Psychosocial Impact of COVID-19 pandemic on patients with end-stage kidney disease on hemodialysis

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Abstract

**Background:** The Coronavirus Disease 2019 (COVID-19) may have a negative effect on the mental and social health of patients with end-stage kidney disease on chronic in-center hemodialysis (HD), who have a high burden of psychological symptoms at baseline and unavoidable treatment-related COVID exposures. The goal of our study was to assess the impact of the COVID-19 pandemic on the psychosocial health of patients on chronic in-center HD.

**Methods:** Participants enrolled in the ongoing Technology Assisted Collaborative Care (TĀCcare) trial in Western Pennsylvania and New Mexico were approached for participation in a phone survey in May 2020. Data on the pandemic’s effect on participants’ physical and mental health, symptoms (such as anxiety, mood, loneliness, sleep and stress), food and housing security was collected.

**Results:** Surveys were completed by 49 participants (mean age 56 years, 53% males, 18% African American, 20% American Indian, 22% Hispanic). Almost 80% of participants reported being moderately-to-extremely worried about the pandemic’s effect on their mental/emotional health and interpersonal relationships. More than 85% of the participants were worried about obtaining their dialysis treatments due to infection risk from close contact in the dialysis facility or during transportation. Despite this, 82% of participants reported being not at all/slightly interested in trying home dialysis as an alternative option. Overall, 27% of the participants had clinical levels of depressive symptoms but only 12% had anxiety meeting clinical criteria. About 33% of participants reported poor sleep quality over the last month. Perceived stress was high in about 30% of participants and 85% felt overwhelmed by difficulties with COVID-19, although 41% felt that things were fairly/very often going their way.
Conclusions: Our study provides preliminary insights into the psychosocial distress caused by
the COVID-19 pandemic among a diverse cohort of patients receiving chronic hemodialysis who
are participating in an ongoing clinical trial.
Introduction

The Coronavirus Disease 2019 (COVID-19) global pandemic, caused by a novel severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), has impacted billions of people worldwide. Patients with kidney disease, especially those receiving chronic dialysis treatment have enhanced risk of severe COVID-19 infection-related complications and poor prognosis including higher risk of hospitalization, intensive-care unit admission, mechanical ventilation, and death.[1, 2] In addition to these direct effects, the pandemic may have indirect effects on the psychosocial health of patients on in-center chronic hemodialysis (HD), even if they are not infected with COVID-19. These effects may be particularly overwhelming in a patient population that already has a disproportionately high burden of symptoms such as depression and anxiety.[3]

Patients with end-stage renal disease require life-sustaining treatment at a specialized facility three times weekly and need to travel to dialysis centers, often using public transportation or shared ride services. Accordingly, they are particularly vulnerable to COVID-19 secondary to their inability to strictly follow social distancing guidelines while undergoing treatment as well as for some during transport to the dialysis center. Dialysis facilities often have open floor plans with treatment chairs lined up next to each other, and open waiting rooms, which may make social distancing between patients challenging. Also, several aspects of treatment such as cannulation, de-cannulation, and vital status monitoring, require repeated close contact with multiple dialysis staff who have had multiple contacts with other patients. Moreover, new dialysis unit practices to limit the spread of infection, such as requiring patients to wear masks at all times, disallowing consumption of food during treatment, and limiting entry of family members in dialysis units, which may add to patients’ stress in attending dialysis treatment. The
psychological distress caused by these circumstances may cause patients to develop or experience worsening of symptoms such as depression, anxiety, or poor sleep. These COVID-related concerns may also cause some patients to miss in-center HD treatments to limit exposure to the virus, and thereby worsen their clinical condition and increase risk for hospitalization and mortality. Additionally, some patients may experience food and housing insecurity due to the economic impact of the pandemic that may contribute to or exacerbate psychological symptoms.

The goal of our study was to assess the impact of the COVID-19 pandemic on the psychosocial health of patients on chronic in-center HD. We additionally explored the impact on food and housing security, and adherence with HD. We also explored patients’ accessibility to participate in telemedicine visits from their home, as this may be a potential avenue for providing mental health care and psychosocial support during the pandemic.

