Background

- Adults with ESKD have higher prevalence of sleep disturbances than peers.
- Poor sleep quality is associated with depression, worse quality of life, and more severe cardiovascular outcomes.
- Poor sleep is underdiagnosed in pediatric ESKD and is difficult to assess in subjects with chronic illness.
- Polysomnography is the gold standard for evaluating sleep quality but is expensive and inconvenient.
- Sleep questionnaires are more accessible but are entirely subjective.
- ActiGraph accelerometers (ACG) are validated objective assessors of pediatric sleep quality by detecting light levels and movement during sleep. They have never been assessed in pediatric ESKD.

Hypothesis: ACG will detect a higher prevalence of poor sleep quality than sleep questionnaires in pediatric hemodialysis patients.

Methods

- Prospective cohort study
- 21 patients, 8-18 years old, on HD for at least 3 months
- All had 4hr HD treatments 3 days/week
- Asked to wear an ACG on their non-dominant wrist for one week
- Asked to log sleep/wake times daily
- Patients/parents completed the Sleep Disturbance Scale for Children (SDSC), a validated subjective sleep assessment
- Poor sleep quality was defined by these previously published standards:
  - Sleep time <7hrs
  - ACG sleep efficiency <85%
  - SDSC Total T-scores >55

Results

Sleep Disturbance Scale for Children Scores

<table>
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<tr>
<th>T-score</th>
<th>Mean ± SD</th>
<th># out of cut-off for significance (%)</th>
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<tr>
<td>Total</td>
<td>58.38 ± 11.64</td>
<td>13/21 (61.9)</td>
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Table 1: SDSC score: Mean total T-score (sum of subgroups). A T-score of >55 was considered the cut-off for clinically significant disordered sleep. 62% of patients met this criterion.

- Mean age 15.06 years ±SD 2.88
- Weight, Z-score Mean ±1.74 ±SD 1.49
- Height, Z-score Mean ±1.44 ±SD 1.14
- BMI, Z-score Mean -0.84 ±SD 1.38
- 50% on antihypertension medications
- 62% male (n = 13)
- 38% female (n = 8)
- 48% Hispanic (n = 10)
- 33% Black (n = 6)
- 9% White (n = 2)
- Vintage on HD: Mean 0.9 years ±SD 1.14

- Per ACG: 95% had sleep duration <7hrs and 86% had impaired sleep efficiency when looking at average of two nights.
- Per SDSC: only 62% had poor sleep.
- Poor correlation between SDSC total score and ACG sleep efficiency on both HD and non-HD days.
- When comparing sleep on HD and non-HD days, paired T-tests showed worse sleep efficiency, shorter total sleep time, and longer length of awakenings on non-HD days (the nights before dialysis) (p<0.05).
- Age, vintage, BMI, or CKD labs were not associated with sleep efficiency.

Hypothesis: ACG will detect a higher prevalence of poor sleep quality than sleep questionnaires in pediatric hemodialysis patients.

Discussion of Findings

- This is the first study of ActiGraph accelerometry in pediatric HD patients.
- High prevalence of sleep disturbance was noted by both ACG and SDSC, but ACG had a higher rate of detection and provided objective measures of sleep disturbance, superior to questionnaire.
- Sleep time and efficiency were better on nights after dialysis, perhaps due to clearance of uremic toxins or exhaustion from HD.
- Further studies are needed to assess the impact of poor sleep on quality of life and CV morbidity in pediatric HD patients and to look into causes of this population’s sleep inefficiency.