Appendix A. Main Outcomes of Interest

Table A1: Outcomes of interest

Measure	Description
Metabolic/inflammatory control	Phosphorus level
Metabolic/inflammatory control	Phosphorus binders
Metabolic/inflammatory control	Potassium level
Metabolic/inflammatory control	Normalized protein catabolic rate
Metabolic/inflammatory control	Albumin level
Metabolic/inflammatory control	CRP level
Metabolic/inflammatory control	Hemoglobin level
Metabolic/inflammatory control	ESA use
Hypertension control pressure control	Clinic SBP (and report how it was measured)
Hypertension control pressure control	Clinic DBP (and report how it was measured)
Hypertension control pressure control	ABPM average SBP
Hypertension control pressure control	ABPM average DBP
Hypertension control pressure control	Number of BP meds
Hypertension control pressure control	LV mass
Morbidity	Hospitalization rate
Morbidity	CVD event rate
Morbidity	MI events
Morbidity	Stroke events
Morbidity	CHF events
Morbidity	PAD events
Morbidity	Infection event rate
Morbidity	Vascular Access interventions/thrombosis
Morbidity	Compliance and adherence
Morbidity	Time to recovery from hemodialysis
Quality of life	Sf-36 overall
Quality of life	Sf-36 each component
Quality of life	KDQOL overall
Quality of life	KDQOL each component
Quality of life	Other QOL instruments?
Quality of life	Patient compliance
Quality of life	Patient burden/Caregiver burden
Mortality	Overall mortality rate
Mortality	CVD mortality rate
Mortality	Infection mortality rate
Harms of more frequent dialysis	Hypotension
Harms of more frequent dialysis	Vascular access complications/thrombosis
Harms of more frequent dialysis	Loss of residual kidney function
Harms of more frequent dialysis	Patient and caregiver burden
Pregnancy	Surviving infants
Pregnancy	Neonatal deaths
Pregnancy	Spontaneous abortions
Pregnancy	Birth weight
Pregnancy	Preterm delivery
Pregnancy	Malformations
Pregnancy	Other neonatal complications

ABPM=Ambulatory blood pressure measure; BP=Blood pressure; CHF=Congestive heart failure; CRP=C-reactive protein; CVD=Cardiovascular disease; DBP=Diastolic blood pressure; ESA=Erythropoiesis stimulating agent; KDQOL=Kidney Disease Quality of Life Instrument; LV=Left ventricular; MI=Myocardial infarction; PAD=Peripheral artery disease; SBP=Systolic blood pressure

Appendix B. Detailed Search Strategy

Table B1. PubMed search string for Key Questions 1 thru 3, run on October 21, 2019

#	String
1	"Kidney Failure, Chronic"[Mesh]
2	"kidney failure"[tiab]
3	"end stage renal"[tiab]
4	“end stage kidney”[tiab]
5	“chronic renal failure”[tiab]
6	ESRD[tiab]
7	ESKF[tiab]
8	ESKD[tiab]
9	ESRF[tiab]
10	Combine 1 thru 9 with “OR”
11	"Renal Dialysis"[Mesh]
12	hemodialysis[tiab]
13	dialysis[tiab]
14	haemodialysis[tiab]
15	Combine 11 thru 14 with “OR”
16	Frequency[tiab]
17	frequent[tiab]
18	day[tiab]
19	daily[tiab]
20	week[tiab]
21	weekly[tiab]
22	quotidian[tiab]
23	Duration[tiab]
24	nocturnal[tiab]
25	night[tiab]
26	nightly[tiab]
27	overnight[tiab]
28	“Over night”[tiab]
29	intensive[tiab]
30	extended[tiab]
31	Combine 16 thru 30 with “OR”
32	10 AND 15 AND 31
	Limit to 2005 to present

Table B2. PubMed search string for Key Questions 4, run on October 21, 2019

#	String
1	"Kidney Failure, Chronic"[Mesh]
2	"kidney failure"[tiab]
3	"end stage renal"[tiab]
4	“end stage kidney”[tiab]
5	“chronic renal failure”[tiab]
6	ESRD[tiab]
7	ESKF[tiab]
8	ESKD[tiab]
9	ESRF[tiab]
10	Combine 1 thru 9 with “OR”
11	“Symptom Assessment"[Mesh]
12	“Patient Reported Outcome Measures"[Mesh]
13	"Quality of Life"[Mesh]
14	"quality of life"[tiab]
15	Combine 11 thru 14 with “OR”
16	symptom[tiab]
17	“patient reported outcome”[tiab]
18	PRO[tiab]
19	Combine 16 thru 18 with “OR”
20	measure[tiab]
21	measurement[tiab]
22	tool[tiab]
23	assessment[tiab]
24	Combine 20 thru 23 with “OR”
25	15 OR (19 AND 24)
26	10 AND 15

Table B3. Embase Search String, run on October 21, 2019

#	String
1	'chronic kidney failure'/exp OR 'chronic kidney failure':ab,ti
2	'kidney failure':ab,ti KQ1
3	'end stage renal':ab,ti
4	'end stage kidney':ab,ti
5	'chronic renal failure':ab,ti KQ1
6	'esrd':ab,ti
7	'eskf':ab,ti
8	'eskd':ab,
9	'esrf':ab,ti
10	#1 OR #2 OR #3 OR #4 OR #5 OR #6 OR #7 OR #8 OR #9
11	'symptom assessment'/exp OR 'symptom assessment':ab,
12	'quality of life'/exp OR 'quality of life':ab,ti
13	'patient reported outcome measure':ab,ti OR 'patient reported outcome measures':ab,ti
14	#11 OR #12 OR #13
15	'patient-reported outcome'/exp OR 'patient reported outcome':ab,ti
16	'symptom'/exp OR symptom:ab,ti
17	#15 OR #16
18	measure:ab,ti
19	measurement:ab,ti
20	tool:ab,ti
21	assessment:ab,ti
22	#18 OR #19 OR #20 OR #21
23	#17 AND #22
24	#14 OR #23
25	#10 AND #24
26	#25 AND (2005:py OR 2006:py OR 2007:py OR 2008:py OR 2009:py OR 2010:py OR 2011:py OR 2012:py OR 2013:py OR 2014:py OR 2015:py OR 2016:py OR 2017:py OR 2018:py OR 2019:py)
27	'test'/exp OR test
28	'chronic kidney failure'/exp OR 'chronic kidney failure':ab,
29	'kidney failure':ab,ti
30	'end stage renal':ab,ti
31	‘end stage kidney':ab,ti
32	'chronic renal failure':ab,ti
33	'esrd':ab,ti
34	'eskf':ab,ti
35	'eskd':ab,ti
36	'esrf':ab,ti
37	#27 OR #28 OR #29 OR #30 OR #31 OR #32 OR #33 OR #34 OR #35 OR #36
38	'hemodialysis'/exp OR hemodialysis:ab,ti
39	haemodialysis:ab,ti
40	dialysis:ab,ti
41	#38 OR #39 OR #40
42	frequncy:ab,ti
43	frequent:ab,ti
44	day:ab,ti
45	daily:ab,ti
46	week:ab,ti
47	weekly:ab,ti
48	quotidian:ab,ti
49	duration:ab,ti
50	nocturnal:ab,ti
51	night:ab,ti
52	nightly:ab,ti
53	overnight:ab,ti
54	'over night':ab,ti
55	intensive:ab,ti
56	extended:ab,ti

#	String
57	#42 OR #43 OR #44 OR #45 OR #46 OR #47 OR #48 OR #49 OR #50 OR #51 OR #52 OR #53 OR #54 OR #55 OR #56
58	#37 AND #41 AND #57
59	#58 AND (2005:py OR 2006:py OR 2007:py OR 2008:py OR 2009:py OR 2010:py OR 2011:py OR 2012:py OR 2013:py OR 2014:py OR 2015:py OR 2016:py OR 2017:py OR 2018:py OR 2019:py)
60	#58 AND (2005:py OR 2006:py OR 2007:py OR 2008:py OR 2009:py OR 2010:py OR 2011:py OR 2012:py OR 2013:py OR 2014:py OR 2015:py OR 2016:py OR 2017:py OR 2018:py OR 2019:py) AND [embase]/lim NOT ([embase]/lim AND [medline]/lim)

Table B4. Cochrane Search String, run on October 21, 2019

#	String
1	MeSH descriptor: [Kidney Failure, Chronic] explode all trees
2	("kidney failure"):ti,ab,kw OR ("end stage renal"):ti,ab,kw OR ("end stage kidney"):ti,ab,kw OR ("chronic renal failure"):ti,ab,kw (Word variations have been searched)
3	(ESRD):ti,ab,kw OR (ESKD):ti,ab,kw OR (ESRF):ti,ab,kw OR (ESKF):ti,ab,kw (Word variations have been searched)
4	#1 OR #2 OR #3
5	MeSH descriptor: [Renal Dialysis] explode all trees
6	(hemodialysis):ti,ab,kw OR (haemodialysis):ti,ab,kw OR (dialysis):ti,ab,kw (Word variations have been searched)
7	#5 OR #6
8	(frequency):ti,ab,kw OR (frequent):ti,ab,kw OR (day):ti,ab,kw AND (daily):ti,ab,kw AND (week):ti,ab,kw (Word variations have been searched)
9	(weekly):ti,ab,kw OR (quotidian):ti,ab,kw OR (duration):ti,ab,kw AND (nocturnal):ti,ab,kw AND (night):ti,ab,kw (Word variations have been searched)
10	(nightly):ti,ab,kw OR (overnight):ti,ab,kw OR ("over night"):ti,ab,kw AND (intensive):ti,ab,kw AND (extended):ti,ab,kw (Word variations have been searched)
11	#8 OR #9 OR #10
12	#4 AND #7 AND #11 with Publication Year from 2005 to 2019, with Cochrane Library publication date Between Jan 2005 and Dec 2019, in Trials
13	MeSH descriptor: [undefined] explode all trees
14	MeSH descriptor: [Patient Reported Outcome Measures] explode all trees
15	MeSH descriptor: [Quality of Life] explode all trees
16	("quality of life"):ti,ab,kw (Word variations have been searched)
17	#13 OR #14 OR #15 OR #16
20	(measure):ti,ab,kw OR (measurement):ti,ab,kw OR (tool):ti,ab,kw OR (assessment):ti,ab,kw (Word variations have been searched)
21	(symptom):ti,ab,kw OR ("patient reported outcome"):ti,ab,kw (Word variations have been searched)
22	#18 AND #19
23	#17 OR #20
24	#4 AND #21

