Effect of Low Dialysate Calcium on Outcomes in Hemodialysis Patients in the United States

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Introduction
The Kidney Disease Outcomes Quality Initiative (KDOQI) guidelines and Kidney Disease Improving Global Outcomes (KDIGO) guidelines recommend that dialysate calcium concentrations be 1.25 mmol/L, for most patients undergoing hemodialysis for the treatment of ESRD.

• Some dialysis centers in the United States have used dialysate calcium concentrations from 1.25 mmol/L to 1.125 or 1.000 mmol/L, presumably to avoid calcium overload.

• To date, there has been no rigorous systematic examination of the effects of low dialysate calcium on clinical outcomes.

Objective
The Kidney Disease Outcomes Quality Initiative (KDOQI) guidelines and Kidney Disease Improving Global Outcomes (KDIGO) guidelines recommend that dialysate calcium concentrations be 1.25 mmol/L, for most patients undergoing hemodialysis for the treatment of ESRD.

• The following study examined the association between conversion from predialysis use (>75% patients) of 1.25 mmol/L dialysate calcium to predialysis use of 1.25 or 1.00 mmol/L (converter clinics) versus those that maintained predialysis use of 1.25 mmol/L (control clinics) on measured clinical outcomes, laboratory markers of metabolic bone disease, and medication utilization at the facility level.

Methods

Source Data
• We conducted a retrospective study of in-center hemodialysis patients at a large dialysis organization (520) from January 2009 through December 2010.

• Potential conversion was obtained from the DaVita’s electronic health record.

• Data on clinical events were obtained by linkage to Medicare Part A claims data from the United States Renal Data System (USRDS) as well as claims and medication utilization data that are only available for Medicare Part D. A multi-center analysis of laboratory outcomes and injected medication utilization were conducted among the subgroup of patients with Part D coverage. The analysis was limited to clinically significant laboratory measurements, including calcium and related drug utilization at the facility level.

• Hypercalcemia was defined using a previously published definition: serum calcium > 2.55 mmol/L, 2.80 mmol/L, and > 3.125 mmol/L, respectively; whereas hypocalcemia was defined as serum calcium < 1.875 mmol/L.

• In this study, hypertension was defined as systolic blood pressure of at least 130 mmHg accompanied by at least 2 separate measures of either systolic or diastolic blood pressure.

• The postconversion period was the contiguous window (of at least 3 and up to 12 months) beginning on the first date of the first consecutive month (ie, month 0) in which there was predominant use of < 1.25 mmol/L dialysate calcium. The postconversion period was the contiguous window (of at least 3 and up to 12 months) beginning on the first date of the first consecutive month (ie, month 0) in which there was predominant use of < 1.25 mmol/L dialysate calcium.

• For converter facilities, the index month was defined as the month in which there was predominant use of < 1.25 mmol/L dialysate calcium and continuing until the facility no longer used < 1.25 mmol/L dialysate calcium (minimum 3 months follow-up, max 6 months). For control facilities the index month was defined as the month in which there was predominant use of 1.25 mmol/L dialysate calcium.

• Comparisons made by 2-tailed Wilcoxon rank sum test.

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• For converter facilities the index month was randomly assigned to a distribution that mirrored that of the index months among control facilities.

• Mean linear models were fit to assess change in event rate pre-to-postconversion among converter facilities versus converters versus control clinics.

• Table 2 shows biochemical changes and medication utilization across dialysate calcium conversion period.

• Table 1 compares laboratory and medication utilization data.

• Compared to control clinics, converter clinics experienced:

• Decreased serum calcium

• Increased serum phosphate and parathyroid hormone

• Increased utilization of phosphate binders, activated vitamin D, and calcitriol.

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