Metabolic Acidosis is Underdiagnosed and Undertreated in Patients with CKD
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Disclosure: Dr. Tangri is a consultant to Tricida, Inc.
37 Million People with CKD in the United States
37 Million People with CKD in the United States

15% of US Adults are Afflicted with CKD

Three Million Patients with Stage 3 to 5 CKD Affected by Metabolic Acidosis

![Diagram showing the distribution of patients with different stages of CKD affected by metabolic acidosis.]

- Stage 3a: 9%, ~1.4 Million Patients with Metabolic Acidosis
- Stage 3b: 18%, ~1.1 Million Patients with Metabolic Acidosis
- Stage 4&5: >30%, >600,000 Patients with Metabolic Acidosis

Data on file. NHANES 1999-2004 reports prevalence of CKD Stages 3 and 4 for the US adult population ages 20 and older. CKD Stage 3 and 4 prevalence was calculated using NHANES prevalence and 2016 US Census data. Stage 3a (70%) and 3b (30%) were approximated using NCCD-CDC Surveillance System. MA prevalence by Stage 3a, 3b, and 4 reported in Inker LA et al., J Am Soc Nephrol 22:2322-31, 2011.
The Consequences of Metabolic Acidosis are Wide Ranging

- Reduced Renal Acid Excretion
- Acid Buffering Leads to Loss of Bone Density
- Increased Protein Catabolism

- Reduced Kidney Function
- Increased Risk of Fractures, Renal Osteodystrophy
- Muscle Wasting

National and International Guidelines Suggest Treatment of Metabolic Acidosis

We suggest that in people with CKD and serum bicarbonate concentrations <22 mmol/L treatment with oral bicarbonate supplementation be given to maintain serum bicarbonate within the normal range, unless contraindicated.

Serum bicarbonate concentrations less than 22 mmol/l are associated with risk of CKD progression and increased risk of death.

In CKD Stages 3, 4, and 5, the serum level of total CO\(_2\) should be measured. The frequency of these measurements should be based on the stage of CKD (OPINION).

In these patients, serum levels of total CO\(_2\) should be maintained at >22 mEq/L (22 mmol/L). (EVIDENCE) If necessary, supplemental alkali salts should be given to achieve this goal. (OPINION).
In the CRIC Study 2.7% of Patients with Metabolic Acidosis were Treated with Oral Alkali

### Table 1. Baseline Characteristics of All Participants and According to Quartiles of Serum Bicarbonate

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>All Participants (N = 3,904)</th>
<th>≤22 mEq/L (n = 1,039)</th>
<th>23-24 mEq/L (n = 924)</th>
<th>25-26 mEq/L (n = 968)</th>
<th>&gt;26 mEq/L (n = 973)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alkali therapy</td>
<td>91 (2.4)</td>
<td>29 (2.7)</td>
<td>20 (2.2)</td>
<td>18 (1.9)</td>
<td>25 (2.6)</td>
<td>0.6</td>
</tr>
</tbody>
</table>

**Notes:**
- **COPD**: Chronic obstructive pulmonary disease
- Body mass index (kg/m²)
- Systolic blood pressure (mm Hg)
- Diastolic blood pressure (mm Hg)
- Medication use:
  - Aspirin
  - β-Blockers
  - Statins
  - ACEi/ARBs

Real-World Diagnosis and Treatment Rates of Metabolic Acidosis in the United States

- 2016
- 2017
- 2018

De-Identified Lab Records

Tangri N, American Society of Nephrology, Nov 7-10, 2019 (abstract 3231478). This study was sponsored by Tricida, Inc.
Real-World Diagnosis and Treatment Rates of Metabolic Acidosis in the United States

De-Identified Lab Records

Unequivocal lab-based evidence of CKD stage 3 to 5
- Two eGFR values < 60 ml/min/1.73 m²
- 28 days apart
- No intervening eGFR values ≥ 60 ml/min/1.73 m²

Unequivocal lab-based evidence of metabolic acidosis
- Serum bicarbonate values at least 28 days apart
- Two year study period
- Serum bicarbonate between 12 to < 22 mEq/L
- Exclude if serum bicarbonate outside range at any time

>118,000 with Unequivocal Metabolic Acidosis and CKD

Tangri N, American Society of Nephrology, Nov 7-10, 2019 (abstract 3231478). This study was sponsored by Tricida, Inc.
>86,000 Patients with Laboratory Evidence of Metabolic Acidosis Also Had Claims Data

Lab Data Records

Claims Data
- One Claim within 3 months of qualifying eGFR value
- Excepting death
- Excepting patients with a diagnosis of acute kidney injury within 28 days prior to either qualifying serum bicarbonate value were excluded

Confirmation of Claims to Assess Diagnosis and Treatment Rates

Tangri N, American Society of Nephrology, Nov 7-10, 2019 (abstract 3231478). This study was sponsored by Tricida, Inc.
~80% of Patients with Metabolic Acidosis and Stage 3 to 5 CKD are Undiagnosed

Tangri N, American Society of Nephrology, Nov 7-10, 2019 (abstract 3231478). This study was sponsored by Tricida, Inc.
Only ~15% of Patients with Metabolic Acidosis and Stage 3 to 5 CKD are Treated

15% Treated

Tangri N, American Society of Nephrology, Nov 7-10, 2019 (abstract 3231478). This study was sponsored by Tricida, Inc.
~80% of Patients with Metabolic Acidosis and Stage 3 to 5 CKD are Undiagnosed

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There is a Significant Diagnosis and Treatment Gap for Metabolic Acidosis as an Important Disease Modifying Complication of CKD
The End