ISCD

The International Society For Clinical Densitometry

2007 PEDIATRIC OFFICIAL POSITIONS

of the
INTERNATIONAL SOCIETY
FOR CLINICAL DENSITOMETRY

The International Society for Clinical Densitometry (ISCD) is a not-for-profit multidisciplinary professional society with a mission to advance excellence in the assessment of skeletal health by standard setting, increasing patient awareness, continuing medical education, public policy, densitometry certification, and supporting clinical and scientific advances in the field.

With the evolution of bone densitometry, differences in technologies, acquisition techniques, reference databases, reporting methods, and terminology have developed. These differences may have adverse effects on patient care and the exchange of scientific information. To address these issues, the ISCD periodically holds Position Development Conferences, a process whereby an international panel of experts makes recommendations based on reviews of the scientific literature by the ISCD's Scientific Advisory Committee. Recommendations that are approved by the ISCD Board of Directors become Official Positions of the ISCD.

All ISCD Official Positions are for worldwide application except where otherwise noted.

These are the Official Positions of the ISCD as updated in 2007. **The Official Positions that are new or revised since 2005 are in bold type**. These Official Positions may also be viewed and downloaded as a text file or PowerPoint presentation from the ISCD Web site at www.ISCD.org.

Skeletal Health Assessment In Children and Adolescents (Males and Females ages 5-19)

Fracture Prediction and Definition of Osteoporosis

- **Fracture prediction should primarily identify children at risk of clinically significant fractures, such as fracture of long bones in the lower extremities, vertebral compression fractures, or two or more long-bone fractures of the upper extremities.**
- **The diagnosis of osteoporosis in children and adolescents should NOT be made on the basis of densitometric criteria alone.**
  - **The diagnosis of osteoporosis requires the presence of both a clinically significant fracture history and low bone mineral content or bone mineral density.**
    - **A clinically significant fracture history is one or more of the following:**
      - **Long bone fracture of the lower extremities**
      - **Vertebral compression fracture**
      - **Two or more long-bone fractures of the upper extremities**
    - **Low bone mineral content or bone mineral density is defined as a BMC or areal BMD Z-score that is less than or equal to -2.0, adjusted for age, gender and body size, as appropriate.**

DXA Assessment in Children and Adolescents With Disease That May Affect the Skeleton

- **DXA measurement is part of a comprehensive skeletal health assessment in patients with increased risk of fracture.**

- Therapeutic interventions should not be instituted on the basis of a single DXA measurement.
- When technically feasible, all patients should have spine and total body less head (TBLH) BMC and areal BMD measured
  - Prior to initiation of bone-active treatment.
  - To monitor bone-active treatment in conjunction with other clinical data.
- In patients with primary bone diseases or potential secondary bone diseases (e.g., due to chronic inflammatory diseases, endocrine disturbances, history of childhood cancer, or prior transplantation (non-renal)), spine and TBLH BMC and areal BMD should be measured at clinical presentation.
- In patients with thalassemia major, spine and TBLH BMC and areal BMD should be measured at fracture presentation or at age 10 years, whichever is earlier.
- In children with chronic immobilization (e.g., cerebral palsy) spine and TBLH BMC and areal BMD should be measured at fracture presentation.
  - DXA should not be performed if contractures prevent the safe and appropriate positioning of the child.
- The minimum time interval for repeating a bone density measurement to monitor treatment with a bone-active agent or disease processes is six months.

DXA Interpretation and Reporting in Children and Adolescents

- DXA is the preferred method for assessing BMC and areal BMD.
- The PA spine and TBLH are the most accurate and reproducible skeletal sites for performing BMC and areal BMD measurements.