Appendix C. Screening and Data Abstraction Forms

Figure C-1. Abstract screening form for Key Quesitons 1 through 3

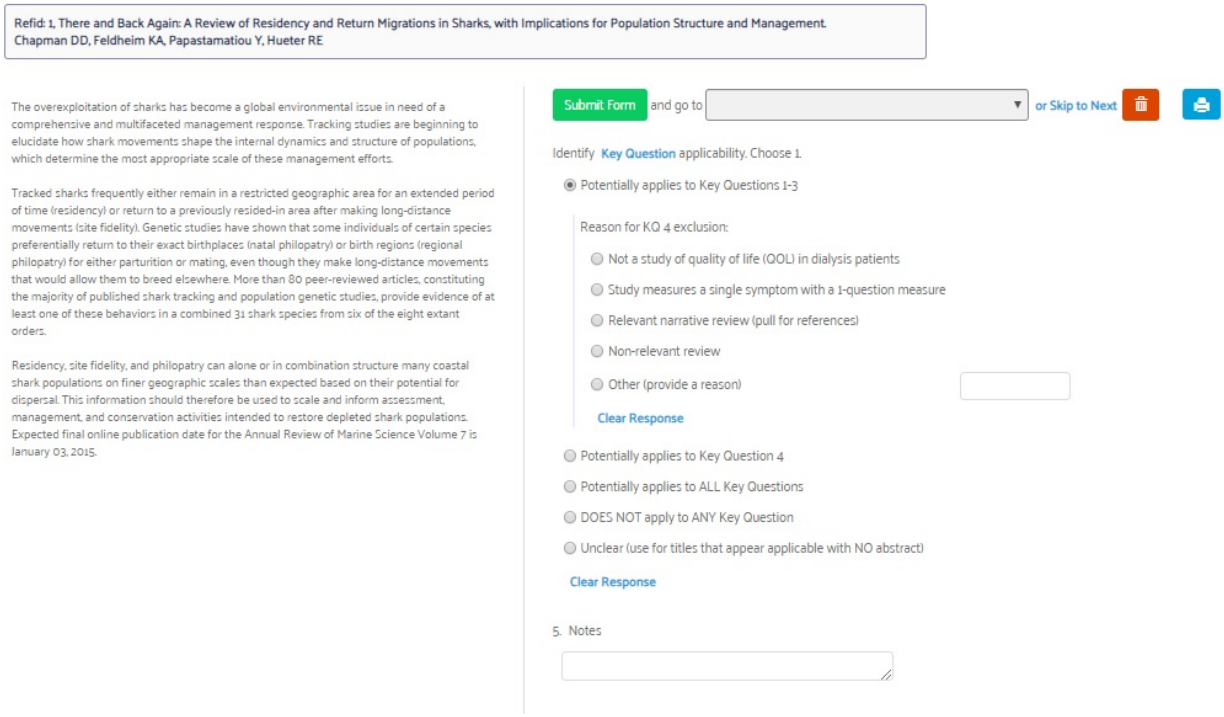


Figure C-2. Abstract screening form for Key Quesitons 4

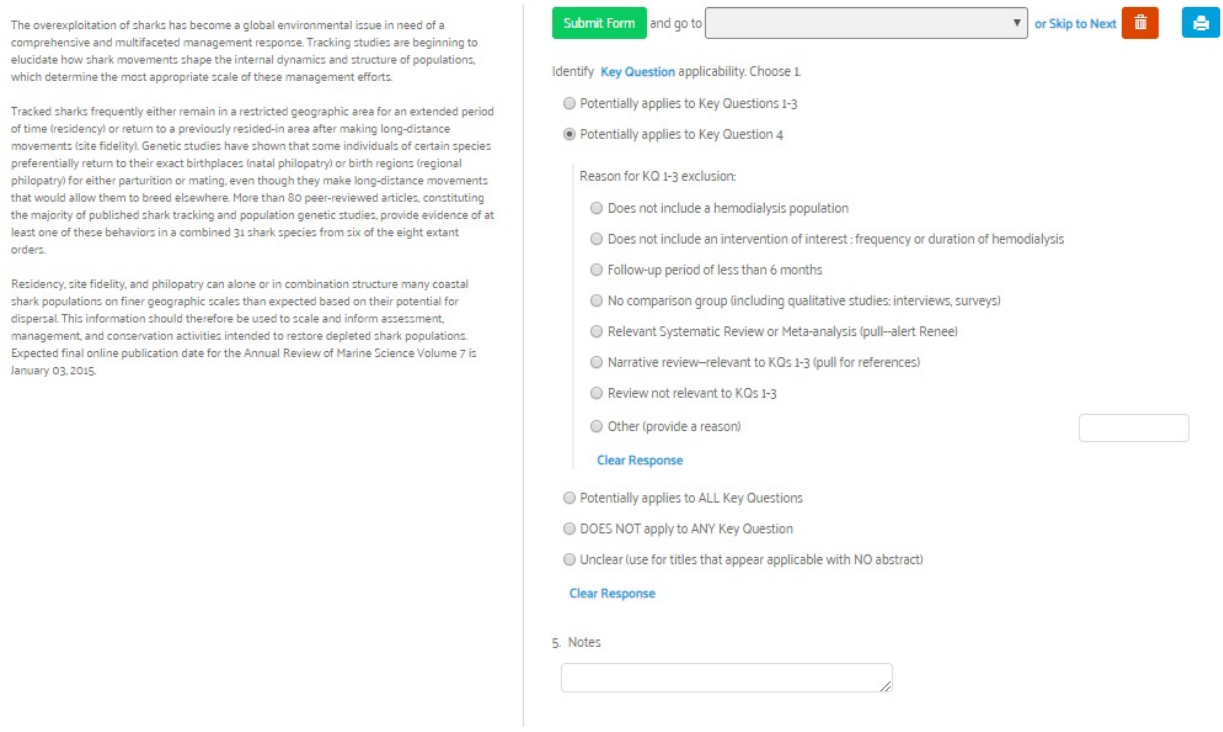


Figure C-3. Abstract screening form for no relevance to any Key Questions

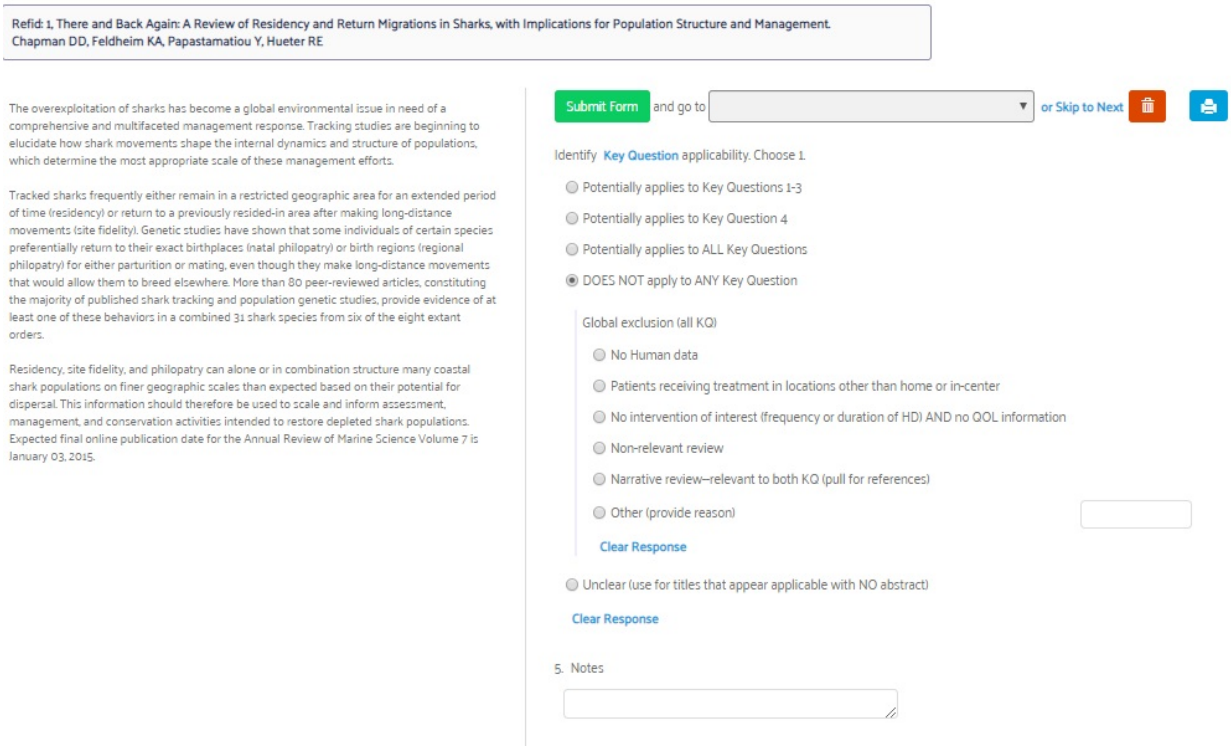


Figure C-4. Article screening form for Key Quesitons 1 through 3

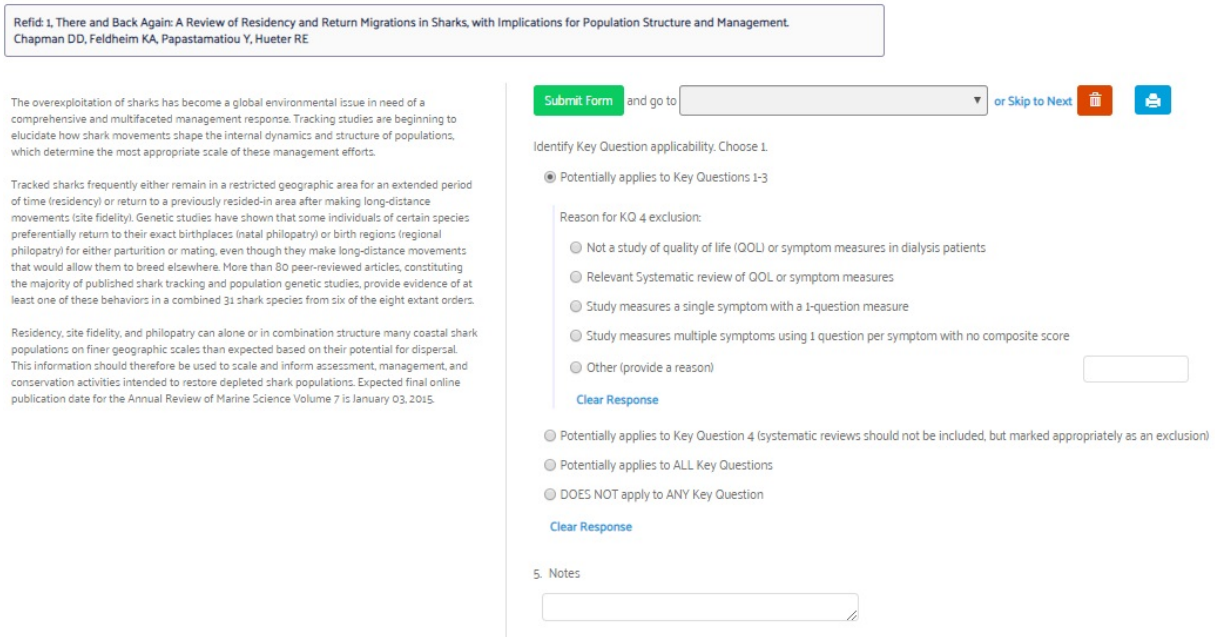


Figure C-5. Article screening form for Key Quesitons 4

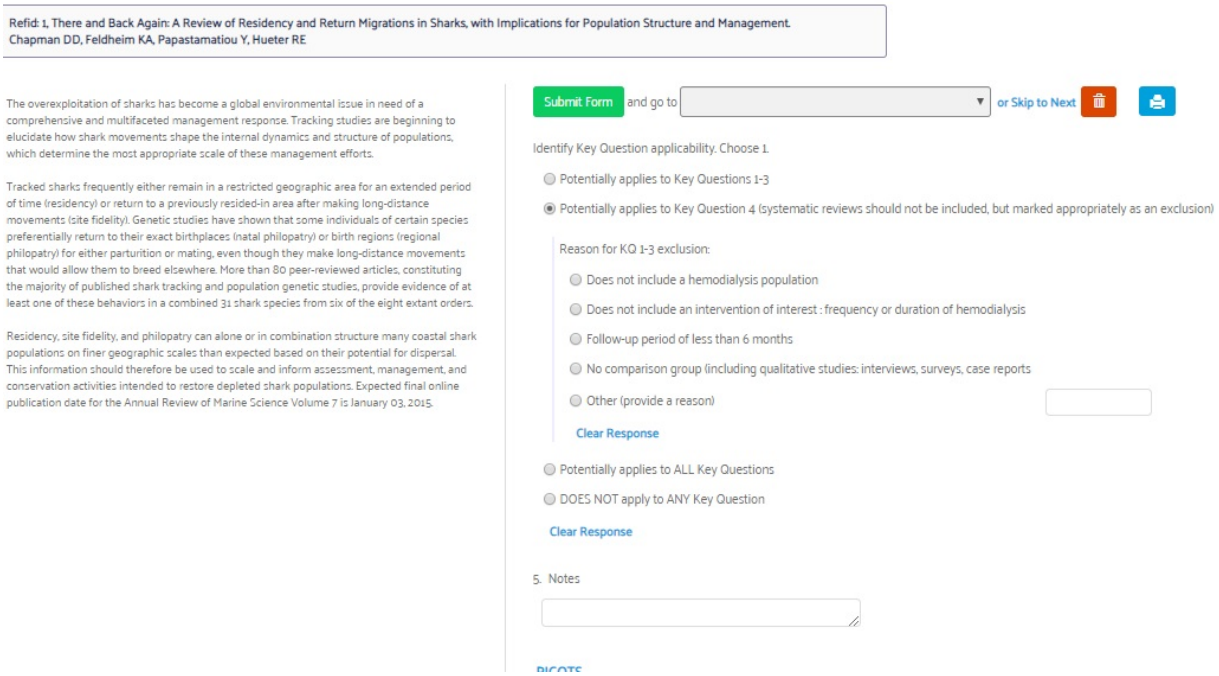


Figure C-6. Article screening form for no relevance to any Key Questions

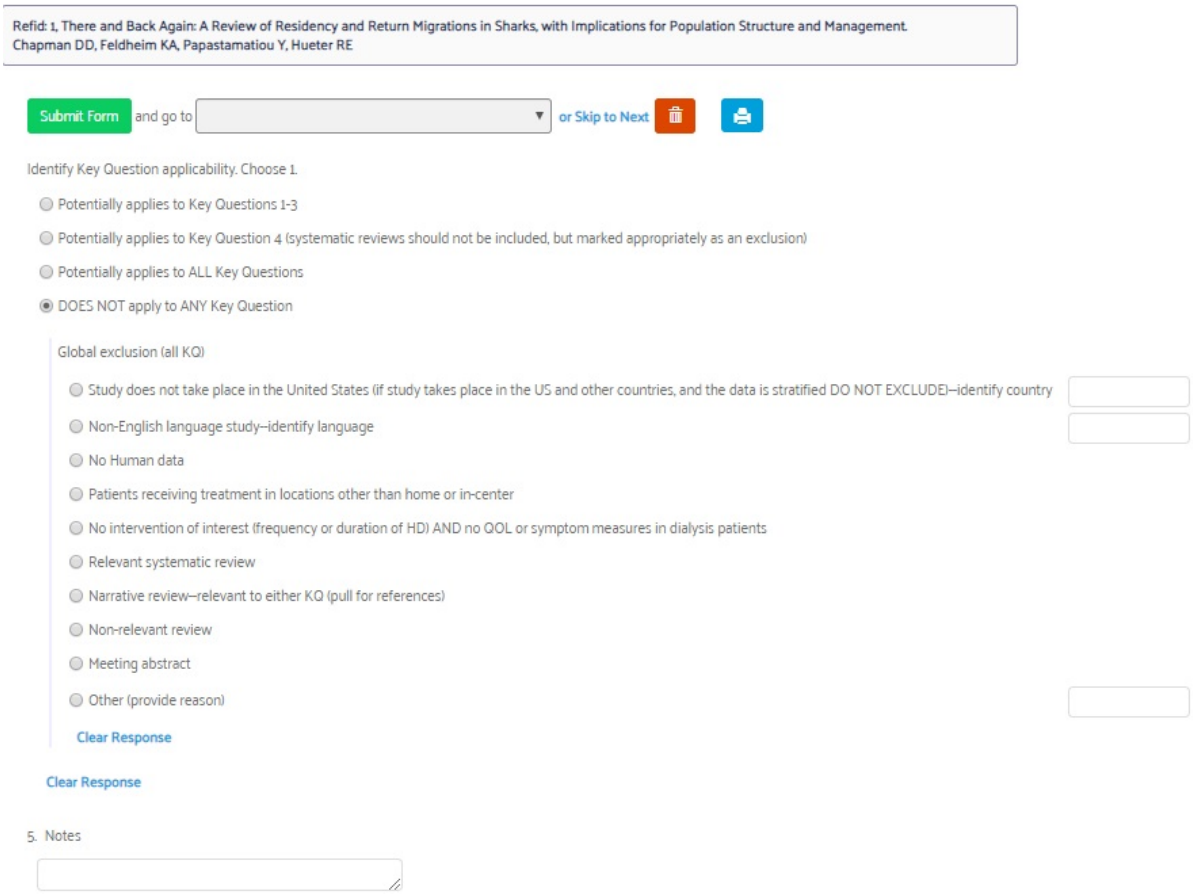
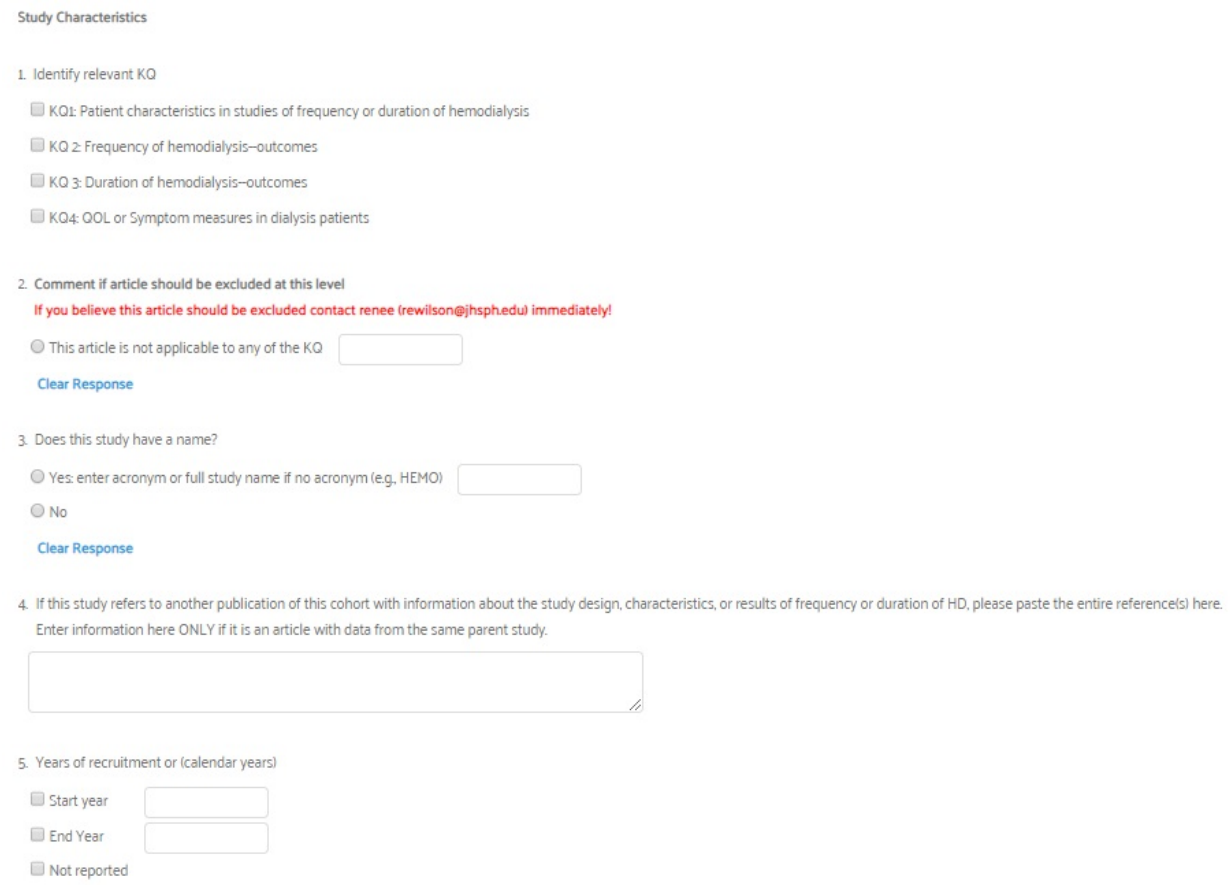


Figure C-7. Study Characteristics data abstraction form



Study Characteristics

1. Identify relevant KQ
   - ☐ KQ1: Patient characteristics in studies of frequency or duration of hemodialysis
   - ☐ KQ 2: Frequency of hemodialysis--outcomes
   - ☐ KQ 3: Duration of hemodialysis--outcomes
   - ☐ KQ4: QOL or Symptom measures in dialysis patients

2. **Comment if article should be excluded at this level**
   If you believe this article should be excluded contact renee (rewilson@jhsph.edu) immediately!
   - ○ This article is not applicable to any of the KQ
   Clear Response

3. Does this study have a name?
   - ○ Yes: enter acronym or full study name if no acronym (e.g., HEMO)
   - ○ No
   Clear Response

4. If this study refers to another publication of this cohort with information about the study design, characteristics, or results of frequency or duration of HD, please paste the entire reference(s) here. Enter information here ONLY if it is an article with data from the same parent study.

5. Years of recruitment or (calendar years)
   - ☐ Start year
   - ☐ End Year
   - ☐ Not reported

6. Location of the intervention (choose all that apply)

- [ ] Home
- [ ] Dialysis center
- [ ] other
- [ ] Not reported

7. Study Design

- ○ Randomized intervention (controlled trial)
- ○ Non-randomized intervention (controlled trial)
- ○ Observational study with a comparison group (e.g., frequency or duration of HD)

9. Single or multi-center

This question should only be answered if this is NOT a home setting

- [ ] Single-center (clinic)
- [ ] Multi-center
- [ ] Single-center network
- [ ] Multi-center network
- [ ] Not specified
- [ ] Other

11. Clinic characteristics

- [ ] For-profit
- [ ] Non-profit
- [ ] Other
- [ ] Not reported

12. Clinic location (general)

- Urban
- Rural
- Other
- Not reported

Inclusion criteria (convert all exclusion criteria to inclusion criteria)
If the inclusion criteria are different across groups make a note in the "other comments"

Criteria	Male	Female	Age	Language (spoken/understood)	Ethnicity	Incident v. Prevalent	Other
INCLUDE	13. Male only Not listed as an inclusion criterion	14. Female only Not listed as an inclusion criterion	15. use > for greater than OR greater than or equal to use < for less than OR less than or equal to >, <, Other Not listed as an inclusion criterion	16. English Spanish Other (describe) Not listed as an inclusion criterion	17. Choose all that apply White, non-Hispanic Black, non-Hispanic Latino/Hispanic Asian/Pacific Islander American Indian/Alaska Native Other Other Other not listed as an inclusion criterion	18. Incident Prevalent Duration of prior dialysis Not reported	19. If no additional inclusion criteria, write "none."