**Methods**

**Study participants**

Participants enrolled in the ongoing Technology Assisted Collaborative Care (TĀCcare) trial [4] were approached for participation in the current ancillary study. TĀCcare is a multi-site randomized controlled trial (RCT) evaluating a collaborative care intervention to improve pain, fatigue, sleep, and depression among participants on chronic HD, and incorporates the use of telemedicine-delivered cognitive behavioral therapy. From April 2018 to March 2020, 109 participants [56 from Western Pennsylvania (PA) and 53 from New Mexico (NM)] were recruited for the parent study. Recruitment and trial activities were put on hold and trial activities suspended in mid-March 2020 due to COVID-19. All TĀCcare participants who had been enrolled in the RCT were contacted by phone in May 2020, while the local restrictions were still
in place at both study sites. During the retention phone call, participants were provided COVID-related education and support, information on community resources (e.g., local food bank or crisis line contact numbers), and were invited to participate in a survey evaluating the impact of COVID-19 on their health. The study was approved by the Universities of Pittsburgh and New Mexico Institutional Review Boards, and all participants provided informed consent.

**Socio-demographic and clinical covariates**

Baseline participant data on socio-demographics, comorbidities, laboratory variables collected as part of the TÄCcare RCT was used in the current study.

**Survey instrument**

We adapted the CoRonavIruS Health Impact Survey (CRISIS) developed by the National Institute of Mental Health.[5] CRISIS includes questions on the effect of the pandemic on participants’ physical and mental health symptoms (e.g., anxiety, mood, loneliness), interpersonal relations, and food and housing security. We added specific validated symptom assessments for depression [Patient Health Questionnaire-2 (PHQ-2)], anxiety [Generalized Anxiety Disorder-2 (GAD-2)], sleep quality [1 item from the Pittsburgh Sleep Quality Index (PSQI)] and stress [Perceived Stress Scale (PSS) - 4], and asked whether the symptoms had changed since the pandemic started.[6-9] These instruments were chosen based on their psychometric properties in ESKD patients and brevity (to minimize participant burden). Lastly, we added questions on participant’s concerns for in-center HD, their adherence to HD, preferences for home dialysis and their ability to do telemedicine sessions from home. Of note, participants in the parent study were provided tablets in the dialysis unit and were not required to have telemedicine accessibility from home. Open-ended questions on worries about going to
dialysis and on the positive impact of the pandemic were also included. The final survey had 27 questions (Supplementary Material).

**Statistical Analysis**

We examined descriptive statistics for participants’ baseline characteristics using percent and count for categorical variables and means and standard deviations (SDs) or median and interquartile range for continuous variables. We used t-tests and chi-square or Fisher exact tests to compare participants from PA and NM. Reported symptom levels were compared among participants from PA and NM and if no significant differences were found, results for the entire cohort were combined and reported as such. We also compared those who completed and did not complete the survey (were unable to be contacted or refused) for baseline characteristics. We analyzed responses to survey questionnaires and present them as percentages or means. Answers to open-ended questions were collated into broad categories. We conducted all analyses using R version 3.6.3.[10]

**Results**

**Study Participants**

Of the original 109 randomized participants in the TĀCcare RCT, 27 were ineligible/unavailable for the current study [i.e., death (n=7), kidney transplant (n=5), relocation (n=2), no longer on HD (n=2), hospitalized (n=2)] or had withdrawn from the TĀCcare RCT (n=8) by May 2020 when the survey was conducted (Fig 1). We were unable to contact 21 of the remaining 82 participants who were eligible to participate in the current ancillary study. Of the remaining 61 participants who we could reach, 49 (23 from PA, 26 from NM) completed the
survey, yielding a 60% participation rate. Participants who were unable to be contacted or refused to participate in the survey (n=33) were similar by site, demographic characteristics and comorbidity burden to those who completed the survey (Supplementary Table 1). For participants who completed the survey, the median number of call attempts was 2 and average call length was 20±15 minutes.

Baseline characteristics of the survey participants are shown in Table 1. The sample was predominantly male (53%, n=26) with mean age 56 years, and median dialysis duration of 3.2 years. Although more than half of the participants were White (55%, n=27), we had a fair representation of other racial and ethnic groups (18.4% African American, 22.4% Hispanic), reflecting the geographical diversity of the participating sites. As expected, there was high burden of comorbidities such as diabetes (69.4%) and cardiovascular disease (34.7%). The PA site participants were older, were more likely to be African Americans than Hispanic or Native American and had a higher prevalence of cardiovascular disease than the NM cohort.

