians believe these poor quality reports are detrimental to patient care. We believe these adverse outcomes are correctable through educational programs, and that documentation of proficiency can be achieved through certification of bone densitometrists and accreditation of DXA facilities.

Patient Scenarios

Potential adverse effects of poor quality bone density testing are illustrated by the following patient case histories, each of which describes a real patient, or composite of patients, seen by the authors. In our opinion, these cases are representative of scenarios where poor quality BMD testing can result in inappropriate clinical decisions that generate unnecessary medical expenses and may harm patients. These are divided in categories of quality control, acquisition, analysis, and interpretation.

Quality control

A 68 year-old woman with a diagnosis of severe osteoporosis has been treated with a bisphosphonate for past 2

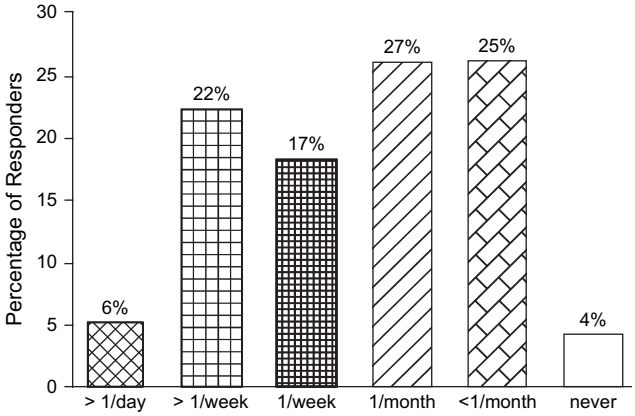

Fig. 1. Frequency of incorrect DXA reports. Responses of 690 clinician members of the ISCD indicate that incorrect DXA reports are not rare. In response to the question ''How often do you see a patient with a previous DXA report interpretation that is incorrect (wrong diagnostic classification, invalid comparison, incorrect use of skeletal site or region of interest, etc.)?'' 308/690 (45%) reported seeing such patients once per week or more frequently. Percentages do not add up to 100% due to effects of rounding.