20. COMMENTS about Study Characteristics

21. R2 only: If you are reviewing R1 data entry, enter your initials when you have completed the audit

Figure C-8. Participant characteristics data abstraction form

Participant Characteristics at Baseline

1. Does the study report baseline characteristics for subgroups seperately?

- Yes
- No

Clear Response

	All Arms	Arm 1 (control/usual care)	Arm 2	Arm 3	Arm 4
Define	3. _	4. _	5. _	6. _	7. _
N at baseline	9. _	10. _	11. _	12. _	13. _
15. Follow-up (click measure and define days/weeks/months in text box) Mean Median Maximum/Minimum Clear Response	16. _	17. _	18. _	19. _	20. _

22. Sex

◉ reported

Overall Group	Arm 1	Arm 2	Arm 3	Arm 4	Arm 5
23. ☐ women, n ☐ women, %	24. ☐ women, n ☐ women, %	25. ☐ women, n ☐ women, %	26. ☐ women, n ☐ women, %	27. ☐ women, n ☐ women, %	28. ☐ women, n ☐ women, %

○ not reported

29. Age

◉ reported

Overall Group	Arm 1	Arm 2	Arm 3	Arm 4	Arm 5
30. ☐ mean ☐ Median ☐ Range	31. ☐ mean ☐ Median ☐ Range	32. ☐ mean ☐ Median ☐ Range	33. ☐ mean ☐ Median ☐ Range	34. ☐ mean ☐ median ☐ range	35. ☐ mean ☐ median ☐ range

○ not reported

36. Race/ethnicity

◉ Reported

	Overall Group	Arm 1	Arm 2	Arm 3	Arm 4	Arm 5
White, non-Hispanic	37. ☐ n ☐ %	38. ☐ n ☐ %	39. ☐ n ☐ %	40. ☐ n ☐ %	41. ☐ n ☐ %	42. ☐ n ☐ %
Black, non-Hispanic	43. ☐ n ☐ %	44. ☐ n ☐ %	45. ☐ n ☐ %	46. ☐ n ☐ %	47. ☐ n ☐ %	48. ☐ n ☐ %
Latino/Hispanic	49. ☐ n ☐ %	50. ☐ n ☐ %	51. ☐ n ☐ %	52. ☐ n ☐ %	53. ☐ n ☐ %	54. ☐ n ☐ %
Asian/Pacific Islander	55. ☐ n ☐ %	56. ☐ n ☐ %	57. ☐ n ☐ %	58. ☐ n ☐ %	59. ☐ n ☐ %	60. ☐ n ☐ %
American Indian/Alaska Native	61. ☐ n ☐ %	62. ☐ n ☐ %	63. ☐ n ☐ %	64. ☐ n ☐ %	65. ☐ n ☐ %	66. ☐ n ☐ %
67. Other --	68. ☐ n ☐ %	69. ☐ n ☐ %	70. ☐ n ☐ %	71. ☐ n ☐ %	72. ☐ n ☐ %	73. ☐ n ☐ %

88. Education

◉ Reported

	Overall Group	Arm 1	Arm 2	Arm 3	Arm 4	Arm 5
< High School	89. ☐ n ☐ %	90. ☐ n ☐ %	91. ☐ n ☐ %	92. ☐ n ☐ %	93. ☐ n ☐ %	94. ☐ n ☐ %
Completed High School	95. ☐ n ☐ %	96. ☐ n ☐ %	97. ☐ n ☐ %	98. ☐ n ☐ %	99. ☐ n ☐ %	100. ☐ n ☐ %
College Degree	101. ☐ n ☐ %	102. ☐ n ☐ %	103. ☐ n ☐ %	104. ☐ n ☐ %	105. ☐ n ☐ %	106. ☐ n ☐ %
Post-graduate Degree	107. ☐ n ☐ %	108. ☐ n ☐ %	109. ☐ n ☐ %	110. ☐ n ☐ %	111. ☐ n ☐ %	112. ☐ n ☐ %
Years of education	113. ☐ mean ☐ median ☐ min ☐ max	114. ☐ mean ☐ median ☐ min ☐ max	115. ☐ mean ☐ median ☐ min ☐ max	116. ☐ mean ☐ median ☐ min ☐ max	117. ☐ mean ☐ median ☐ min ☐ max	118. ☐ mean ☐ median ☐ min ☐ max
119. Other --	120. ☐ n ☐ %	121. ☐ n ☐ %	122. ☐ n ☐ %	123. ☐ n ☐ %	124. ☐ n ☐ %	125. ☐ n ☐ %

140. Smoking

◉ reported

	Overall Group	Arm 1	Arm 2	Arm 3	Arm 4	Arm 5
Current	141. ☐ n ☐ %	142. ☐ n ☐ %	143. ☐ n ☐ %	144. ☐ n ☐ %	145. ☐ n ☐ %	146. ☐ n ☐ %
Former	147. ☐ n ☐ %	148. ☐ n ☐ %	149. ☐ n ☐ %	150. ☐ n ☐ %	151. ☐ n ☐ %	152. ☐ n ☐ %
Ever	153. ☐ n ☐ %	154. ☐ n ☐ %	155. ☐ n ☐ %	156. ☐ n ☐ %	157. ☐ n ☐ %	158. ☐ n ☐ %
Never	159. ☐ n ☐ %	160. ☐ n ☐ %	161. ☐ n ☐ %	162. ☐ n ☐ %	163. ☐ n ☐ %	164. ☐ n ☐ %

○ not reported

165. Is the entire study population a subgroup (all particiupants have a specific disease or condition)?

◉ Yes

Condition	Define
Renal insufficiency (included CKD)	166.
Diabetes	167.
On Dialysis	168.
169. Other	170.
171. Other	172.
173. Other	174.

○ No

Clear Response

175. Other Comments

Figure C-9. Intervention data abstraction form

Intervention Description: Key Questions 1-3

1. Does the study report interventions for subgroups seperately?

- ○ Yes
- ○ No

Clear Response

3. Intervention

- ☐ Frequency of HD
- ☐ Duration of HD

Use Arm 1 EXCLUSIVELY for the control or standard care intervention. If there is not control, leave those columns blank under Arm 1

NOTE: the Arms below should match the Arms described in the participant characteristics form.

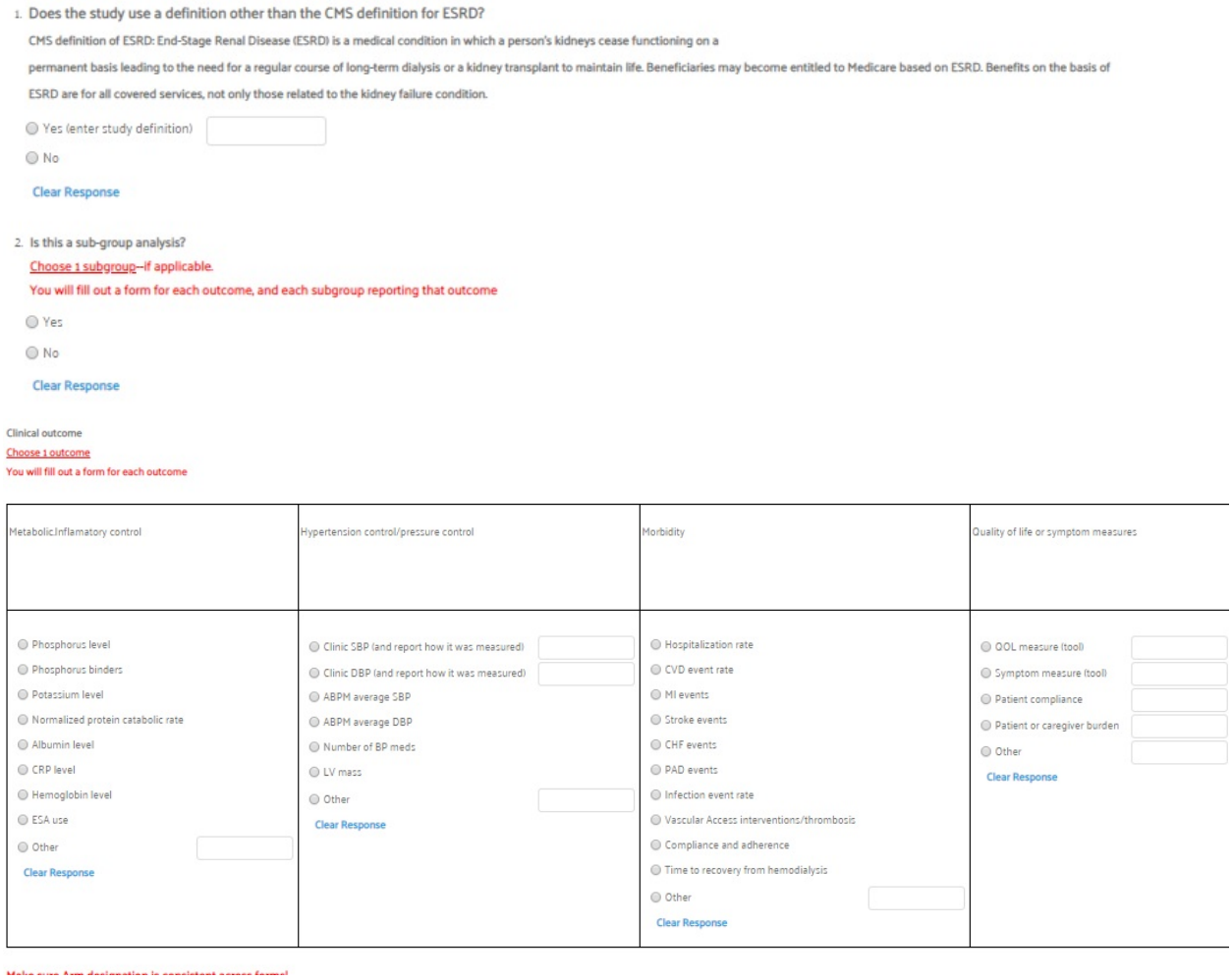
	Arm 1 (control/usual care)	Arm 2	Arm 3	Arm 4	Arm 5
GOAL HD Frequency In times per week (if applicable)	..	..	..	..	..
ACTUAL HD Frequency In times per week (if applicable)	..	..	..	..	..
GOAL HD duration In hours per week (if applicable)	☐ Hours/week ☐ Minutes/week ☐ Hours/session ☐ Minutes/session ☐ Other	☐ Hours/week ☐ Minutes/week ☐ Hours/session ☐ Minutes/session ☐ Other	☐ Hours/week ☐ Minutes/week ☐ Hours/session ☐ Minutes/session ☐ Other	☐ Hours/week ☐ Minutes/week ☐ Hours/session ☐ Minutes/session ☐ Other	☐ Hours/week ☐ Minutes/week ☐ Hours/session ☐ Minutes/session ☐ Other
ACTUAL HD duration In hours per week (if applicable)	☐ Hours/week ☐ Minutes/week ☐ Hours/session ☐ Minutes/session ☐ Other	☐ Hours/week ☐ Minutes/week ☐ Hours/session ☐ Minutes/session ☐ Other	☐ Hours/week ☐ Minutes/week ☐ Hours/session ☐ Minutes/session ☐ Other	☐ Hours/week ☐ Minutes/week ☐ Hours/session ☐ Minutes/session ☐ Other	☐ Hours/week ☐ Minutes/week ☐ Hours/session ☐ Minutes/session ☐ Other
Other details	..	..	..	..	..

29. Comments

30. R2 only: if you are reviewing R1 data entry, enter your initials when you have completed the audit

..

Figure C-10. General outcome data abstraction form for Key Questions 1 through 3



1. Does the study use a definition other than the CMS definition for ESRD?

CMS definition of ESRD: End-Stage Renal Disease (ESRD) is a medical condition in which a person's kidneys cease functioning on a permanent basis leading to the need for a regular course of long-term dialysis or a kidney transplant to maintain life. Beneficiaries may become entitled to Medicare based on ESRD. Benefits on the basis of ESRD are for all covered services, not only those related to the kidney failure condition.

- ○ Yes (enter study definition)
- ○ No

Clear Response

2. Is this a sub-group analysis?

Choose 1 subgroup--if applicable.

You will fill out a form for each outcome, and each subgroup reporting that outcome

- ○ Yes
- ○ No

Clear Response

Clinical outcome

Choose 1 outcome

You will fill out a form for each outcome

Metabolic/Inflamatory control	Hypertension control/pressure control	Morbidity	Quality of life or symptom measures
○ Phosphorus level ○ Phosphorus binders ○ Potassium level ○ Normalized protein catabolic rate ○ Albumin level ○ CRP level ○ Hemoglobin level ○ ESA use ○ Other Clear Response	○ Clinic SBP (and report how it was measured) ○ Clinic DBP (and report how it was measured) ○ ABPM average SBP ○ ABPM average DBP ○ Number of BP meds ○ LV mass ○ Other Clear Response	○ Hospitalization rate ○ CVD event rate ○ MI events ○ Stroke events ○ CHF events ○ PAD events ○ Infection event rate ○ Vascular Access interventions/thrombosis ○ Compliance and adherence ○ Time to recovery from hemodialysis ○ Other Clear Response	○ QOL measure (tool) ○ Symptom measure (tool) ○ Patient compliance ○ Patient or caregiver burden ○ Other Clear Response

Make sure Arm designation is consistent across forms!

Mortality	Harms	4. Other (e.g. composite) Define below _
○ Overall mortality rate ○ CVD mortality rate ○ Infection mortality rate ○ Other Clear Response	○ Hypotension ○ Vascular access complications/thrombosis ○ Other Clear Response	11. Describe _

Figure C-11. Continous outcome data abstraction form for Key Questions 1 through 3

Figure C-12. Categorical outcome data abstraction form for Key Questions 1 through 3

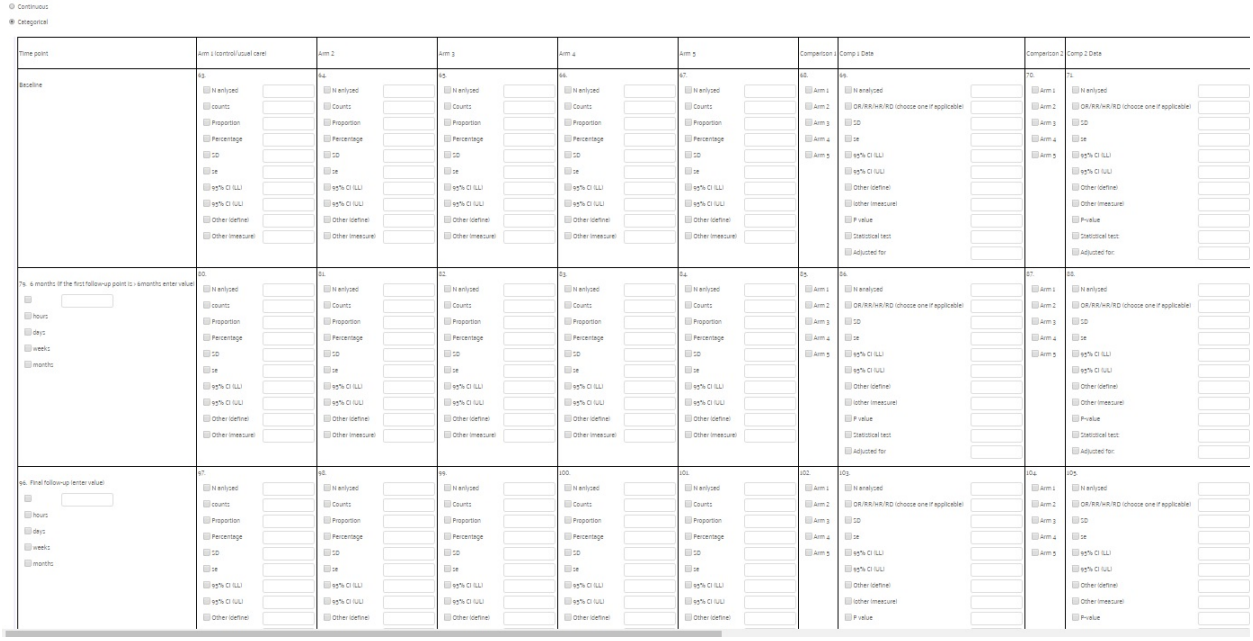
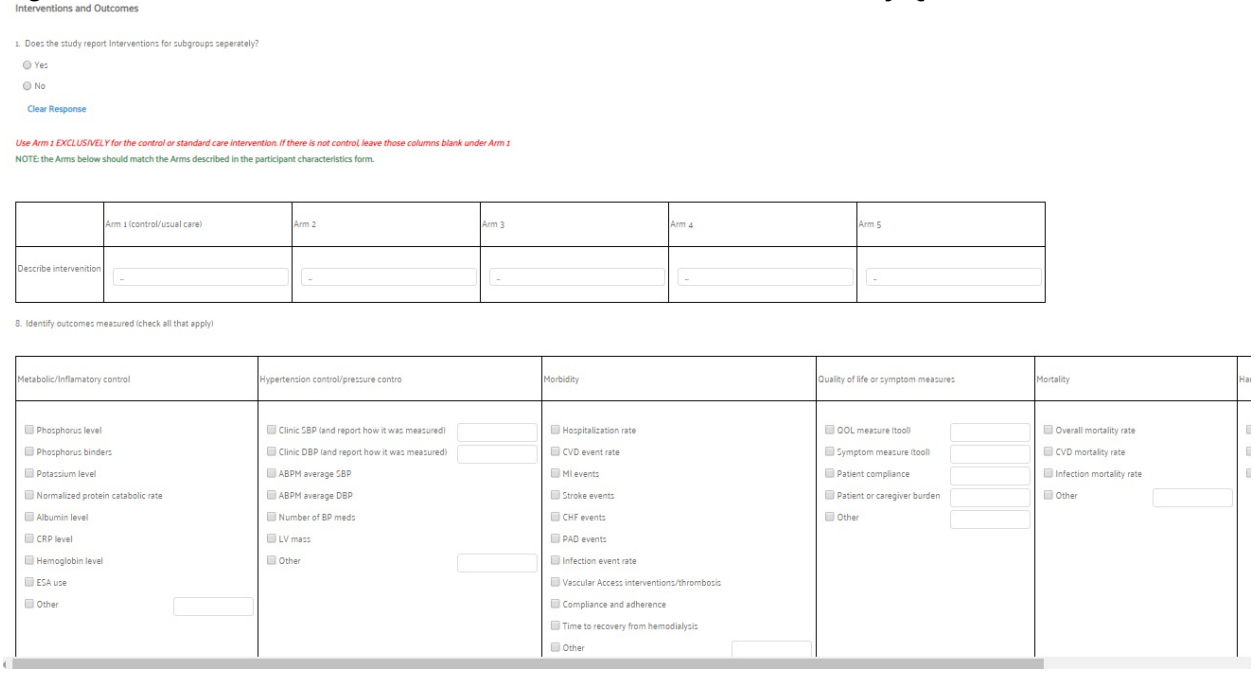
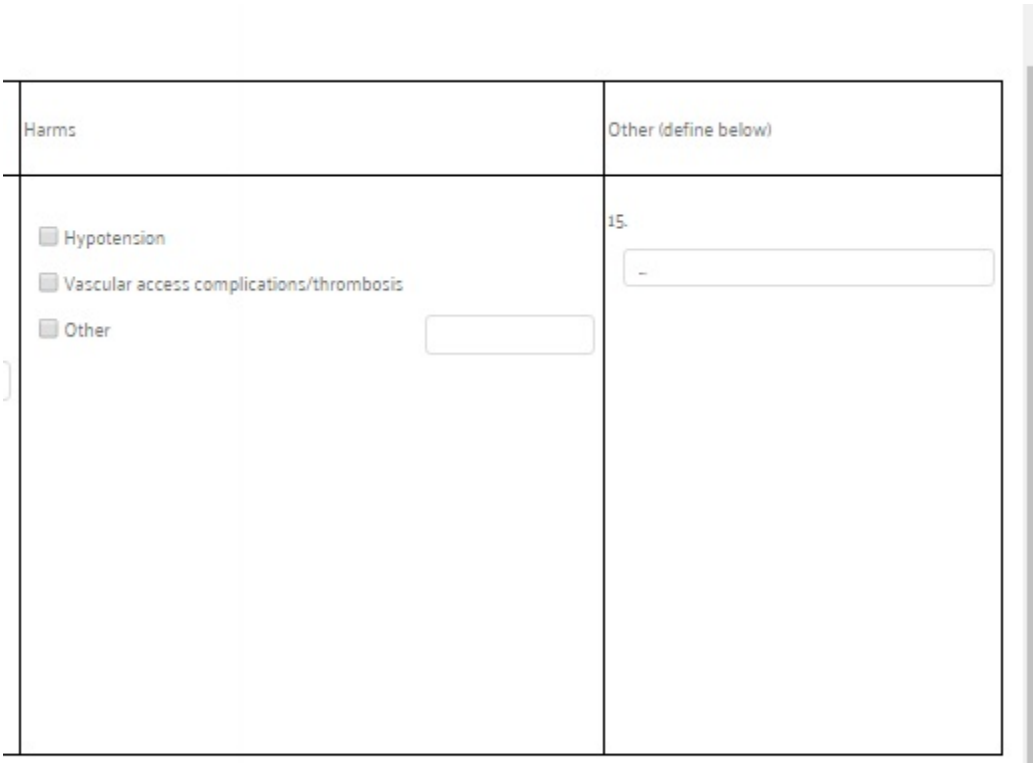


Figure C-13. Interventions and outcomes data abstraction form for Key Questions 4





Harms	Other (define below)
☐ Hypotension ☐ Vascular access complications/thrombosis ☐ Other	15.