**Impact of the pandemic on health and socio-economic well-being**

The pandemic had a significant impact on participants’ well-being, with 61% of the sample at least moderately worried about being infected themselves or their family/friends being infected; and, 77% moderately to extremely worried about their physical health being impacted by the pandemic. Most participants (81.7%) reported being moderately-to-extremely worried about the pandemic’s effect on their mental/emotional health and inter-personal relationships (Table 2). Significant concerns over housing insecurity were reported by 90% of the participants. However, fewer participants [29% (n=14)] were worried about food security [yes/no response]. There were no differences in any of these reported concerns among participants from PA and NM (data not shown).
Although many participants (59%, n=29) reported no positive changes from the pandemic, some did experience positive changes such as spending more time with family, getting to know neighbors, adopting health behaviors (washing hands, quitting smoking, limiting alcohol, being more careful in general), eating at home more often, becoming more religious and not taking things for granted.

**Impact of pandemic on dialysis treatments**

In this cohort, 85.8% of the sample was either moderately, very or extremely concerned about leaving home to attend dialysis, and 75% were similarly stressed by restrictions for leaving home for non-dialysis purposes (Table 2). Responses to the open-ended question on worries about going to dialysis revealed patient’s concerns regarding being close to other dialysis participants, health care workers, and people in the dialysis facility or during transportation. When asked about missing dialysis treatments, 16% (n=8) reported missing any treatments, but none due to the above-mentioned pandemic-related reasons. Despite the restrictions due to the pandemic, 82% of participants reported being not at all/slightly interested in trying home dialysis, if that was an option. There were no differences in any of these outcomes among participants from PA and NM (data not shown).

**Impact of the pandemic on specific patient-reported symptoms**

Only 14% of the participants reported being at least moderately sad or unhappy within the last 2 weeks, but 27% of the sample reporting significant depressive symptoms (score ≥2) on PHQ-2 (Table 3a, Fig 2). However, 57% of those reporting reported being at least moderately sad or unhappy indicated that these symptoms had changed since the pandemic started, suggesting these were due to the effect of the pandemic. We found that 27% of the participants reported feeling moderately or very anxious, and over 50% reported feeling distracted and unable
to concentrate (Fig 2). However, only 12% reported GAD-2 score ≥3, the cutoff for clinically significant anxiety symptoms (Table 3a). Like depressive symptoms, almost 85% of the participants reported that these symptoms had changed since the pandemic started (data not shown).

Most participants (82%) felt at least moderately lonely due to social distancing measures. About 33% of the participants reported poor sleep quality over the last month (Fig 2). For the PSS-4 score, 31% of participants had PSS-4 score ≥6, which is the mean score for population norms (mean ± SD: 6.1±3.1), indicating high level of perceived stress.[11, 12] Since the pandemic started, almost 73% of the participants reported feeling sometimes, fairly or very often that they were unable to control important things in their lives and almost 85% of the participants reported feeling overwhelmed by difficulties at least some of the time. Despite these feelings, 76% of the participants felt confident in handling personal problems fairly or very often, and over 41% of the participants reported that they felt fairly or very often that things were going their way (Table 3). There were no differences in any of these reported symptoms among participants from PA and NM (data not shown).

**Dialysis participants’ accessibility to telemedicine from home**

Most participants (71%) in our study reported access to an internet device (e.g., smartphone, tablet) and a reliable internet connection at home and were capable of doing video conferencing sessions from home. Among those unable to videoconference from home (n=14), 10 did not have an internet device and 12 did not have an internet connection at home. However, even among the 10 participants who did not own an internet device, 9 had a cellphone and only 1 reported not having a cellphone. Thus, 98% of the participants in the study could participate in telemedicine visits with mental or health care providers (71% video-visits and 27% phone-visits).
from home. More participants from PA had internet at home as compared to participants from
NM (91% vs 58%, p=0.02). Access to internet device or cell phone was not different among the
groups.

**Discussion**

Ours is the first study to evaluate the psychosocial impact of the COVID-19 pandemic among patients on chronic in-center HD. In our study, a large proportion of participants on in-center HD reported worry and stress due to the COVID-19 pandemic, and about 1/4th met clinical criteria for depression. Participants were worried about the risk of infection with going for dialysis treatments, and the impact of infection on their physical and mental health, and on their interpersonal relationships. The economic instability due to the pandemic caused concern over housing insecurity in almost 90% of the participants and food insecurity in 30% of the participants.

