



## TECHNICAL/CLINICAL TOOLS

### **BEST PRACTICE 6: Evaluate and Manage Complications associated with Chronic Kidney Disease-Mineral and Bone Disorder (CKD-MBD)**

#### **WHY IS THIS IMPORTANT?**

Kidney Disease: Improving Global Outcomes (KDIGO) has defined CKD-MBD as a systemic disorder of mineral and bone metabolism due to CKD manifested by either one or a combination of the following: 1) abnormalities of calcium, phosphorus, parathyroid hormone (PTH) or vitamin D metabolism; 2) abnormalities in bone turnover, mineralization, volume, linear growth, or strength; 3) (medial) vascular or other soft-tissue calcification. KDIGO's definition restricts the term renal osteodystrophy to the skeletal component of CKD-MBD. Clinicians monitor blood assays, bone radiographs or biopsies, and cardiovascular studies. Treatments considered are interventions for treating hyperphosphatemia, hyperparathyroidism and bone disease.

#### **BEST PRACTICE 6**

***Systematically evaluate and treat abnormalities of CKD-MBD in adults with CKD Stage 5 on dialysis.***

#### **HOW DO YOU ACHIEVE THIS BEST PRACTICE?**

- 1) Monitor 25(OH)D levels, serum calcium, phosphorus, PTH, and alkaline phosphatase levels starting in CKD Stage 3. Frequency of monitoring should be based on the stage of CKD and rate of CKD progression.
- 2) Establish a monitoring schedule for 25(OH)D levels, serum calcium, phosphorus, PTH and alkaline phosphatase or the bone fraction of alkaline phosphatase levels, as allowed by current reimbursement policy to identify trends and treatment efficacy and side effects.
- 3) Establish therapeutic targets for calcium, phosphorus and PTH.
  - a) Phosphorous target to consider: level between 3.5 mg/dl and 5.5 mg/dl by whatever means necessary, but balancing against the impact on serum albumin and aggressive dietary restriction.

- 4) The dialysis clinic should maintain standardization in the methods of sample collection, processing and assay used. Be aware of PTH assay variabilities, particularly the characteristics and limitations of the assay used for that clinic.
- 5) Aim to normalize serum phosphorus and calcium levels, using a combination of strategies, to minimize progression of vascular calcification and secondary hyperparathyroidism. Common interventions include: individualization of dialysate calcium concentration for HD and PD patients (e.g., a patient on nocturnal HD may require higher dialysate calcium than a patient on a shorter, intermittent HD schedule), limiting dietary phosphate intake, medications such as phosphate binders, vitamin D and calcimimetics, and lengthening time on hemodialysis for those on shorter, intermittent schedules.
  - a) Monitor for and diagnose hyperphosphatemia and secondary hyperparathyroidism by evaluating all available CKD – MBD assessments, taking **trends** into consideration rather than single values.
  - b) Assess vascular calcification (plain films of aorta via CXR, lateral abdominal x-ray, or spiral CTs, recognizing that these may not distinguish between endothelial or medial involvement) and assess for valvular calcification via ECHO or per current guidelines.
- 6) Correct Vitamin D deficiency and insufficiency with ergocalciferol or cholecalciferol, or in accordance with current guidelines.
  - a) Consider supplementing patients on at least a low dose vitamin D product, such as oral or intravenous di-hydroxy D3.
- 7) Per the 2009 KDIGO guidelines, a bone biopsy can be performed in certain situations such as unexplained fractures, persistent bone pain, unexplained hypercalcemia or hypophosphatemia, and possible aluminum toxicity and before treatment with bisphosphonates, teriparatides or raloxifene in CKD-MBD, Stage 5 dialysis patients.
  - a) There are no data about the efficacy or safety of antiresorptive agents in patients with CKD stages 4-5D so routine use of them can not be recommended.
- 8) Track the patient's progress in his or her Patient Assessment and Plan of Care. Track changes in the aggregate of all clinic patients using a Quality Assurance and Performance Improvement program.
- 9) Educate the patient concerning the risk for vascular calcification leading to stroke, heart attack and amputation in keeping with shared decision making. Consider using visual examples to put MBD lab numbers in a context that is more meaningful.