Figure C-14. Tools and measures data abstraction form for Key Questions 4

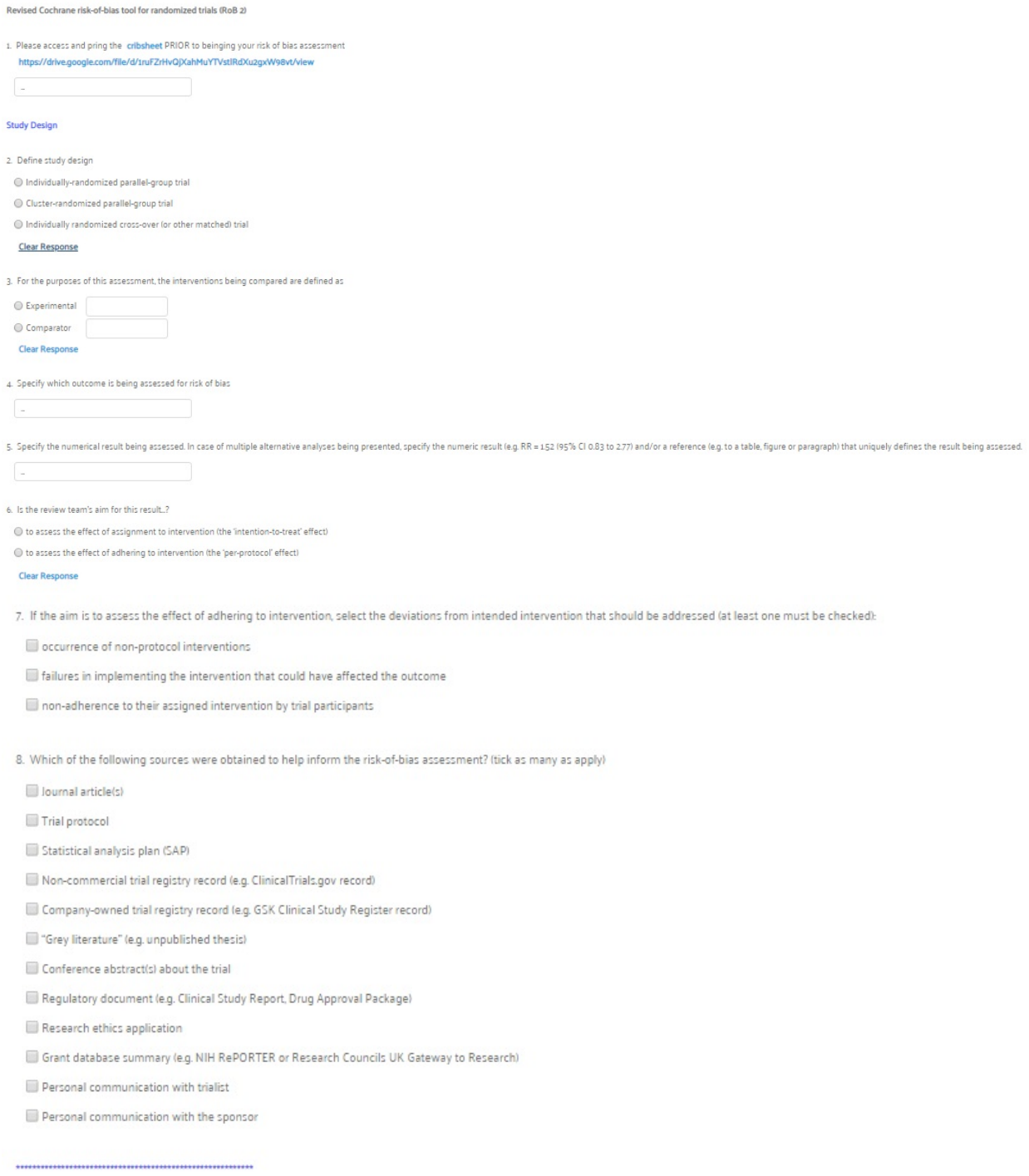
Key Question 4:

Tool and measure properties

Tool or measurement instrument	Reliability	Validity	Validation method (define)	Feasibility
KD-QOL overall ○ Reported ○ Not reported Clear Response	☐ Chronback's alpha coefficiant ☐ Test-retest reliability ☐ Study states the tool is reliable, no data provided ☐ Not reported	☐ Content ☐ Factor analysis ☐ Other construct ☐ Responsiveness ☐ Study states the tool is valid, no data provided ☐ Not reported	☐ Describe ☐ Not reported	☐ Patient burden ☐ Computer-adapted testing ☐ Interpretability ☐ not reported
KDQOL subscale (define below) ○ Reported, define subscale ○ Not reported Clear Response	☐ Chronback's alpha coefficiant ☐ Test-retest reliability ☐ Study states the tool is reliable, no data provided ☐ Not reported	☐ Content ☐ Factor analysis ☐ Other construct ☐ Responsiveness ☐ Study states the tool is valid, no data provided ☐ Not reported	☐ Describe ☐ Not reported	☐ Patient burden ☐ Computer-adapted testing ☐ Interpretability ☐ Not reported
KDQOL subscale (define below) ○ Reported, define subscale ○ Not reported Clear Response	☐ Chronback's alpha coefficiant ☐ Test-retest reliability ☐ Study states the tool is reliable, no data provided ☐ Not reported	☐ Content ☐ Factor analysis ☐ Other construct ☐ Responsiveness ☐ Study states the tool is valid, no data provided	☐ Describe ☐ Not reported	☐ Patient burden ☐ Computer-adapted testing ☐ Interpretability ☐ Not reported

Usability	Minimal Clincally Important Difference measured? (define)	Placebo Effect measured? (define)	Other measures
☐ Used in clinical practice ☐ Has Pro-PM ☐ Not reported	○ Yes (define) ○ No ○ Not reported Clear Response	○ Yes (define) ○ No ○ Not reported Clear Response	9. ○ Define ○ Not reported Clear Response
☐ Used in clinical practice ☐ Has Pro-PM ☐ Not reported	○ Yes (define) ○ No ○ Not reported Clear Response	○ Yes (define) ○ No ○ Not reported Clear Response	18. ○ Define ○ Not reported Clear Response
☐ Used in clinical practice ☐ Has Pro-PM ☐ Not reported	○ Yes (define) ○ No ○ Not reported Clear Response	○ Yes (define) ○ No ○ Not reported Clear Response	27. ○ Define ○ Not reported Clear Response

Figure C-15. Cochrane risk of bias form for randomized clinical trials



Revised Cochrane risk-of-bias tool for randomized trials (RoB 2)

1. Please access and pring the cribsheet PRIOR to beinging your risk of bias assessment
https://drive.google.com/file/d/1ruFZrHvQJXahMuYTVstlRdXu2gxW98vt/view

Study Design

2. Define study design
- Individually-randomized parallel-group trial
- Cluster-randomized parallel-group trial
- Individually randomized cross-over (or other matched) trial

Clear Response

3. For the purposes of this assessment, the interventions being compared are defined as
- Experimental
- Comparator

Clear Response

4. Specify which outcome is being assessed for risk of bias

5. Specify the numerical result being assessed. In case of multiple alternative analyses being presented, specify the numeric result (e.g. RR = 1.52 (95% CI 0.83 to 2.77) and/or a reference (e.g. to a table, figure or paragraph) that uniquely defines the result being assessed.

6. Is the review team's aim for this result...?
- to assess the effect of assignment to intervention (the 'intention-to-treat' effect)
- to assess the effect of adhering to intervention (the 'per-protocol' effect)

Clear Response

7. If the aim is to assess the effect of adhering to intervention, select the deviations from intended intervention that should be addressed (at least one must be checked):
- occurrence of non-protocol interventions
- failures in implementing the intervention that could have affected the outcome
- non-adherence to their assigned intervention by trial participants

8. Which of the following sources were obtained to help inform the risk-of-bias assessment? (tick as many as apply)
- Journal article(s)
- Trial protocol
- Statistical analysis plan (SAP)
- Non-commercial trial registry record (e.g. ClinicalTrials.gov record)
- Company-owned trial registry record (e.g. GSK Clinical Study Register record)
- "Grey literature" (e.g. unpublished thesis)
- Conference abstract(s) about the trial
- Regulatory document (e.g. Clinical Study Report, Drug Approval Package)
- Research ethics application
- Grant database summary (e.g. NIH RePORTER or Research Councils UK Gateway to Research)
- Personal communication with trialist
- Personal communication with the sponsor

****

Domain 1: Risk of bias arising from the randomization process

Signaling Question	Comment	Response
1.1 Was the allocation sequence random?	9.	10. Select an Answer
1.2 Was the allocation sequence concealed until participants were enrolled and assigned to interventions?	11.	12. Select an Answer
1.3 Did baseline differences between intervention groups suggest a problem with the randomization process?	13.	14. Select an Answer
Risk-of-bias judgement	See algorithm on cribsheet	15. Select an Answer
Optional: What is the predicted direction of bias arising from the randomization process?	16.	17. Select an Answer

****

Domain 2: Risk of bias due to deviations from the intended interventions (*effect of assignment to intervention*)

Signaling Question	Comment	Response
2.1 Were participants aware of their assigned intervention during the trial?	18.	19. Select an Answer
2.2 Were carers and people delivering the interventions aware of participants' assigned intervention during the trial?	20.	21. Select an Answer
2.3 If Y/PY/NI to 2.1 or 2.2: Were there deviations from the intended intervention that arose because of the experimental context?	22.	23. Select an Answer
2.4 If Y/PY to 2.3: Were these deviations likely to have effected the outcome?	24.	25. Select an Answer
2.5 If Y/PY/NI to 2.4: Were these deviations from intended intervention balanced between groups?	26.	27. Select an Answer
2.6 Was an appropriate analysis used to estimate the effect of assignment to intervention?	28.	29. Select an Answer
2.7 If N/PN/NI to 2.6: Was there potential for a substantial impact (on the result) of the failure to analyse participants in the group to which they were randomized?	30.	31. Select an Answer
Risk-of-bias judgement	See algorithm on cribsheet	32. Select an Answer
Optional: What is the predicted direction of bias arising from the randomization process?	33.	34. Select an Answer

Domain 2: Risk of bias due to deviations from the intended interventions (*effect of adhering to intervention*)

Signaling Question	Comment	Response
2.1 Were participants aware of their assigned intervention during the trial?	35.	36. Select an Answer
2.2 Were carers and people delivering the interventions aware of participants' assigned intervention during the trial?	37.	38. Select an Answer
2.3 [If applicable] If Y/PY/NI to 2.1 or 2.2: Were important non-protocol interventions balanced across intervention groups?	39.	40. Select an Answer
2.4 [If applicable] Were there failures in implementing the intervention that could have affected the outcome?	41.	42. Select an Answer
2.5 [If applicable] Was there non-adherence to the assigned intervention regimen that could have affected participants' outcomes?	43.	44. Select an Answer
2.6 If N/PN/NI to 2.3, or Y/PY/NI to 2.4 or 2.5: Was an appropriate analysis used to estimate the effect of adhering to the intervention?	45.	46. Select an Answer
Risk-of-bias judgement	See algorithm on cribsheet	47. Select an Answer
Optional: What is the predicted direction of bias arising from the randomization process?	48.	49. Select an Answer

Domain 3: Missing outcome data

Signaling Question	Comment	Response
3.1 Were data for this outcome available for all, or nearly all, participants randomized?	50.	51. Select an Answer
3.2 If N/PN/NI to 3.1: Is there evidence that the result was not biased by missing outcome data?	52.	53. Select an Answer
3.3 If N/PN to 3.2: Could missingness in the outcome depend on its true value?	54.	55. Select an Answer
3.4 If Y/PY/NI to 3.3: Is it likely that missingness in the outcome depended on its true value?	56.	57. Select an Answer
Risk-of-bias judgement	See algorithm on cribsheet	58. Select an Answer
Optional: What is the predicted direction of bias arising from the randomization process?	59.	60. Select an Answer

Domain 4: Risk of bias in measurement of the outcome

Signalling Question	Comment	Response
4.1 Was the method of measuring the outcome inappropriate?	61.	62. Select an Answer
4.2 Could measurement or ascertainment of the outcome have differed between intervention groups?	63.	64. Select an Answer
4.3 If N/PN/NI to 4.1 and 4.2: Were outcome assessors aware of the intervention received by study participants?	65.	66. Select an Answer
4.4 If Y/PY/NI to 4.3: Could assessment of the outcome have been influenced by knowledge of intervention received?	67.	68. Select an Answer
4.5 If Y/PY/NI to 4.4: Is it likely that assessment of the outcome was influenced by knowledge of intervention received?	69.	70. Select an Answer
Risk-of-bias judgement	See algorithm on cribsheet	71. Select an Answer
Optional: What is the predicted direction of bias arising from the randomization process?	72.	73. Select an Answer

Domain 5: Risk of bias in selection of the reported result

Signalling Question	Comment	Response
5.1 Were the data that produced this result analysed in accordance with a pre-specified analysis plan that was finalized before unblinded outcome data were available for analysis?	74.	75. Select an Answer
Is the numerical result being assessed likely to have been selected, on the basis of the results, from...	76.	
5.2 ... multiple eligible outcome measurements (e.g. scales, definitions, time points) within the outcome domain?	77.	78. Select an Answer
5.3 ... multiple eligible analyses of the data?	79.	80. Select an Answer
Risk-of-bias judgement		81. Select an Answer
Optional: What is the predicted direction of bias arising from the randomization process?	82.	83. Select an Answer

Overall risk of bias

Risk of bias judgement	84. Select an Answer
Optional: What is the overall predicted direction of bias for this outcome?	85. Select an Answer

****

Overall risk of bias judgement, guidance

Judgement	Criteria
Low risk of bias	The study is judged to be at low risk of bias for all domains for this result.
Some concerns	The study is judged to raise some concerns in at least one domain for this result, but not to be at high risk of bias for any domain.
High risk of bias	The study is judged to be at high risk of bias in at least one domain for this result. Or The study is judged to have some concerns for multiple domains in a way that substantially lowers confidence in the result.