More than 85% of the participants were worried about going for their dialysis treatments due to risk of infection from close contact in the dialysis facility or during transportation. However, very few reported missing treatments, and none reported missing dialysis due to worries about infection. In order to prioritize patient safety, several different approaches to modify HD have been proposed including shortening treatment times, screening patients prior to every treatment, wearing masks at all times, or decreasing frequency of HD to twice weekly.[13-15] The dialysis units in PA and NM involved in this study continued to provide treatments that were unchanged in duration or frequency. However, enhanced safety precautions were implemented across the units including daily screening for all patients and staff, masking at all times, limiting family members in the waiting rooms, adopting strict hand washing and social distancing guidelines, and education of staff and patients. These positive changes perhaps helped
allay some of the participants’ fears and worries, resulting in no missed treatments directly due to the pandemic, and in fact reinforced health behaviors among participants. Interestingly, despite worries about in-center HD, 82% of participants reported being not at all/slightly interested in trying home dialysis as an alternative option. There may be some unique socioeconomic factors that might partially explain this finding. For some chronic hemodialysis patients going to their unit for dialysis is sometimes their only chance of seeing other people and socializing. More importantly in very rural and poor areas, the housing conditions may not be adequate to support home dialysis.

Depression and anxiety are common in patients with kidney failure on dialysis and are associated with impaired quality of life, and higher risk of hospitalization and death.[3] The prevalence of depression in patients undergoing chronic dialysis is reported to be 20-25%.[16] Prevalence of anxiety in patients on chronic dialysis varies from 12% to 50%.[17] However, the majority of our participants did not report feeling sad/unhappy or nervous/anxious, nor did they score in the clinical range on the validated screening scale we used for anxiety. On the other hand, 27% of the participants met clinical criteria for depressive symptoms. Additionally, many participants reported feeling worried about the risk of infection, especially when going for dialysis treatments, and the effect of the pandemic on their health. Although the screening instruments used in this study are well validated and commonly used in ESKD population, the lower rate of anxiety seen may be due to failure of these instruments to capture the effects of the pandemic.[6, 18] These scales were not designed to evaluate symptoms due to such an ongoing and uncertain life event and only ask about symptoms over the last 2 weeks. Another possible explanation may be that when this survey was conducted in May 2020, the number of COVID-19 cases were low at both sites, although they were rising in NM and falling in Western PA.[19, 20]
However, despite the low cases, significant worry and stress were reported similarly among participants at both sites. When asked about perceived stress, participants reported feeling overwhelmed with difficulties and felt quite often that things were not going their way. Future studies are needed to assess the long-term effects of COVID-19 on this patient population’s mental health.

Most participants in our study reported a median household income below $40,000 per year, demonstrating that participants had financial burdens prior to any loss of income or stresses from COVID-19. In fact, more than half the participants reported income less than $20,000 per year which is below the US poverty line of $26,000 per year for a family of four.[21] Thus, it is not surprising that 90% of the participants were worried about the economic impact of the pandemic on the stability of their housing situation. Although food insecurity was less commonly reported, it was still a concern among about one-third of the participants.

We explored accessibility to telemedicine as this may be a potential avenue for providing mental and psychosocial support for the participants during the pandemic, while adhering to social distancing guidelines and minimizing exposure [4]. Despite the low income of many participants, most participants had accessibility to engage in video-conferencing sessions from home and among those, without this accessibility, cellphone ownership was high. Overall, 98% of the participants in the study reported having access to technology that is required for telemedicine visits (either video or audio/phone) from home. Thus, an alternative form of home-based care delivered through telemedicine may be a potential avenue to provide mental health and psychosocial support to these patients, while conforming to social distancing guidelines and minimizing patient burden. However, we did not assess other limitations that participants might encounter for telemedicine visits such as internet bandwidth constraints, technology literacy, or
cell phone data limitations. We also recognize that there may be selection bias in our cohort as these participants were enrolled in an ongoing RCT using telemedicine. However, accessibility to do such telemedicine sessions from home or prior knowledge on how to do such sessions was not a requirement to participate in the TĀCcare trial, and participants were provided study tablets and training to do videoconferencing from dialysis units. Future work should explore the accessibility and usability of telemedicine in a larger population, and its potential to provide psychosocial support to patients.

Strengths of our study include a diverse racial-ethnic and geographic representation, and novel findings regarding the psychosocial impact of the pandemic in patients on in-center HD. However, our study had some limitations as well. Our sample size was small because the survey only included participants already enrolled in an ongoing trial, and we were unable to reach everyone in our original study. Given the small sample size, we were unable to compare participants by intervention arm. Our results may have been impacted by selection bias given that we could not interview all participants enrolled in the original RCT. However, among participants who we were able to contact, refusal rate was low (20%). Also, there were no differences among participants who completed the survey as compared to those who were unable to be contacted or refused. Lastly, since the participants in the intervention arm received cognitive behavioral therapy, it would limit our potential findings for clinically significant rates of anxiety and depression, although only 37% of the survey respondents were in the intervention arm.