## TECHNICAL/CLINICAL BEST PRACTICE #6: MANAGEMENT OF CKD-MBD

### Printed Tools and Resources

<b>Bone and Mineral Management Tools</b>	<p>Cause and Effect Diagram  <a href="#">Bone and Mineral Fishbone Draft PEAK 2010.ppt</a></p> <p>Continuous Quality Improvement Action Plan—Sample Patient-Specific Plan  <a href="#">Action Plan Sample for Bone Mineral PEAK 2010.doc</a></p> <p>Data Collection and Root Cause Documentation Tool for Mineral-Bone Management  <a href="#">MBD Documentation Tool Amended 2008 PEAK 2010.doc</a></p>
<b>Bone Metabolism in CKD Guidelines</b>	<p>KDOQI  <a href="http://www.kidney.org/professionals/kdoqi/guidelines/commentaries.cfm#guidelines">http://www.kidney.org/professionals/kdoqi/guidelines/commentaries.cfm#guidelines</a></p>
<b>Cardiovascular Screening, Coronary Vascular Calcification Practice Guidelines, 2008</b>	<p>American Heart Association  <a href="http://www.yourethecureonthehill.heart.org/presenter.jhtml?identifier=3004595">http://www.yourethecureonthehill.heart.org/presenter.jhtml?identifier=3004595</a></p>
<b>Clinical Practice Guidelines for the Diagnosis, Evaluation, Prevention, and Treatment of Chronic Kidney Disease-Mineral and Bone Disorder</b>	<p>KDIGO  <a href="http://www.kdigo.org/guidelines/mbd/index.html">http://www.kdigo.org/guidelines/mbd/index.html</a></p>

### Supporting Literature

<p>Block GA, et al. Mineral metabolism, mortality, and morbidity in maintenance hemodialysis. <i>JASN</i>. 2004 15:2208-18. <a href="http://jasn.asnjournals.org/cgi/content/full/15/8/2208">http://jasn.asnjournals.org/cgi/content/full/15/8/2208</a></p>
<p>Foley RN, et al. Hypocalcemia, morbidity, and mortality in end-stage renal disease. <i>Amer J of Nephrol</i>. 1996 16:386-393. <a href="http://www.ncbi.nlm.nih.gov/pubmed/8886175?dopt=Abstract&amp;holding=npq">http://www.ncbi.nlm.nih.gov/pubmed/8886175?dopt=Abstract&amp;holding=npq</a></p>
<p>Goodman WG, et al. Coronary-artery calcification in young adults with end-stage renal disease who are undergoing dialysis. <i>N Engl J Med</i>. 2000 342(20):1478-1483. <a href="http://www.ncbi.nlm.nih.gov/pubmed/10816185">http://www.ncbi.nlm.nih.gov/pubmed/10816185</a></p>
<p>Kalantar-Zadeh K, et al. Survival predictability of time-varying indicators of bone disease in maintenance hemodialysis patients. <i>Kidney Int</i>. 2006 70:771-780. <a href="http://www.ncbi.nlm.nih.gov/pubmed/16820797">http://www.ncbi.nlm.nih.gov/pubmed/16820797</a></p>
<p>Kidney Disease: Improving Global Outcomes (KDIGO) CKD-MBD Work Group: KDIGO Clinical Practice Guideline for the Diagnosis, Evaluation, Prevention, and Treatment of Chronic Kidney Disease-Mineral and Bone Disorder (CKD-MBD). <i>Kidney Int</i>. 2009 76(113): S1-S130. <a href="http://www.kdigo.org/pdf/KDIGO%20CKD-MBD%20GL%20KI%20Suppl%20113.pdf">http://www.kdigo.org/pdf/KDIGO%20CKD-MBD%20GL%20KI%20Suppl%20113.pdf</a></p>
<p>Souberbielle JC, et al. Inter-method variability in PTH measurement: implication for the care of CKD patients. <i>Kidney Int</i>. 2006 70(2):345-350. <a href="http://www.ncbi.nlm.nih.gov/pubmed/16788691">http://www.ncbi.nlm.nih.gov/pubmed/16788691</a></p>
<p>Souberbielle JC, et al. Parathyroid hormone measurement in CKD. <i>Kidney Int</i>. 2010 77(2):93-100. <a href="http://www.nature.com/ki/journal/v77/n2/abs/ki2009374a.html">http://www.nature.com/ki/journal/v77/n2/abs/ki2009374a.html</a></p>

Tentori F, et al. Mortality risk for dialysis patients with different levels of serum calcium, phosphorus, and PTH: the Dialysis Outcomes and Practice Patterns Study (DOPPS). *Am J Kidney Dis.* 2008 52:519-530. <http://www.ncbi.nlm.nih.gov/pubmed/18514987>

Uhlig K, et al. KDOQI U.S. Commentary on the KDIGO Clinical Practice Guideline for the Diagnosis, Evaluation, and Treatment of CKD-Mineral and Bone Disorder (CKD-MBD). *Am J Kidney Dis.* 2010. 55(5):773-799. <http://www.kidney.org/professionals/KDOQI/pdf/KDOQI-CKD-MBD-Commentary.pdf> and <http://www.ajkd.org/article/PIIS0272638610004890/fulltext>

Young EW, et al. Predictors and consequences of altered mineral metabolism: The Dialysis Outcomes and Practice Patterns Study. *Kidney Int.* 2005 67:1179-1187. <http://www.ncbi.nlm.nih.gov/pubmed/15698460>

All links last accessed on November 18, 2010