Figure C-16. Cochrane ROBINS risk of bias form for observational studies

Risk of bias assessment

1. BIAS DUE TO CONFOUNDING

Signalling question	Description	Location in text or source (reference, pg #, ¶, fig/table/other)
1.1 Is there potential for confounding of the effect of intervention in this study? If N/PN to 1.1 the study can be considered to be at low risk of bias due to confounding and no further signalling questions need be considered ○ Yes ○ Probably yes ○ Probably no ○ No Clear Response		
If **Y/PY** to 1.1: determine whether there is a need to assess time-varying confounding: 1.2. Was the analysis based on splitting participants' follow up time according to intervention received? If **N/PN**, answer questions relating to baseline confounding (1.4 to 1.6) If **Y/PY**, proceed to question 1.3. ○ Yes ○ Probably yes ○ Probably no ○ No ○ No Information Clear Response		
1.3. Were intervention discontinuations or switches likely to be related to factors that are prognostic for the outcome? If N/PN, answer questions relating to baseline confounding (1.4 to 1.6) If Y/PY, answer questions relating to both baseline and time-varying confounding (1.7 and 1.8) ○ Yes ○ Probably yes ○ Probably no ○ No ○ No Information Clear Response		
Questions relating to baseline confounding only		
1.4. Did the authors use an appropriate analysis method that controlled for all the important confounding domains? ○ Yes ○ Probably yes ○ Probably no ○ No ○ No Information Clear Response		
If Y/PY to 1.4 1.5. Were confounding domains that were controlled for measured validly and reliably by the variables available in this study? ○ Yes ○ Probably yes ○ Probably no ○ No ○ No Information Clear Response		

1.6. Did the authors control for any post-intervention variables that could have been affected by the intervention? ○ Yes ○ Probably yes ○ Probably no ○ No ○ No Information Clear Response		
Questions relating to baseline and time-varying confounding		
1.7. Did the authors use an appropriate analysis method that adjusted for all the important confounding domains and for timevarying confounding? ○ Yes ○ Probably yes ○ Probably no ○ No ○ No Information Clear Response		
If Y/PY to 1.7 1.8. Were confounding domains that were adjusted for measured validly and reliably by the variables available in this study? ○ Yes ○ Probably yes ○ Probably no ○ No ○ No Information Clear Response		
DOMAIN 1: RISK OF BIAS JUDGEMENT ○ Low ○ Moderate ○ Serious ○ Critical ○ No Information Clear Response	Support for judgement	Optional: What is the predicted direction of bias due to confounding? ○ Favours experimental ○ Favours comparator ○ Unpredictable Clear Response Rationale

2. BIAS IN SELECTION OF PARTICIPANTS INTO THE STUDY

Signalling question	Description Plus location in text or source (reference, pg & ¶¶/fig/table/other)	Location in text or source (reference, pg & ¶¶/fig/table/other)
2.1. Was selection of participants into the study (or into the analysis) based on participant characteristics observed after the start of intervention? If N/PN to 2.1: go to 2.4 ○ Yes ○ Probably yes ○ Probably no ○ No ○ No Information Clear Response		

If Y/PY to 2.1 2.2. Were the postintervention variables that influenced selection likely to be associated with intervention? ○ Yes ○ Probably yes ○ Probably no ○ No ○ No Information Clear Response		
If Y/PY to 2.2 2.3 Were the postintervention variables that influenced selection likely to be influenced by the outcome or a cause of the outcome? ○ Yes ○ Probably yes ○ Probably no ○ No ○ No Information Clear Response		
2.4. Do start of follow-up and start of intervention coincide for most participants? ○ Yes ○ Probably yes ○ Probably no ○ No ○ No Information Clear Response		
If Y/PY to 2.2 and 2.3, or N/PN to 2.4: 2.5. Were adjustment techniques used that are likely to correct for the presence of selection biases? ○ Yes ○ Probably yes ○ Probably no ○ No ○ No Information Clear Response		
DOMAIN 2: RISK OF BIAS JUDGEMENT ○ Low ○ Moderate ○ Serious ○ Critical ○ No Information Clear Response	Support for judgement	Optional What is the predicted direction of bias due to selection of participants into the study? ○ Favours experimental ○ Favours comparator ○ Towards null ○ Away from null ○ Unpredictable Clear Response Rationale

3. BIAS IN CLASSIFICATION OF INTERVENTIONS

Signalling question	Description Plus location in text or source (reference, pg & ¶¶/fig/table/other)	Location in text or source (reference, pg & ¶¶/fig/table/other)
3.1 Were intervention groups clearly defined? ○ Yes ○ Probably yes ○ Probably no ○ No ○ No Information Clear Response		
3.2 Was the information used to define intervention groups recorded at the start of the intervention? ○ Yes ○ Probably yes ○ Probably no ○ No ○ No Information Clear Response		
3.3 Could classification of intervention status have been affected by knowledge of the outcome or risk of the outcome? ○ Yes ○ Probably yes ○ Probably no ○ No ○ No Information Clear Response		
DOMAIN 3: RISK OF BIAS JUDGEMENT ○ Low ○ Moderate ○ Serious ○ Critical ○ No Information Clear Response	Support for judgement	Optional: What is the predicted direction of bias due to measurement of outcomes or interventions? ○ Favours experimental ○ Favours comparator ○ Towards null ○ Away from null ○ Unpredictable Clear Response Rationale

4. BIAS DUE TO DEVIATIONS FROM INTENDED INTERVENTIONS

Signalling question	Description	Location in text or source (reference, pg #/Fig/table/other)
4.1. Were there deviations from the intended intervention beyond what would be expected in usual practice? ○ Yes ○ Probably yes ○ Probably no ○ No Clear Response		
If Y/PY to 4.1 4.2 Were these deviations from intended intervention unbalanced between groups and likely to have affected the outcome? If your aim for this study is to assess the effect of starting and adhering to intervention, answer questions 4.3 to 4.6 ○ Yes ○ Probably yes ○ Probably no ○ No ○ No Information Clear Response		
4.3. Were important co-interventions balanced across intervention groups? ○ Yes ○ Probably yes ○ Probably no ○ No ○ No Information Clear Response		
4.4. Was the intervention implemented successfully for most participants? ○ Yes ○ Probably yes ○ Probably no ○ No ○ No Information Clear Response		
4.5. Did study participants adhere to the assigned intervention regimen? ○ Yes ○ Probably yes ○ Probably no ○ No ○ No Information Clear Response		
If N/PN to 4.3, 4.4 or 4.5 4.6 Was an appropriate analysis used to estimate the effect of starting and adhering to the intervention? ○ Yes ○ Probably yes ○ Probably no ○ No ○ No Information Clear Response		

DOMAIN 4: RISK OF BIAS JUDGEMENT	Support for judgement	
○ Low ○ Moderate ○ Serious ○ Critical ○ No information Clear Response		Optional What is the predicted direction of bias due to deviations from the intended interventions? ○ Favours experimental ○ Favours comparator ○ Towards null ○ Away from null ○ Unpredictable Clear Response Rationale

5. BIAS DUE TO MISSING DATA

Signalling question	Description	Location in text or source (reference, pg #, ¶, fig/table/other)
5.1 Were outcome data available for all, or nearly all, participants? ○ Yes ○ Probably yes ○ Probably no ○ No Clear Response		
5.2 Were participants excluded due to missing data on intervention status? ○ Yes ○ Probably yes ○ Probably no ○ No ○ No information Clear Response		
5.3 Were participants excluded due to missing data on other variables needed for the analysis? ○ Yes ○ Probably yes ○ Probably no ○ No ○ No information Clear Response		
If PN/N to 5.1, or Y/PY to 5.2 or 5.3 5.4 Are the proportion of participants and reasons for missing data similar across interventions? ○ Yes ○ Probably yes ○ Probably no ○ No ○ No information Clear Response		
If PN/N to 5.1, or Y/PY to 5.2 or 5.3 5.5 Is there evidence that results were robust to the presence of missing data? ○ Yes ○ Probably yes ○ Probably no ○ No ○ No information Clear Response		

DOMAIN 5: RISK OF BIAS JUDGEMENT	Support for judgement	Optional What is the predicted direction of bias due to missing data? Favours experimental Favours comparator Towards null Away from null Unpredictable Clear Response Rationale
Low Moderate Serious Critical No Information Clear Response		

6. BIAS IN MEASUREMENT OF OUTCOMES

Signalling question	Description	Location in text or source (reference, pg #, ¶, fig/table/other)
6.1 Could the outcome measure have been influenced by knowledge of the intervention received? Yes Probably yes Probably no No Clear Response		
6.2 Were outcome assessors aware of the intervention received by study participants? Yes Probably yes Probably no No No Information Clear Response		
6.3 Were the methods of outcome assessment comparable across intervention groups? Yes Probably yes Probably no No No Information Clear Response		
6.4 Were any systematic errors in measurement of the outcome related to intervention received? Yes Probably yes Probably no No No Information Clear Response		

DOMAIN 6: RISK OF BIAS JUDGEMENT	Support for judgement	
○ Low ○ Moderate ○ Serious ○ Critical ○ No information Clear Response		Optional What is the predicted direction of bias due to measurement of outcomes? ○ Favours experimental ○ Favours comparator ○ Towards null ○ Away from null ○ Unpredictable Clear Response Rationale

7. BIAS IN SELECTION OF REPORTED RESULT

Signalling question	Description Plus location in text or source (reference, pg & ¶¶/fig/table/other)	Location in text or source (reference, pg & ¶¶/fig/table/other)
Is the reported effect estimate likely to be selected, on the basis of the results, from... 7.1. .. multiple outcome measurements within the outcome domain? ○ Yes ○ Probably yes ○ Probably no ○ No ○ No Information Clear Response		
7.2 .. multiple analyses of the intervention-outcome relationship? ○ Yes ○ Probably yes ○ Probably no ○ No ○ No Information Clear Response		
7.3 .. different *subgroups*? ○ Yes ○ Probably yes ○ Probably no ○ No ○ No Information Clear Response		
DOMAIN 7: RISK OF BIAS JUDGEMENT	Support for judgement	

DOMAIN 7: RISK OF BIAS JUDGEMENT

- Low
- Moderate
- Serious
- Critical
- No information

Clear Response

Support for judgement

Optional:

What is the predicted direction of bias due to measurement of outcomes or interventions?

- Favours experimental
- Favours comparator
- Towards null
- Away from null
- Unpredictable

Clear Response

Rationale

OVERALL BIAS

RISK OF BIAS JUDGEMENT

- Low
- Moderate
- Serious
- Critical
- No information

Clear Response

Support for judgement

Optional:

What is the predicted direction of bias due to measurement of outcomes or interventions?

- Favours experimental
- Favours comparator
- Towards null
- Away from null
- Unpredictable

Clear Response

Appendix D. Included and Excluded Articles

Included Articles

Key Question 1-3

1. Achinger SG, Ikizler TA, Bian A, et al. Long-term effects of daily hemodialysis on vascular access outcomes: a prospective controlled study. Hemodial Int. 2013 Apr;17(2):208-15. doi: 10.1111/j.1542-4758.2012.00756.x. PMID: 23016876.

2. Ayus JC, Mizani MR, Achinger SG, et al. Effects of short daily versus conventional hemodialysis on left ventricular hypertrophy and inflammatory markers: a prospective, controlled study. J Am Soc Nephrol. 2005 Sep;16(9):2778-88. doi: 10.1681/asn.2005040392. PMID: 16033855.

3. Brunelli SM, Chertow GM, Ankers ED, et al. Shorter dialysis times are associated with higher mortality among incident hemodialysis patients. Kidney Int. 2010 Apr;77(7):630-6. doi: 10.1038/ki.2009.523. PMID: 20090666.

4. Brunelli SM, Wilson SM, Ficociello LH, et al. A Comparison of Clinical Parameters and Outcomes over 1 Year in Home Hemodialysis Patients Using 2008K@home or NxStage System One. Asaio j. 2016 Mar-Apr;62(2):182-9. doi: 10.1097/mat.0000000000000315. PMID: 26692402.

5. Chan CT, Chertow GM, Daugirdas JT, et al. Effects of daily hemodialysis on heart rate variability: results from the Frequent Hemodialysis Network (FHN) Daily Trial. Nephrol Dial Transplant. 2014 Jan;29(1):168-78. doi: 10.1093/ndt/gft212. PMID: 24078335.

6. Chan CT, Greene T, Chertow GM, et al. Determinants of left ventricular mass in patients on hemodialysis: Frequent Hemodialysis Network (FHN) Trials. Circ Cardiovasc Imaging. 2012 Mar;5(2):251-61. doi: 10.1161/circimaging.111.969923. PMID: 22360996.

7. Chan CT, Greene T, Chertow GM, et al. Effects of frequent hemodialysis on ventricular volumes and left ventricular remodeling. Clin J Am Soc Nephrol. 2013 Dec;8(12):2106-16. doi: 10.2215/cjn.03280313. PMID: 23970131.

8. Chertow GM, Levin NW, Beck GJ, et al. Long-Term Effects of Frequent In-Center Hemodialysis. J Am Soc Nephrol. 2016 Jun;27(6):1830-6. doi: 10.1681/asn.2015040426. PMID: 26467779.

9. Chertow GM, Levin NW, Beck GJ, et al. In-center hemodialysis six times per week versus three times per week. N Engl J Med. 2010 Dec 9;363(24):2287-300. doi: 10.1056/NEJMoa1001593. PMID: 21091062.

10. Daugirdas JT, Chertow GM, Larive B, et al. Effects of frequent hemodialysis on measures of CKD mineral and bone disorder. J Am Soc Nephrol. 2012 Apr;23(4):727-38. doi: 10.1681/asn.2011070688. PMID: 22362907.

11. Daugirdas JT, Greene T, Rocco MV, et al. Effect of frequent hemodialysis on residual kidney function. Kidney

international. 2013;83(5):949-58. doi: 10.1038/ki.2012.457. PMID: CN-00877614.

12. Daugirdas JT, Greene T, Rocco MV, et al. Effect of frequent hemodialysis on residual kidney function. Kidney Int. 2013 May;83(5):949-58. doi: 10.1038/ki.2012.457. PMID: 23344474.

13. Dember LM, Lacson E, Jr., Brunelli SM, et al. The TiME Trial: A Fully Embedded, Cluster-Randomized, Pragmatic Trial of Hemodialysis Session Duration. J Am Soc Nephrol. 2019 May;30(5):890-903. doi: 10.1681/asn.2018090945. PMID: 31000566.

14. Dixon BS, Vanburen JM, Rodrigue JR, et al. Cognitive changes associated with switching to frequent nocturnal hemodialysis or renal transplantation Dialysis and Transplantation. BMC Nephrology. 2016;17(1)doi: 10.1186/s12882-016-0223-9.

15. Garg AX, Suri RS, Eggers P, et al. Patients receiving frequent hemodialysis have better health-related quality of life compared to patients receiving conventional hemodialysis. Kidney Int. 2017 Mar;91(3):746-54. doi: 10.1016/j.kint.2016.10.033. PMID: 28094031.

16. Hall YN, Larive B, Painter P, et al. Effects of six versus three times per week hemodialysis on physical performance, health, and functioning: Frequent Hemodialysis Network (FHN) randomized trials. Clin J Am Soc Nephrol. 2012 May;7(5):782-94. doi: 10.2215/cjn.10601011. PMID: 22422538.

17. Hladunewich MA, Hou S, Odutayo A, et al. Intensive hemodialysis associates with improved pregnancy outcomes: a Canadian and United States cohort comparison. J Am Soc Nephrol. 2014 May;25(5):1103-9. doi: 10.1681/asn.2013080825. PMID: 24525032.

18. Johansen KL, Zhang R, Huang Y, et al. Survival and hospitalization among patients using nocturnal and short daily compared to conventional hemodialysis: a USRDS study. Kidney Int. 2009 Nov;76(9):984-90. doi: 10.1038/ki.2009.291. PMID: 19692997.

19. Kaysen GA, Greene T, Larive B, et al. The effect of frequent hemodialysis on nutrition and body composition: frequent Hemodialysis Network Trial. Kidney Int. 2012 Jul;82(1):90-9. doi: 10.1038/ki.2012.75. PMID: 22456602.

20. Kotanko P, Garg AX, Depner T, et al. Effects of frequent hemodialysis on blood pressure: Results from the randomized frequent hemodialysis network trials. Hemodial Int. 2015 Jul;19(3):386-401. doi: 10.1111/hdi.12255. PMID: 25560227.

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Excluded Articles

1. . [Self-care promotes well-being in dialysis patients]. Krankenpfl Soins Infirm. 2002;95(1):84. PMID: 11845508. - **Non-United States study**
2. . Association between recombinant human erythropoietin and quality of life and exercise capacity of patients receiving haemodialysis. Canadian Erythropoietin Study Group. Bmj. 1990 Mar 3;300(6724):573-8. PMID: 2108751. - **Non-United States study**
3. . Depression and dialysis. Nephrol News Issues. 2007 Jun;21(7):S1, s8. PMID: 17623989. - **Non-relevant review**
4. . Implementation of health care quality improvement in Medicare's end- stage renal disease program. Dialysis and Transplantation. 1996;25(9):591-8. - **Non-relevant review**
5. . Project Hope study looks at quality of life issues and economic implications of daily dialysis. Nephrol News Issues. 1999 Nov;13(11):20, 4. PMID: 10865621. **- No intervention of interest (frequency or duration of HD) AND no QOL or symptom measures in dialysis patients**
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Appendix E. Evidence Tables

Evidence Table 1. Study design characteristics for studies comparing frequency and duration of hemodialysis in non-institutionalized patients

Study design: Author, year	KQ	Study name Recruitment period	Number of study center Dialysis location	Clinic type Clinic location	Datasource
Non-randomized clinical trial: Ayus, 2005[1]	2 and 3	NR 2003 to 2004	Single-center In-center	NR Urban	NR
Non-randomized clinical trial: Achinger, 2013[2]	2 and 3	NR NR	Single center In-center	NR Urban	NR
RCT: Chertow, 2010*[3-22]	2	FHN-Daily 2006 to 2009	Multi-center In-center	For-profit and Non-profit NR	NR
RCT: Rocco, 2011*[4-25]	2 and 3	FHN-Nocturnal 2006 to 2009	Multi-center Home and In-center	NR NR	NR
RCT: Dember, 2019[26]	3	TiME 2013 to 2015	Multi-center In-center	For-profit NR	NR
Observational prospective: Brunelli, 2010[27]	3	ArMORR cohort 2004 to 2005	Multi-center In-center	NR NR	ArMORR cohort
Observational prospective: Lacson, 2012[28]	3	NR 2006 to 2007	Multi-center network In-center	NR NR	NR
Observational prospective: Troidle, 2007[29]	3	NR 2005 to	Multi-center network In-center	NR NR	NR
Observational retrospective: Brunelli, 2016[30]	2	NR 2009 to 2010	Single-center network Home	For-profit NR	NR
Observational retrospective: Hladunewich, 2014[31]	2 and 3	Toronto PreKid 2000 to 2013	Patient registries NR	NR Urban	The Toronto Pregnancy and Kidney Disease (PreKid) Clinic and Registry and American Registry for Pregnancy in Dialysis Patients (ARPD)
Observational retrospective: Johansen, 2009[32]	2 2 and 3	NR 1997-2006	NR Home (intervention) In center (control/usual care)	NA	USRDS database