Conclusion
Among patients receiving chronic hemodialysis who are participating in an ongoing clinical trial, a large proportion report adverse psychosocial effects of COVID-19. Future research is needed to
verify our findings in a larger sample using the newly developed, pandemic specific
questionnaires to evaluate the psychosocial impact of the pandemic on patient well-being.

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### Table 1. Baseline characteristics of patients that completed the COVID survey

| Variable                                           | Total (n=49) | New Mexico (n=26) | Western PA (n=23) | p     |
|---------------------------------------------------|--------------|-------------------|-------------------|-------|
| **Age (years)**                                   | 55.9 (10.7)  | 52.9 (10.8)       | 59.4 (9.6)        | 0.03  |
| **Male**                                          | 26 (53.1%)   | 14 (53.8%)        | 12 (52.2%)        | 1.00  |
| **Race**                                          |              |                   |                   |       |
| White                                             | 27 (55.1%)   | 12 (46.2%)        | 15 (65.2%)        | <0.01 |
| Black or African American                         | 9 (18.4%)    | 1 (3.8%)          | 8 (34.8%)         |       |
| Native Hawaiian/Other Pacific Islander            | 1 (2.0%)     | 1 (3.8%)          | 0 (0.0%)          |       |
| American Indian/Alaska Native                     | 10 (20.4%)   | 10 (38.5%)        | 0 (0.0%)          |       |
| Hispanic Ethnicity                                | 11 (22.4%)   | 11 (42.3%)        | 0 (0.0%)          | <0.01 |
| A least high school education (HS or greater)      | 43 (87.8%)   | 22 (84.6%)        | 21 (91.3%)        | 0.67  |
| **Married**                                       | 13 (26.5%)   | 8 (30.8%)         | 5 (21.7%)         | 0.90  |
| **Employed**                                      | 2 (4.1%)     | 1 (3.8%)          | 1 (4.3%)          | 1.00  |
| **Tobacco use (ever)**                            | 29 (59.2%)   | 16 (61.5%)        | 13 (56.5%)        | 0.95  |
| **Alcohol use**                                   | 3 (6.1%)     | 3 (11.5%)         | 0 (0.0%)          | 0.24  |
| **Household income**                              |              |                   |                   |       |
| Less than $20,000                                  | 27 (55.1%)   | 17 (65.4%)        | 10 (43.5%)        | 0.56  |
| $20,000 to less than $40,000                      | 10 (20.4%)   | 5 (19.2%)         | 5 (21.7%)         |       |
| $40,000 to less than $60,000                      | 4 (8.2%)     | 1 (3.8%)          | 3 (13.0%)         |       |
| Greater than $60,000                               | 5 (10.2%)    | 2 (7.7%)          | 3 (13.0%)         |       |
| **Diabetes**                                       | 34 (69.4%)   | 21 (80.8%)        | 13 (56.5%)        | 0.13  |
| **Cardiovascular Disease**                        | 17 (34.7%)   | 4 (15.4%)         | 13 (56.5%)        | <0.01 |
| **Charlson Comorbidity Index**                     | 4.7 (1.6)    | 4.3 (1.3)         | 5.1 (1.7)         | 0.06  |
| **Etiology of ESRD**                              |              |                   |                   |       |
| Diabetic nephropathy                              | 29 (60.4%)   | 20 (76.9%)        | 9 (40.9%)         | 0.03  |
| Hypertensive nephrosclerosis                       | 3 (6.2%)     | 1 (3.8%)          | 2 (9.1%)          |       |
| Other                                             | 13 (27.1%)   | 5 (19.2%)         | 8 (36.4%)         |       |
| **Dialysis vintage (years)**                       | 3.2 [1.4, 5.8]| 3.2 [1.7, 5.6]| 3.2 [1.1, 5.5]| 0.67  |
| **Hemoglobin (g/dL)**                             | 11.5 (1.5)   | 11.6 (1.8)        | 11.3 (1.1)        | 0.41  |
| **Phosphorus (mg/dl)**                            | 5.6 (1.3)    | 5.8 (1.4)         | 5.5 (1.2)         | 0.39  |
| **Albumin (mg/dl)**                               | 3.9 (0.4)    | 4.0 (0.3)         | 3.9 (0.5)         | 0.33  |
| **Single pool Kt/V**                              | 1.7 (0.5)    | 1.8 (0.6)         | 1.6 (0.3)         | 0.11  |
| **Creatinine (mg/dL)**                            | 8.8 (2.7)    | 9.4 (2.1)         | 8.0 (3.1)         | 0.08  |