- Soft tissue measures in conjunction with whole body scans may be helpful in evaluating patients with chronic conditions associated with malnutrition (such as anorexia nervosa, inflammatory bowel disease, cystic fibrosis), or with both muscle and skeletal deficits (such as idiopathic juvenile osteoporosis).
- The hip (including total hip and proximal femur) is not a reliable site for measurement in growing children due to significant variability in skeletal development and lack of reproducible ROI.
- In children with linear growth or maturational delay, spine and TBLH BMC and areal BMD results should be adjusted for absolute height or height age, or compared to pediatric reference data that provide age-, gender-, and height-specific Z-scores.
- An appropriate reference data set must include a sample of the general healthy population sufficiently large to characterize the normal variability in bone measures that takes into consideration gender, age, and race/ethnicity.
- When upgrading densitometer instrumentation or software, it is essential to use reference data valid for the hardware and software technological updates.
- Baseline DXA reports should contain the following information:
  - DXA manufacturer, model, and software version
  - Referring physician
  - Patient age, gender, race/ethnicity, weight, and height
  - Relevant medical history including previous fractures
  - Indication for study
  - Bone age results, if available

- Technical quality
- BMC and areal BMD
- BMC and areal BMD Z-score
- Source of reference data for Z-score calculations
- Adjustments made for growth and maturation
- Interpretation
- Recommendations for the necessity and timing of the next DXA study are optional

- Serial DXA testing
  - Should be done only when the expected change in areal BMD equals or exceeds the LSC
  - Serial DXA reports should include the same information as for baseline testing, but additionally include:
    - Indications for follow-up scan
    - Comparability of studies
    - Interval changes in height and weight
    - BMC and areal BMD Z-scores adjusted or unadjusted for height or other adjustments
    - Percent change in BMC and areal BMD and interval change in Z-scores
    - Recommendations for the necessity and timing of the next BMD study are optional
- Accurate interpretation of serial DXA results requires knowledge of the LSC for all sites measured and for all technologists at the DXA testing facility.
- Terminology
  - T-scores should not appear in pediatric DXA reports
  - The term "osteopenia" should not appear in pediatric DXA reports
  - The term "osteoporosis" should not appear in pediatric DXA reports without knowledge of clinically significant fracture history
  - "Low bone mineral content or bone mineral density for chronologic age" is the preferred term when BMC or BMD Z-scores are less than or equal to -2.0

pQCT in Children and Adolescents

- Reference data are not sufficient for the clinical use of pQCT for fracture prediction or diagnosis of low bone mass.
- When the forearm is measured, the non-dominant forearm should be used.
- Measurements sites should include the metaphysis and diaphysis.
- Determination of the precision error, LSC, and monitoring time interval should be performed as described for DXA.
- pQCT reports should include:
  - Manufacturer, model, and software version
  - Referring physician
  - Patient age, gender, race/ethnicity, weight, and height
  - Relevant medical history including previous fractures
  - Indication for measurement
  - Bone age results, if available
  - Measurement site
  - Limb length
  - Scan acquisition and analysis parameters
  - Scan technical quality
  - Reference data source for Z-score calculation
  - Metaphyseal total and trabecular vBMD and Z-scores

- **Diaphyseal BMC, cortical vBMD, cortical thickness, cross-sectional moment of inertia, SSI results, and Z-scores.**
- **Adjustments made for growth and maturation**
- **Interpretation**

- **Quality control procedures should be performed as described for central DXA.**

DXA Nomenclature

- DXA - not DEXA.
- T-score - not T score, t-score, or t score
- Z-score - not Z score, z-score, or z score

DXA Decimal Digits

Preferred number of decimal digits for DXA reporting:

- BMD: 3 digits
  (example, 0.927 g/cm2)
- T-score: 1 digit
  (example, -2.3)
- Z-score: 1 digit
  (example, 1.7)
- BMC: 2 digits
  (example, 31.76 g)
- Area: 2 digits
  (example, 43.25 cm2)
- % reference database: Integer
  (example, 82%)

Glossary

BMC - bone mineral content

BMD - bone mineral density

DXA - dual-energy X-ray absorptiometry

ISCD – International Society for Clinical Densitometry

LSC - least significant change

NHANES III - National Health and Nutrition Examination Survey III

PA - posterior anterior

pDXA – peripheral dual-energy x-ray absorptiometry

pQCT – peripheral quantitative computed tomography

QC - quality control

QCT - quantitative Computed Tomography

QUS - quantitative Ultrasound

ROI – region(s) of interest

SSI - strain strength index

TBLH - total body less head

VFA - Vertebral Fracture Assessment

vBMD - volumetric BMD

WHO - World Health Organization

INTERNATIONAL SOCIETY FOR CLINICAL DENSITOMETRY

342 North Main Street
West Hartford, CT 06117-2507
USA
Phone 860.586.7563 | Fax 860.586.7550
www.ISCD.org

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