Study design: Author, year	KQ	Study name Recruitment period	Number of study center Dialysis location	Clinic type Clinic location	Datasource
Observational retrospective: Lockridge, 2011[33]	2 and 3	NR 1997 to 2009	Single-center Home	NR NR	Lynchburg dialysis electronic database; The cause of renal disease, comorbid conditions, and primary and secondary causes of death were obtained from the 2728 and 2746 forms of the Centers for Medicare and Medicaid Services; Comparison group - USRDS data
Observational retrospective: Mathew, 2016[34]	2	NR 2007 to 2011	Multi-center In-center	For-profit NR	NR
Observational retrospective: Miller, 2010[35]	3	NR 2001 to 2006	Multi-center In-center	For-profit NR	The original 5-year (July 2001-June 2006) ational database of all DaVita HD
Observational retrospective: Nesrallah, 2012[36]	2 and 3	NR 2000 to 2010	Multi-center network Home and In-center	NR NR	The International Quotidian Dialysis Registry
Observational retrospective: Rivara, 2016[37]	3	NR 2007 to 2011	Multi-center In-center	For-profit NR	Davita dialysis facility electronic medical records
Observational retrospective: Weinhandl, 2012[38]	2	NR 2005 to 2007	National registry data (NxStage and USRDS) Home and In-center	NR NR	Registry of NxStage System One users and USRDS database
Observational retrospective: Weinhandl, 2015[39]	2	NR 2006 thru 2007 (era 1) 2008 thru 2009 (erra 2)	NR Home (NxStage) In-center (USRDS)	NR NR	NxStage Registry system USRDS Database

*This is the main study. Subsequent sub-articles are cited

ArMORR=Accelerated Mortality on Renal Replacement cohort; ARPD=American Registry for Pregnancy in Dialysis Patients; FHN=Frequent Hemodialysis Network trials; KQ=Key Question; RCT = randomized controlled trial; NR=not reported; Toronto PreKid=Toronto Pregnancy and Kidney Disease Clinic; TiME=Time to Reduce Mortality in ESRD; USRDS=United States Renal Data System

Evidence Table 2. Inclusion criteria for studies comparing frequency and duration of hemodialysis in non-institutionalized patients

Study design: Author, year	KQ	Study name	Inclusion: Gender	Inclusion: Age (years)	Inclusion: Language	Inclusion: Ethnicity	Dialysis	Other inclusion criteria
Non-randomized clinical trial: Ayus, 2005[1]	2 and 3	NR	Not listed as an inclusion criterion	Not listed as an inclusion criterion	not listed as an inclusion criterion	not listed as an inclusion criterion	not listed as an inclusion criterion	Willingness to participate in the short daily hemodialysis program
Non-randomized clinical trial: Achinger, 2013[2]	2 and 3	NR	Not listed as an inclusion criterion	Not listed as an inclusion criterion	not listed as an inclusion criterion	not listed as an inclusion criterion	not listed as an inclusion criterion	Willingness to participate in the short hemodialysis program
RCT: Chertow, 2010*[3-22]	2	FHN-Daily	Not listed as an inclusion criterion	> 13	English or Spanish	not listed as an inclusion criterion	Prevalent	-Achieved mean eKt/V > 1.0 for last two baseline hemodialysis sessions -Weight > 30 kg -Mentalyl competent and willing to follow the study protocol -Able and willing to provide informed consent -Does not require HD >3 times per week due to medical comorbidity -Not pregnant or actively planning to become pregnant in the next 12 months -No History of poor adherence thrice weekly HD -Ability to come for in-center HD 6 days per week -No Expected geographic unavailability at a participating HD unit for >2 consecutive weeks or >4 weeks total during the next 14 months (excluding unavailability due to hospitalizations) -Not in an acute or chronic care hospital -No contraindication to heparin -No expectation that native kidneys will recover -Residual renal clearance <3ml/min per 35 L -Not currently on daily or nocturnal HD -If previously on daily/nocturnal HD, >3 months since subject discontinued daily/nocturnal HD -If received transplant, >= 3 months since patient returned to HD after acute rejection resulting in allograft failure -No current use of investigational drugs or participation in another clinical trial that contradicts or interferes with the trial methods/outcomes -Not scheduled living donor kidney transplant, change to peritoneal dialysis, or plans to relocate to a non-study center within next 14 months

Study design: Author, year	KQ	Study name	Inclusion: Gender	Inclusion: Age (years)	Inclusion: Language	Inclusion: Ethnicity	Dialysis	Other inclusion criteria
RCT: Chertow, 2010*[3-22] (continued)								-Life expectancy > 6 months -No medical history that might limit patient's ability to take trial treatments and complete 12 month study duration, including: receiving chemo or radiotherapy for a malignant neoplastic disease other than localized non-melanoma skin cancer, active systemic infection (including tuberculosis, disseminated fungal infection, active AIDS but not HIV), cirrhosis with encephalopathy -No medical conditions that would prevent performing the cardiac MRI procedure (e.g., inability to remain still for the procedure, a metallic object in the body, including cardiac pacemaker, inner ear (cochlear) implant, brain aneurysm clips, mechanical heart valves, recently placed artificial joints, and older vascular stents) -Tunneled catheter for HD vascular access
RCT: Rocco, 2011*[4-25]	2 and 3	FHN-Nocturnal	Not listed as an inclusion criterion	> 18	English or Spanish	not listed as an inclusion criterion	Prevalent	-ESRD requiring chronic renal replacement therapy - Achieved mean eKt/V > 1.0 for last two baseline hemodialysis sessions -Willing to perform hemodialysis at home -Able and willing to follow the study protocol -Able and willing to provide informed consent or sign the Institutional Review Board-approved consent form -No requirement for hemodialysis more than three times per week due to medical comorbidity -Not pregnant, or planning to become pregnant within the next 12 months -No history of non-compliance with hemodialysis or peritoneal dialysis treatments in the past -Able to follow the nocturnal home hemodialysis training protocol -No expected geographic unavailability at a participating HD unit or at home for >2 consecutive weeks or >5 weeks total during the next 12 months -Not currently in an acute or chronic care hospital -No contraindication to heparin -No expectation that native kidneys will recover kidney function - Glomerular filtration rate<10 ml/min per 1.73m2 as measured by the average of urea and creatinine clearances from urine collection obtained over at least 24 hours

Study design: Author, year	KQ	Study name	Inclusion: Gender	Inclusion: Age (years)	Inclusion: Language	Inclusion: Ethnicity	Dialysis	Other inclusion criteria
RCT: Rocco, 2011*[4-25] (continued)								-Not on nocturnal HD, or > than 3 months since the patient discontinued daily or nocturnal HD ->3 months since patient returned to HD after rejection resulting in allograft failure from a kidney transplant -No current use of investigational drugs or participation in another clinical trial that contradicts or interferes with the therapies or measured outcomes in this trial -Not scheduled for living donor kidney transplant, change to peritoneal dialysis, or plans to relocate to a non-study center within the next 12 months - Life expectance> 6 months -No medical history that might limit the individual's ability to take the trial treatments for the 12 month duration of the study - Medical conditions that would prevent the patient from performing the cardiac MRI procedure -Able to communicate verbally in English or Spanish -Vascular access is not a temporary non-tunneled catheter
RCT: Dember, 2019[26]	3	TiME	Not listed as an inclusion criterion	> 18	not listed as an inclusion criterion	not listed as an inclusion criterion	Prevalent; Duration: at least 120 days	-Treatment with thrice-weekly in-center hemodialysis -Initiation of dialysis within the previous 120 days -No health care proxy used to provide consent for dialysis treatment -Willing to have clinical data included in dataset
Observational prospective: Brunelli, 2010[27]	3	ArMORR cohort	Not listed as an inclusion criterion	> 18	not listed as an inclusion criterion	not listed as an inclusion criterion	not listed as an inclusion criterion	-Patients who survived until the start of at-risk time (dialysis day 31) -Sufficient covariate data for analysis
Observational prospective: Lacson, 2012[28]	3	NR	Not listed as an inclusion criterion	Not listed as an inclusion criterion	not listed as an inclusion criterion	not listed as an inclusion criterion	not listed as an inclusion criterion	-All consecutive patients initiating 5.5-hour INHD for the first time from 77 FMCNA facilities between January 1, 2006 and December 31 -CHD patients from up to 288 facilities within the surrounding geographic area that were active on January 1, 2007
Observational prospective: Troidle, 2007[29]	3	NR	Not listed as an inclusion criterion	Not listed as an inclusion criterion	not listed as an inclusion criterion	not listed as an inclusion criterion	Prevalent	-Patients able to provide their own consent -Preference for inclusion for patients with difficulty achieving an adequate Kt/V urea, had large intradialytic weight gains with hemodynamic instability, or difficulty achieving ideal dry weight
Observational retrospective: Brunelli, 2016[30]	2	NR	Not listed as an inclusion criterion	> 18	not listed as an inclusion criterion	not listed as an inclusion criterion	not listed as an inclusion criterion	-HHD for >=30 days between Jan 2009 and June 30, 2010. -Included from first full month in which they received HHD (month 0)

Study design: Author, year	KQ	Study name	Inclusion: Gender	Inclusion: Age (years)	Inclusion: Language	Inclusion: Ethnicity	Dialysis	Other inclusion criteria
Observational retrospective: Hladunewich, 2014[31]	2 and 3	Toronto PreKid	Female	Not listed as an inclusion criterion	not listed as an inclusion criterion	not listed as an inclusion criterion	Incident or Prevalent	Toronto Pre-Kid Cohort -All young women with ESRD who conceived on hemodialysis or required hemodialysis during pregnancy for CKD progressing to ESRD -No therapeutic terminations -No peripartum AKI who recovered enough function to come off hemodialysis in the postpartum period ARPD comparison group - Pregnancy cases after 1990 -No therapeutic terminations -Known dialysis hours/week and pregnancy outcomes with known gestational age or birth weight
Observational retrospective: Johansen, 2009[32]	2 2 and 3	NR	NR	NR	NR	NR	NR	Patients on nocturnal HD, or short daily HD for at least 60 days
Observational retrospective: Lockridge, 2011[33]	2 and 3	NR	Not listed as an inclusion criterion	Not listed as an inclusion criterion	not listed as an inclusion criterion	not listed as an inclusion criterion	Incident or Prevalent; Duration:	-No heparin allergy, active drug and alcohol addiction, or severe mental illness
Observational retrospective: Mathew, 2016[34]	2	NR	Not listed as an inclusion criterion	> 18	not listed as an inclusion criterion	not listed as an inclusion criterion	Incident	-Have not received peritoneal dialysis, home HD, or nocturnal HD -Had available ICD-9 codes and laboratory data during first quarter of dialysis before starting less frequent or frequent HD
Observational retrospective: Miller, 2010[35]	3	NR	Not listed as an inclusion criterion	Not listed as an inclusion criterion	not listed as an inclusion criterion	not listed as an inclusion criterion	not listed as an inclusion criterion	None
Observational retrospective: Nesrallah, 2012[36]	2 and 3	NR	Not listed as an inclusion criterion	> 18 to < 80; Other	not listed as an inclusion criterion	not listed as an inclusion criterion	not listed as an inclusion criterion	-No known or suspected dementia -Followup death status ascertainment -No missing ESRD start date -No missing data on the following comorbid conditions: diabetes, myocardial infarction, congestive heart failure, peripheral vascular disease, cerebrovascular disease, or cancer
Observational retrospective: Rivara, 2016[37]	3	NR	Not listed as an inclusion criterion	> 18	not listed as an inclusion criterion	not listed as an inclusion criterion	Incident or Prevalent	-> 60 days total dialysis treatment -Patients with a dialysis treatment session at a participating facility within 91 days of ESRD incidence -Race data available
Observational retrospective: Weinhandl, 2012[38]	2	NR	Not listed as an inclusion criterion	Not listed as an inclusion criterion	not listed as an inclusion criterion	not listed as an inclusion criterion	not listed as an inclusion criterion	-Patients whose NxStage registry information could be linked to USRDS data -DHHD patients with five or six prescribed dialysis sessions per week with Medicare primary payer status during the 3 months preceding NxStage System One use initiation or beginning renal replacement therapy during the 6 months preceding use initiation -Thrice-weekly in-center patients treated with in-center hemodialysis between 2005-2007

Study design: Author, year	KQ	Study name	Inclusion: Gender	Inclusion: Age (years)	Inclusion: Language	Inclusion: Ethnicity	Dialysis	Other inclusion criteria
Observational retrospective: Weinhandl, 2015[39]	2	NR	Not listed as an inclusion criterion	Not listed as an inclusion criterion	not listed as an inclusion criterion	not listed as an inclusion criterion	not listed as an inclusion criterion	5 or 6 prescribed dialysis sessions per week Medicare as primary payer on and during the 3 months preceding the date of daily HHD initiation

AIDS=Acquired Immunodeficiency Syndrome; AKI=acute kidney injury; ArMORR= Accelerated Mortality on Renal Replacement; ARPD= American Registry for Pregnancy in Dialysis Patients; CHD=conventional hemodialysis; CKD=chronic kidney disease; DHHD=Daily home hemodialysis; eKt/V=Equilibrated Kt/V (urea clearance); ESRD=End-stage renal disease; FHN=Frequent Hemodialysis Network trials; FMCNA=Fresenius Medical Care North America; HD=hemodialysis; HHD=home hemodialysis; HIV=Human Immunodeficiency Virus; ICD-9= International Classification of Diseases, 9th Revision; INHD=In-center nocturnal hemodialysis; kg=kilograms; KQ=key question; Kt/V= Urea clearance; L=liters; MRI=magnetic resonance imaging; NR=not reported; RCT = randomized controlled trial; TiME=Time to Reduce Mortality in ESRD; Toronto Pre-Kid=Toronto Pregnancy and Kidney Disease Clinic; USRDS= United States Renal Data System

Evidence Table 3. Interventions for studies comparing frequency and duration of hemodialysis in non-institutionalized patients

Author, year Study name	KQ	Arm	Intervention	Comments
Clinically controlled trial: Ayus, 2005[1] NR	2 and 3	1	Goal frequency per week: 3 Actual frequency per week: 3 Goal duration: 4 Hours/session Actual duration: 4 Hours/session	
Clinically controlled trial: Ayus, 2005[1] NR	2 and 3	2	Goal frequency per week: 6 Actual frequency per week: 6 Goal duration: 3 Hours/session Actual duration: 3 Hours/session	
Clinically controlled trial: Achinger, 2013[2]	2 and 3	1	Goal frequency per week: 3 Actual frequency per week: 3 Goal duration: 4 Hours/session Actual duration: 4 Hours/session	
Clinically controlled trial: Achinger, 2013[2]	2 and 3	2	Goal frequency per week: 6 Actual frequency per week: 6 Goal duration: 3 Hours/session Actual duration: 3 Hours/session	
RCT: Chertow, 2010*[3-22] FHN-Daily	2	1	Goal frequency per week: 3 Actual frequency per week: 2.88 Goal duration: 2.5 to 4 Hours/session Actual duration: 10.4 +/-1.6 Hours/week, Minutes/session 213 +/- 28	
RCT: Chertow, 2010*[3-22] FHN-Daily	2	2	Goal frequency per week: 6 Actual frequency per week: 5.17 Goal duration: 1.5 to 2.75 Hours/session Actual duration: 12.7 +/- 2.2 Hours/week, 154 +/-25 Minutes/session	
RCT: Rocco, 2011[4-25] FHN-Nocturnal	2 and 3	1	Goal frequency per week: 3 Actual frequency per week: 2.91 ± 0.21 Goal duration: <5 Hours/session Actual duration: 12. 6± 3.9 Hours/week, 256±65 Minutes/session	Percent of expected treatments: 3x vs. 6x: >80%: 97.6 vs. 72.7 <65–80%: 0 vs. 13.6 <65%: 2.4 vs. 13.6
RCT: Rocco, 2011[4-25] FHN-Nocturnal	2 and 3	2	Goal frequency per week: 6 Actual frequency per week: 5.06 ± 0.80 Goal duration: >=6 Hours/session Actual duration: 30.8 ± 9.1 Hours/week, 379 ± 62 Minutes/session	Percent of expected treatments: 3x vs. 6x: >80%: 97.6 vs. 72.7 <65–80%: 0 vs. 13.6 <65%: 2.4 vs. 13.6
RCT: Dember, 2019[26] TiME	3	1	Goal frequency per week: 3 Actual frequency per week: NR Goal duration: 3.5 Hours/session Actual duration: Majority session length >210 minutes over duration of 3 years	Actual session duration in figure 2d and supplemental figure 2d