**Missing values:** race 2 (4.1%), household income 3 (6.1%), etiology of ESRD 3 (6.2%)

*median (interquartile range)*
| Since the pandemic started, how worried have you been about...... | No/Slightly | Moderately | Very/Extremely |
|---------------------------------------------------------------|-------------|------------|----------------|
| ...being infected                                             | 19 (38.8%)  | 16 (32.7%) | 14 (28.6%)     |
| ...friends or family being infected                           | 18 (36.7%)  | 16 (32.7%) | 15 (30.6%)     |
| ...your physical health being influenced by it                | 11 (22.4%)  | 24 (49.0%) | 14 (28.6%)     |
| ...your Mental/Emotional health being influenced by it        | 10 (20.4%)  | 30 (61.2%) | 9 (18.4%)      |
| ...has the quality of relationships between you and members of your family changed | 9 (18.4%) | 38 (77.6%) | 2 (4.1%)       |
| ...to what degree are you concerned about the stability of your living situation | 5 (10.2%) | 43 (87.8%) | 1 (2.0%)       |
| ...how stressful have the restrictions on leaving home been for you (not including going to dialysis) | 12 (24.5%) | 27 (55.1%) | 10 (20.4%)     |
| ...how worried have you been about leaving the house to go to your dialysis unit | 7 (14.3%) | 38 (77.6%) | 4 (8.2%)       |
### Table 3a. Patient reported symptoms during covid-19 pandemic over last 2 weeks

| Variable                        | [ALL] | New Mexico | Western PA | p  |
|--------------------------------|-------|------------|------------|----|
| Depressive symptoms PHQ-2      | 1.1 (1.6) | 0.7 (1.0) | 1.5 (2.0) | 0.10 |
| PHQ-2 score >=2                | 13 (26.5%) | 6 (23.1%) | 7 (30.4%) | 0.80 |
| Anxiety symptoms GAD-2         | 1.1 (1.4) | 1.1 (1.5) | 1.0 (1.2) | 0.93 |
| GAD-2 score >=3                | 6 (12.2%) | 4 (15.4%) | 2 (8.7%)  | 0.67 |

### Table 3b. Patient reported stressors during covid-19 pandemic over last 2 weeks (Perceived Stress Scale)

| Since the pandemic started...... | No/Aloost never | Sometimes | Fairly/Very often |
|---------------------------------|-----------------|-----------|------------------|
| ...how often have you felt that you were unable to control the important things in your life | 13 (26.5%) | 31 (63.3%) | 5 (10.2%) |
| ...how often have you felt confident about your ability to handle your personal problems | 9 (18.4%) | 3 (6.1%) | 37 (75.5%) |
| ...how often have you felt things were going your way | 24 (49.0%) | 5 (10.2%) | 20 (40.8%) |
| ...how often have you felt difficulties were piling up so high that you could not overcome them | 8 (16.3%) | 37 (75.5%) | 4 (8.2%) |
Fig 1. Flowchart for patients included in the current study

109 randomized patients in TACare (56 from Pennsylvania, 53 from New Mexico)

82 patients available to be approached for survey

49 patients completed survey (23 from Pennsylvania, 26 from New Mexico)

Not available for survey = 27
- 7 died
- 5 received kidney transplant
- 2 no longer on HD
- 2 relocated
- 8 withdrew/withdrawn from main study
- 2 hospitalized

Did not complete survey = 33
- 21 unable to be contacted
- 12 refused

Fig 2. Patient reported symptoms during COVID-19 pandemic

| Symptom                        | Percentage of Total Cohort |
|-------------------------------|-----------------------------|
| Sad/Unhappy                   | 14.3%                       |
| Nervous/Anxious               | 26.5%                       |
| Distracted/Unable to Concentrate | 51.0%                     |
| Lonely                        | 81.6%                       |
| Poor sleep quality            | 32.7%                       |

*For each of these symptoms, participants who reported at least moderate level of symptoms were included; for sleep quality participants who reported “bad” (as compared to good) were included.*