Author, year Study name	KQ	Arm	Intervention	Comments
RCT: Dember, 2019[26] TiME	3	1	Goal frequency per week: 3 Actual frequency per week: NR Goal duration: 3.5 Hours/week Actual duration: 207 Minutes/session	Actual duration included in figure 2C and supplemental figure 2c. "We anticipated average session 3.5 hours."
RCT: Dember, 2019[26] TiME	3	2	Goal frequency per week: 3 Actual frequency per week: NR Goal duration: >/=4.25 Hours/session Actual duration: Small proportion >= 4.25 hours per week consistently	Actual session duration in figure 2d and supplemental figure 2d; If the treating nephrologist felt that the 4.25 hour duration was not appropriate for an individual patient, shorter treatments could be prescribed with the goal of achieving session durations as close to 4.25 hours as possible.
RCT: Dember, 2019[26] TiME	3	2	Goal frequency per week: 3 Actual frequency per week: NR Goal duration: >=4.25 Hours/week Actual duration: 216Minutes/session	actual duration included in figure 2C and supplemental figure 2c
Observational prospective: Brunelli, 2010[27] ArMORR cohort	3	1	Goal frequency per week: 3 Actual frequency per week: NR Goal duration: NR Actual duration: 181 to 239 Minutes/session	Study divided observationally cohort into 3 categories for analysis of duration Overall mean of 225 minutes/session in cohort
Observational prospective: Brunelli, 2010[27] ArMORR cohort	3	2	Goal frequency per week: 3 Actual frequency per week: NR Goal duration: Other: NR Actual duration: <=180 Minutes/session	Study divided observationally cohort into 3 categories for analysis of duration Overall mean of 225 minutes/session in cohort
Observational prospective: Brunelli, 2010[27] ArMORR cohort	3	3	Goal frequency per week: 3 Actual frequency per week: NR Goal duration: Other: NR Actual duration: >=240 Minutes/session	Study divided observationally cohort into 3 categories for analysis of duration Overall mean of 225 minutes/session in cohort
Observational prospective: Lacson, 2012[28] NR	3	1	Goal frequency per week: 3 Actual frequency per week: Goal duration: NR Actual duration: 3.75 Hours/session	Deleted minutes/session as this data is from 726 patients subset (of 746 in the nocturnal trial group) who had a chronic dialysis prescription previously, not arm 1 vs arm 2
Observational prospective: Lacson, 2012[28] NR	3	2	Goal frequency per week: 3 Actual frequency per week: Goal duration: >5.5 Hours/session Actual duration: 7.85 Hours/session	Deleted minutes/session as this data is from 726 patients subset (of 746 in the nocturnal trial group) who had a chronic dialysis prescription previously, not arm 1 vs arm 2
Observational prospective: Troidle, 2007[29] NR	3	2	Goal frequency per week: 3 Actual frequency per week: 3 Goal duration: 8 Hours/session Actual duration: 3.85 +/- 0.45 Hours/session	

Author, year Study name	KQ	Arm	Intervention	Comments
Observational retrospective: Brunelli, 2016[30] NR	2	1	Goal frequency per week: >=5 Actual frequency per week: 4.1 to 4.9 Goal duration: Actual duration: 14.4 (13.3-15.5) Hours/week, 3.0 (2.7-3.2) Hours/session	Treatments per week included in figure 1a
		2	Goal frequency per week: >=3 Actual frequency per week: NA (see Figure 1) Goal duration: Actual duration: 13.9 (12.8-15.0) Hours/week, 4.1 (3.8-4.4) Hours/session	Treatments per week included in figure 1a
Observational retrospective: Hladunewich, 2014[31] Toronto PreKid	2 and 3	1	Goal frequency per week: Actual frequency per week: Goal duration: Actual duration: 0 to 20 Hours/week	Article describes differences in Toronto vs. US cohort. However, only focused on combined cohort analysis comparing pregnancy outcomes by dialysis intensity. Among women with established ESRD
Observational retrospective: Hladunewich, 2014[31] Toronto PreKid	2 and 3	2	Goal frequency per week: Actual frequency per week: Goal duration: Actual duration: 21 to 36 Hours/week	Article describes differences in Toronto vs. US cohort. However, only focused on combined cohort analysis comparing pregnancy outcomes by dialysis intensity. Among women with established ESRD
Observational retrospective: Hladunewich, 2014[31] Toronto PreKid	2 and 3	3	Goal frequency per week: Actual frequency per week: Goal duration: Actual duration: 37 to 56 Hours/week	Article describes differences in Toronto vs. US cohort. However, only focused on combined cohort analysis comparing pregnancy outcomes by dialysis intensity. Among women with established ESRD
Observational retrospective: Johansen, 2009[32]	NA	1	Goal frequency: 3 days per week Actual frequency (mean) 3.5 days per week Actual duration (mean): 3 hours per session	
Observational retrospective: Johansen, 2009[32]	2 and 3	2	Goal frequency: 5-6 days per week Actual frequency (mean): 5.7 days per week Actual duration (mean): 7.5 hours per session	
Observational retrospective: Johansen, 2009[32]	2	3	Goal frequency: 5-6 days per week Actual Frequency (mean): 5.4 days per week Actual duration (mean): 2.9 hours per session	
Observational retrospective: Lockridge, 2011[33] NR	2 and 3	1	Goal frequency per week: 3 Actual frequency per week: Goal duration: Actual duration:	
Observational retrospective: Lockridge, 2011[33] NR	2 and 3	2	Goal frequency per week: Actual frequency per week: Goal duration: Actual duration: 40 Hours/week, 7 Hours/session	

Author, year Study name	KQ	Arm	Intervention	Comments
Observational retrospective: Mathew, 2016[34] NR	2	1	Goal frequency per week: 3 Actual frequency per week: Goal duration: Actual duration:	
Observational retrospective: Mathew, 2016[34] NR	2	2	Goal frequency per week: <=2 Actual frequency per week: Goal duration: Actual duration:	
Observational retrospective: Mathew, 2016[34] NR	2	3	Goal frequency per week: >=4 Actual frequency per week: Goal duration: Actual duration:	
Observational retrospective: Miller, 2010[35] NR	3	1	Goal frequency per week: Actual frequency per week: 3 Goal duration: Actual duration: <3 Hours/session	
Observational retrospective: Miller, 2010[35] NR	3	2	Goal frequency per week: Actual frequency per week: 3 Goal duration: Actual duration: 3-<3.5 Hours/session	
Observational retrospective: Miller, 2010[35] NR	3	3	Goal frequency per week: Actual frequency per week: 3 Goal duration: Actual duration: 3.5 <4 Hours/session	
Observational retrospective: Miller, 2010[35] NR	3	4	Goal frequency per week: Actual frequency per week: 3 Goal duration: Actual duration: >=4 Hours/session	
Observational retrospective: Nesrallah, 2012[36] NR	2 and 3	1	Goal frequency per week: 3 Actual frequency per week: 3 Goal duration: <5.5 Hours/session Actual duration: 3.9 Hours/session, Minutes/session 236	No patient receiving conventional dialysis switched dialysis modality, whereas 48 intensive dialysis patients switched to conventional in-center hemodialysis. Nineteen patients on intensive hemodialysis relocated to a new dialysis facility, but were confirmed alive 90 days after transfer. No patients on conventional hemodialysis relocated.
Observational retrospective: Nesrallah, 2012[36] NR	2 and 3	2	Goal frequency per week: 3 to 7 Actual frequency per week: 4.8 Goal duration: >5.5 Hours/session Actual duration: 7.4 Hours/session441Minutes/session	No patient receiving conventional dialysis switched dialysis modality, whereas 48 intensive dialysis patients switched to conventional in-center hemodialysis. Nineteen patients on intensive hemodialysis relocated to a new dialysis facility, but were confirmed alive 90 days after transfer. No patients on conventional hemodialysis relocated.

Author, year Study name	KQ	Arm	Intervention	Comments
Observational retrospective: Rivara, 2016[37] NR	3	1	Goal frequency per week: 3 Actual frequency per week: 2.9 Goal duration: Actual duration: 211 Minutes/session	
Observational retrospective: Rivara, 2016[37] NR	3	2	Goal frequency per week: 3 Actual frequency per week: 2.8 Goal duration: Actual duration: 399 Minutes/session	
Observational retrospective: Weinhandl, 2012[38] NR	2	1	Goal frequency per week: Daily-Home Actual frequency per week: 5 or 6 Goal duration: Actual duration:	
Observational retrospective: Weinhandl, 2012[38] NR	2	2	Goal frequency per week: Matched In-Center Actual frequency per week: Thrice-weekly in-Center Goal duration: Actual duration:	Identified 5 in-center dialysis patients with matching characteristics (i.e., index date of the DHHD patient; Medicare vs. non-Medicare primary payer; age, cumulative hospital days; cumulative EPO, BMI, transplant waitlist registration, CHF, ESRD duration, race, cancer, primary ESRD cause, Cerebrovascular disease, PVD, other CVD, diabetes, atherosclerotic heart disease, sex, dual Medicare/Medicaid eligibility
Observational retrospective: Weinhandl, 2012[38] NR	2	3	Goal frequency per week: Thrice-weekly In-Center Actual frequency per week: Thrice-weekly In-Center Goal duration: Actual duration:	All in-center patients considered to be thrice-weekly
Observational retrospective: Weinhandl, 2015[39]	2	1	In-center hemodialysis: 3 sessions per week	Limited information is provided for the 2 arms
Observational retrospective: Weinhandl, 2015[39]	2	2	Daily Home hemodialysis: 5-6 sessions per week	

ArMORR= Accelerated Mortality on Renal Replacement; BMI=body mass index; CHF=congestive heart failure; CVD=cerebrovascular disease; DHHD=Daily home hemodialysis; EPO=erythropoietin; ESRD=End-stage renal disease; FHN=Frequent Hemodialysis Network trials; KQ=key question; NR=not reported; PVD=peripheral vascular disease; RCT = randomized controlled trialTiME=Time to Reduce Mortality in ESRD; Toronto Pre-Kid=Toronto Pregnancy and Kidney Disease Clinic

Evidence Table 4. Population characteristics of studies comparing frequency and duration of hemodialysis in non-institutionalized patients

Study design: Author, year Study name	KQ	Arm Description	Arm N	Followup	Women N (%)	Age	Race N (%)	Education N (%)	Smoking N (%)
Clinically controlled trial: Ayus, 2005[1] NR	2 and 3	All Arms	77	12 months	NR	NR	NR	NR	NR
Clinically controlled trial: Ayus, 2005[1] NR	2 and 3	Arm 1: CHD	51	12 months	(33)	Mean: 54	White: (0); Black: (6); Latino: (92); Other: (2)	NR	Ever: (45.1)
Clinically controlled trial: Achinger, 2013[2]	2 and 3	Arm 2: SDHD	26	12 months	(35)	Mean: 51	White: (4); Black: (4); Latino: (92); Other: (0)	NR	Ever: (42.3)
Clinically controlled trial: Achinger, 2013[2]	2 and 3	All arms	77	Up to 48 months	(33.8)	NR	White: 1.3; Black: 5.; Latino: 92.2, Asian/PI: NR; Native American: NR; Other: 1.3; Unknown: NR	NR	NR
Clinically controlled trial: Ayus, 2005[1] NR	2 and 3	Arm 1: CHD	51	Up to 48 months	(33)	NR	White: (0); Black: (6); Latino: (92); Other: (2)	NR	NR
Clinically controlled trial: Ayus, 2005[1] NR	2 and 3	Arm 2: SDHD	26	Up to 48 months	(35)	NR	White: (4); Black: (4); Latino: (92); Other: (0)	NR	NR
RCT: Chan, 2012[15] FHN	2-3	All Daily and Nocturnal Arms	332	12 months	124	NR	White: 137; Black: 125; Latino: 69; Asian/PI: 32; American Indian/Alaska Native: 11; Other/mixed/unknown: 27	NR	NR
RCT: Chan, 2012[15] FHN	2-3	Arm 1: Daily - Conventional	120	12 months	47 (39.2)	Mean: 52	White: 46 (38.3); Black: 53 (44.2); Latino: 31 (26); Asian/PI: 8 (6.7); American Indian/Alaska Native: 4 (3.3); Other/mixed/unknown: 9 (7.5)	NR	NR
RCT: Chan, 2012[15] FHN	2-3	Arm 2: Daily - Intervention	125	12 months	47 (37.6)	Mean: 48.9	White: 43 (34.4); Black: 49 (39.2); Latino: 38 (30); Asian/PI: 12 (9.6); American Indian/Alaska Native: 4 (3.2); Other/mixed/unknown: 17 (13.6)	NR	NR
RCT: Chan, 2012[15] FHN	2-3	Arm 3: Nocturnal - Conventional	42	12 months	14 (33.3)	Mean: 54	White: 21 (50); Black: 11 (26.2); Latino: 0 (0); Asian/PI: 7 (16.7); American Indian/Alaska Native: 2 (4.8); Other/mixed/unknown: 1 (2.4)	NR	NR
RCT: Chan, 2012[15] FHN	2-3	Arm 4: Nocturnal - Intervention	45	12 months	16 (35.6)	Mean: 51.7	White: 27 (60); Black: 12 (26.7); Latino: 0 (0); Asian/PI: 5 (11.1); American Indian/Alaska Native: 1 (2.2); Other/mixed/unknown: 0 (0)	NR	NR

Study design: Author, year Study name	KQ	Arm Description	Arm N	Followup	Women N (%)	Age	Race N (%)	Education N (%)	Smoking N (%)
RCT: Chan, 2012[15] FHN	2-3	All Arms	332	12 months	NR	NR	NR	NR	NR
RCT: Chan, 2012[15] FHN	2-3	Arm 1: Daily trial 3x : Conventional (>=2.5hrs per session)	120	12 months	47 (39.2)	Mean: 52	White: 46 (38.3); Black: 53 (44.2); Latino: 31 (26); Asian/PI: 8 (6.7); American Indian/Alaska Native: 4 (3.3); Other/mixed/unknown: 9 (7.5)	NR	NR
RCT: Chan, 2012[15] FHN	2-3	Arm 2: Daily trial 6x per week : (1.5-2.75 hrs per session)	125	12 months	47 (37.6)	Mean: 48.9	White: 43 (34.4); Black: 49 (39.2); Latino: 38 (30); Asian/PI: 12 (9.6); American Indian/Alaska Native: 4 (3.2); Other/mixed/unknown: 17 (13.6)	NR	NR
RCT: Chan, 2012[15] FHN	2-3	Arm 3: Nocturnal trial 3x per week: Conventional (>=2.5hrs per session)	42	12 months	14 (33.3)	Mean: 54	White: 21 (50); Black: 11 (26.2); Latino: 0 (0); Asian/PI: 7 (16.7); American Indian/Alaska Native: 2 (4.8); Other/mixed/unknown: 1 (2.4)	NR	NR
RCT: Chan, 2012[15] FHN	2-3	Arm 4: Nocturnal trial 6x per week: >=6hrs per session	45	12 months	16 (35.6)	Mean: 51.7	White: 27 (60); Black: 12 (26.7); Latino: 0 (0); Asian/PI: 5 (11.1); American Indian/Alaska Native: 1 (2.2); Other/mixed/unknown: 0 (0)	NR	NR
RCT: Daugirdas, 2012[14] FHN	2-3	Nocturnal Trial: All Arms	87	12 months	NR	NR	NR	NR	NR
RCT: Daugirdas, 2012[14] FHN	2-3	Arm 1: 3 Sessions per Week	42	12 months	14 (33.3)	Mean: 54	White: 21 (50); Black: 11 (26); Other/mixed: 10 (24)	NR	NR
RCT: Daugirdas, 2012[14] FHN	2-3	Arm 2: 6 Sessions per Week	45	12 months	16 (35.6)	Mean: 51.7	White: 27 (60); Black: 12 (27); Other/mixed: 6 (13)	NR	NR
RCT: Daugirdas, 2012[14] FHN	2-3	Daily Trial: All Arms	245	12 months	NR	NR	NR	NR	NR
RCT: Daugirdas, 2012[14] FHN	2-3	Arm 1: 3 sessions per week	120	12 months	47 (39.2)	Mean: 52	White: 46 (38); Black: 53 (44); Other/mixed: 21 (18)	NR	NR

Study design: Author, year Study name	KQ	Arm Description	Arm N	Followup	Women N (%)	Age	Race N (%)	Education N (%)	Smoking N (%)
RCT: Daugirdas, 2012[14] FHN	2-3	Arm 2: 6 sessions per week	125	12 months	47 (37.6)	Mean: 48.9	White: 43 (34); Black: 49 (39); Other/mixed: 33 (26)	NR	NR
RCT: Daugirdas, 2012[14] FHN	2-3	Arm 3: No urine output (3x and 6x)	24		10 (41.7)	Mean: 51.7	NR	NR	NR
RCT: Daugirdas, 2012[14] FHN	2-3	Arm 1: 3X (urine volume>0)	31		9 (29)	Mean: 54.4	NR	NR	NR
RCT: Daugirdas, 2012[14] FHN	2-3	Arm 2: 6X (urine volume>0)	32		11 (34.4)	Mean: 52.2	NR	NR	NR
RCT: Daugirdas, 2012[14] FHN	2-3	Arm 3: no urine output	162		67 (41.4)	Mean: 49.2	NR	NR	NR
RCT: Daugirdas, 2012[14] FHN	2-3	Arm 1: 3X (urine volume>0)	48		15 (31.3)	Mean: 54.7	NR	NR	NR
RCT: Daugirdas, 2012[14] FHN	2-3	Arm 2: 6X (urine volume>0)	35		12 (34.3)	Mean: 50	NR	NR	NR
RCT: Daugirdas, 2013[10] FHN	2-3	All Arms		12 months	NR	NR	NR	NR	NR
RCT: Daugirdas, 2013[10] FHN	2-3	Arm 1: Conventional - Daily (3x weekly)	48	12 months	15 (31.3)	Mean: 54.7	NR	NR	NR
RCT: Daugirdas, 2013[10] FHN	2-3	Arm 2: Daily (6x weekly)	35	12 months	12 (34.3)	Mean: 50	NR	NR	NR

Study design: Author, year Study name	KQ	Arm Description	Arm N	Followup	Women N (%)	Age	Race N (%)	Education N (%)	Smoking N (%)
RCT: Daugirdas, 2013[10] FHN	2-3	Arm 3: Conventional - Nocturnal (3x weekly)	31	12 months	9 (29.0)	Mean: 54.4	NR	NR	NR
RCT: Daugirdas, 2013[10] FHN	2-3	Arm 4: Nocturnal (6x weekly)	32	12 months	11 (34.4)	Mean: 52.2	NR	NR	NR
RCT: Garg, 2017[16] FHN	2-3	All Arms	245	12 months	94 (38.4)	Mean: 50.4; Median: 50	Black: 102 (41.6)	Completed high school or less: 109 (45.1)	NR
RCT: Garg, 2017[16] FHN	2-3	Arm 1: 3 times/wk	120	12 months	47 (39.2)	Mean: 52; Median: 52	Black: 53 (44.2)	Completed high school or less: 53 (44.5)	NR
RCT: Garg, 2017[16] FHN	2-3	Arm 2: 6 times/wk	125	12 months	47 (37.6)	Mean: 48.9; Median: 47	Black: 49 (39.2)	Completed high school or less: 56 (45.5)	NR
RCT: Garg, 2017[16] FHN	2-3	All Arms	87	12 months	30 (34.5)	Mean: 52.8; Median: 54	Black: 23 (26.4)	Completed high school or less: 34 (39.5)	NR
RCT: Garg, 2017[16] FHN	2-3	Arm 1: 3 times/wk	42	12 months	14 (33.3)	Mean: 54; Median: 54	Black: 11 (26.2)	Completed high school or less: 14 (33.3)	NR
RCT: Garg, 2017[16] FHN	2-3	Arm 2: 6 times/wk	45	12 months	16 (35.6)	Mean: 51.7; Median: 53	Black: 12 (26.7)	Completed high school or less: 20 (45.5)	NR
Hall, 2012[19] FHN	2-3	FHN: All Arms	332	12 months	NR	NR	NR	NR	NR
		Arm 1: Nocturnal group: conventional 3x dialysis	42	12 months	(67)	Mean: 54	White: (50); Black: (26); Latino: (NR); Asian/PI: (22); American Indian/Alaska Native: (2); Other/mixed: (0)	NR	NR
		Arm 2: Nocturnal group: frequent dialysis >= 6x	45	12 months	(64)	Mean: 52	White: (60); Black: (27); Asian/PI: (13); American Indian/Alaska Native: (0); Other/mixed: (0)	NR	NR
		Arm 3: Daily Trial: 3x conventional dialysis	120	12 months	(61)	Mean: 52	White: (38); Black: (44); Asian/PI: (7); American Indian/Alaska Native: (3); Other/mixed: (8)	NR	NR
		Arm 4: Daily Trial: 6x frequent dialysis	125	12 months	(62)	Mean: 49	White: (34); Black: (39); Asian/PI: (10); American Indian/Alaska Native: (3); Other/mixed: (14)	NR	NR

Study design: Author, year Study name	KQ	Arm Description	Arm N	Followup	Women N (%)	Age	Race N (%)	Education N (%)	Smoking N (%)
RCT: Kaysen, 2012[13] FHN	2-3	FHN: All Arms	332	12 months	124 (37.3)	Mean: 51	White: 137 (41.3); Black: 125 (37.7); Latino: 69 (20.8); Asian/PI: 28 (8.4); Unknown/Other: 23 (6.9)	NR	NR
RCT: Kaysen, 2012[13] FHN	2-3	Arm 1: 3 times - Nocturnal	42	12 months	14 (33.3)	Mean: 54	White: 21 (50); Black: 11 (26.2); Latino: 0 (0); Asian/PI: 7 (16.7); Unknown/Other: 1 (2.4)	NR	NR
RCT: Kaysen, 2012[13] FHN	2-3	Arm 2: 6 times - Nocturnal	45	12 months	16 (35.6)	Mean: 51.7	White: 27 (60); Black: 12 (26.7); Latino: 0 (0); Asian/PI: 5 (11.1); Unknown/Other: 0 (0)	NR	NR
RCT: Kaysen, 2012[13] FHN	2-3	Arm 3: 3 times - Daily	120	12 months	47 (39.2)	Mean: 52	White: 46 (38.3); Black: 53 (44.2); Latino: 31 (25.8); Asian/PI: 5 (4.2); Unknown/Other: 8 (6.7)	NR	NR
RCT: Kaysen, 2012[13] FHN	2-3	Arm 4: 6 times - Daily	125	12 months	47 (37.6)	Mean: 48.9	White: 43 (34.4); Black: 49 (39.2); Latino: 38 (30.4); Asian/PI: 11 (8.8); Unknown/Other: 14 (11.2)	NR	NR
RCT: Kotanko, 2015[7] FHN	2-3	All Arms	245	12 months	NR	NR	NR	NR	NR
RCT: Kotanko, 2015[7] FHN	2-3	Arm 1: 3x weekly	120	12 months	47 (39.2)	Mean: 52	White: 46 (38.3); Black: 53 (44.2); Latino: 31 (26); Asian/PI: 8 (6.7); American Indian/Alaska Native: 4 (3.3); Other/mixed/unknown: 9 (7.5)	NR	NR
RCT: Kotanko, 2015[7] FHN	2-3	Arm 2: 6xweekly	125	12 months	47 (37.6)	Mean: 48.9	White: 43 (34.4); Black: 49 (39.2); Latino: 38 (30); Asian/PI: 12 (9.6); American Indian/Alaska Native: 4 (3.2); Other/mixed/unknown: 17 (13.6)	NR	NR
RCT: Kotanko, 2015[7] FHN	2-3	All Arms	87	12 months	NR	NR	NR	NR	NR
RCT: Kotanko, 2015[7] FHN	2-3	Arm 1: 3x weekly	42	12 months	14 (33.3)	Mean: 54	White: 21 (50); Black: 11 (26.2); Latino: 0 (0); Asian/PI: 7 (16.7); American Indian/Alaska Native:2 (4.8); Other/mixed/unknown: 1 (2.4)	NR	NR

Study design: Author, year Study name	KQ	Arm Description	Arm N	Followup	Women N (%)	Age	Race N (%)	Education N (%)	Smoking N (%)
RCT: Kotanko, 2015[7] FHN	2-3	Arm 2: 6x weekly	45	12 months	16 (35.6)	Mean: 51.7	White: 27 (60); Black: 12 (26.7); Latino: 0 (0); Asian/PI: 6 (13.3); American Indian/Alaska Native: 0 (0); Other/mixed/unknown: 0 (0)	NR	NR
RCT: Kurella, 2013[12] FHN	2-3	All Arms	299	4 and 12 months	NR	NR	NR	NR	NR
RCT: Kurella, 2013[12] FHN	2-3	Arm 1: 3xwk (daily trial)	101	4 and 12 months	40 (39.6)	Mean: 51.9	White: 46 (38.3); Black: 53 (44.2); Latino: 31 (26); Asian/PI: 8 (6.7); American Indian/Alaska Native: 4 (3.3); Other/Mixed/Unknown: 9 (7.5)	Less than high school: 20 (20); Completed high school: 29 (29); Post high school: 51 (51)	NR
RCT: Kurella, 2013[12] FHN	2-3	Arm 2: 6xwk (daily trial)	117	4 and 12 months	45 (38.5)	Mean: 48.9	White: 43 (34.4); Black: 49 (39.2); Latino: 38 (30); Asian/PI: 12 (9.6); American Indian/Alaska Native:4 (3.2); Other/Mixed/Unknown: 17 (13.6)	Less than high school: 27 (23.5); Completed high school: 25 (21.7); Post high school: 63 (54.8)	NR
RCT: Kurella, 2013[12] FHN	2-3	Arm 3: 3xwk (nocturnal trial)	40	4 and 12 months	14 (35.0)	Mean: 54.9	White: 21 (50); Black: 11 (26.2); Latino: 0 (0); Asian/PI: 7 (16.7); American Indian/Alaska Native: 2 (4.8); Other/Mixed/Unknown: 1 (2.4)	Less than high school: 5 (12.5); Completed high school: 9 (22.5); Post high school: 26 (65)	NR
RCT: Kurella, 2013[12] FHN	2-3	Arm 4: 6xwk (nocturnal trial)	41	4 and 12 months	14 (34.1)	Mean: 51.1	White: 27 (60); Black: 12 (26.7); Latino: 0 (0); Asian/PI: 5 (11.1); American Indian/Alaska Native: 1 (2.2) Other/Mixed/Unknown: 0 (0)	Less than high school: 8 (20); Completed high school: 11 (27.5); Post high school: 21 (52.5)	NR
RCT: Lo, 2017[17] FHN	2-3	All Arms			NR	NR	NR	NR	NR
RCT: Lo, 2017[17] FHN	2-3	Arm 1: Daily 3x (conventional)	91		40 (44)	Mean: 52.1	White: 18 (20); Black: 42 (46); All others: 31 (34)	NR	NR

Study design: Author, year Study name	KQ	Arm Description	Arm N	Followup	Women N (%)	Age	Race N (%)	Education N (%)	Smoking N (%)
RCT: Lo, 2017[17] FHN	2-3	Arm 2: Daily 6x	86		28 (33)	Mean: 49.1	White: 16 (19); Black: 35 (41); All others: 35 (41)	NR	NR
RCT: Lo, 2017[17] FHN	2-3	Arm 3: Nocturnal 3x	29		10 (34)	Mean: 56.4	White: 16 (55); Black: 11 (38); All others: 2 (7)	NR	NR
RCT: Lo, 2017[17] FHN	2-3	Arm 4: Nocturnal 6 x	31		13 (42)	Mean: 52.8	White: 19 (61); Black: 11 (36); All others: 1 (3)	NR	NR
RCT: Lo, 2017[17] FHN	2-3	All Arms	195	12 months	NR	Range: <55 to >=65	NR	NR	NR
RCT: Lo, 2017[17] FHN	2-3	Arm 1: FHN Daily Trial 3x week	72	12 months	NR	Range: <55 to >=65	White: 11 (15.3); Black: 36 (50); All others: 25 (34.7)	NR	NR
RCT: Lo, 2017[17] FHN	2-3	Arm 2: FHN Daily Trial 6x week	75	12 months	NR	Range: <55 to >=65	White: 12 (16); Black: 33 (44); All others: 30 (40)	NR	NR
RCT: Lo, 2017[17] FHN	2-3	Arm 3: FHN Nocturnal Trial 3x week	25	12 months	NR	Range: <55 to >=65	White: 13 (52); Black: 10 (40); All others: 2 (8)	NR	NR
RCT: Lo, 2017[17] FHN	2-3	Arm 4: FHN Nocturnal Trial 6x week	23	12 months	NR	Range: <55 to >=65	White: 12 (52.2); Black: 11 (47.8); All others: 0 (0)	NR	NR
RCT: Molfino, 2019[4] FHN	2-3	All Arms	147	12 months	48 (33)	Mean: 50.9	NR	NR	NR
RCT: Molfino, 2019[4] FHN	2-3	Arm 1: 3 times per week, duration 2.5-4 hours	56	12 months	NR	NR	NR	NR	NR
RCT: Molfino, 2019[4] FHN	2-3	Arm 2: 6 times per week, duration 1.5-2.75 hours	62	12 months	NR	NR	NR	NR	NR
RCT: Molfino, 2019[4] FHN	2-3	All Arms	48	12 months	18 (38)	Mean: 53.8	NR	NR	NR
RCT: Molfino, 2019[4] FHN	2-3	Arm 1: 3 times per week, duration >/=2.5 hours	23	12 months	NR	NR	NR	NR	NR

Study design: Author, year Study name	KQ	Arm Description	Arm N	Followup	Women N (%)	Age	Race N (%)	Education N (%)	Smoking N (%)
RCT: Molfino, 2019[4] FHN	2-3	Arm 2: 6 times per week, duration >/= 6 hours	18	12 months	NR	NR	NR	NR	NR
RCT: Ornt, 2013[9] FHN	2-3	All Arms	332	12 months	NR	NR	NR	NR	NR
RCT: Ornt, 2013[9] FHN	2-3	Arm 1: Conventional - Daily (3x weekly)	120	12 months	47 (39.2)	Mean: 52	White: 46 (38.3); Black: 53 (44.2); Latino: 31 (26); Asian/PI: 8 (6.7); Native American, Aboriginal, Canadian: 4 (3.3); Other/mixed/unknown: 9 (7.5)	NR	NR
RCT: Ornt, 2013[9] FHN	2-3	Arm 2: Daily (6x weekly)	125	12 months	47 (37.6)	Mean: 48.9	White: 43 (34.4); Black: 49 (39.2); Latino: 38 (30); Asian/PI: 12 (9.6); Native American, Aboriginal, Canadian: 4 (3.2); Other/mixed/unknown: 17 (13.6)	NR	NR
RCT: Ornt, 2013[9] FHN	2-3	Arm 3: Conventional - Nocturnal (3x weekly)	42	12 months	NR	NR	White: 21 (50); Black: 11 (26.2); Latino: 0 (0); Asian/PI: 7 (16.7); Native American, Aboriginal, Canadian: 2 (4.8); Other/mixed/unknown: 1 (2.4)	NR	NR
RCT: Ornt, 2013[9] FHN	2-3	Arm 4: Nocturnal (6x weekly)	45	12 months	NR	NR	White: 27 (60); Black: 12 (26.7); Latino: 0 (0); Asian/PI: 5 (11.1); Native American, Aboriginal, Canadian: 1 (2.2); Other/mixed/unknown: 0 (0)	NR	NR
RCT: Raimann, 2016[6] FHN	2-3	All Arms	332	12 months	NR	NR	NR	NR	NR
RCT: Raimann, 2016[6] FHN	2-3	Arm 2: Daily - 3x/week	120	12 months	(39)	Mean: 52	Black: (47)	NR	NR
RCT: Raimann, 2016[6] FHN	2-3	Arm 3: Daily - 6x/week	125	12 months	(38)	Mean: 48.9	Black: (44)	NR	NR
RCT: Raimann, 2016[6] FHN	2-3	Arm 4: Nocturnal - 3x/week	42	12 months	(33)	Mean: 54	Black: (27)	NR	NR

Study design: Author, year Study name	KQ	Arm Description	Arm N	Followup	Women N (%)	Age	Race N (%)	Education N (%)	Smoking N (%)
RCT: Raimann, 2016[6] FHN	2-3	Arm 5: Nocturnal - 6x/week	45	12 months	(36)	Mean: 51.7	Black: (27)	NR	NR
RCT: Unruh, 2013[11] FHN	2-3	All Arms		12 months	NR	NR	NR	NR	NR
RCT: Unruh, 2013[11] FHN	2-3	Arm 1: 3x/wk HD (daily)	120	12 months	47 (39.2)	Mean: 52	White: 46 (38.3); Black: 53 (44.2); Other/mixed: 21 (17.5)	Less than high school: 21 (17.6); Completed high school: 32 (26.9); > High school: 66 (55.5)	NR
RCT: Unruh, 2013[11] FHN	2-3	Arm 2: 6x/wk HD (daily)	125	12 months	47 (37.6)	Mean: 48.9	White: 43 (34.4); Black: 49 (39.2); Other/mixed: 33 (27.4)	Less than high school: 30 (24.4); Completed high school: 26 (21.1); > High school: 67 (54.5)	NR
RCT: Unruh, 2013[11] FHN	2-3	Arm 3: 3x/wk HD (nocturnal)	42	12 months	14 (33.3)	Mean: 54	White: 21 (50); Black: 11 (26.2); Other/mixed: 10 (23.8)	Less than high school: 5 (11.9); Completed high school: 9 (21.4); > High school: 28 (66.7)	NR
RCT: Unruh, 2013[11] FHN	2-3	Arm 4: 6x/wk HD (nocturnal)	45	12 months	16 (35.6)	Mean: 51.7	White: 27 (60); Black: 12 (26.7); Other/mixed: 6 (13.3)	Less than high school: 8 (18.2); Completed high school: 12 (27.3); > High school: 24 (54.5)	NR
RCT: Unruh, 2016[18] FHN	2-3	All Arms	332	12 months	NR	NR	NR	NR	NR
RCT: Unruh, 2016[18] FHN	2-3	Arm 1: Daily Trial, 3x week	120	12 months	47 (39.2)	Mean: 52	White: 46 (38.3); Black: 53 (44.2); Other/mixed: 21 (17.5)	Less than high school: 21 (17.6); Completed high school: 32 (26.9); Post high school: 66 (55.5)	Ever: 45 (37.5)

Study design: Author, year Study name	KQ	Arm Description	Arm N	Followup	Women N (%)	Age	Race N (%)	Education N (%)	Smoking N (%)
RCT: Unruh, 2016[18] FHN	2-3	Arm 2: Daily Trial, 6x week	125	12 months	47 (37.6)	Mean: 48.9	White: 43 (34.4); Black: 49 (39.2); Other/mixed: 33 (27.4)	Less than high school: 30 (24.4); Completed high school: 26 (21.1); Post high school: 67 (54.5)	Ever: 46 (36.8)
RCT: Unruh, 2016[18] FHN	2-3	Arm 3: Nocturnal Trial, 3x week	42	12 months	14 (33.3)	Mean: 54	White: 21 (50); Black: 11 (26.2); Other/mixed: 10 (23.8)	Less than high school: 5 (11.9); Completed high school: 9 (21.4); Post high school: 28 (66.7)	Ever: 25 (59.5)
RCT: Unruh, 2016[18] FHN	2-3	Arm 4: Nocturnal Trial, 6x week	45	12 months	16 (35.6)	Mean: 51.7	White: 27 (60); Black: 12 (26.7); Other/mixed: 6 (13.3)	Less than high school: 8 (18.2); Completed high school: 12 (27.3); Post high school: 24 (54.5)	Ever: 18 (40)
RCT: Chan, 2014[22] FHN-Daily	2	All Arms	207	12 months	NR	NR	NR	NR	NR
RCT: Chan, 2014[22] FHN-Daily	2	Three time/week conventional	99	12 months	43 (43.4)	Mean: 51.4	White: 33 (33.3); Black: 46 (46.5); Latino: 22 (22.2); Native Hawaiian/PI: 2 (2); Canadian/Alaska Native/ First Nation, Asian: 5 (5.1); Native American, aboriginal: 4 (4); Other/mixed/unknown: 9 (9.1)	NR	NR
RCT: Chan, 2014[22] FHN-Daily	2	Six times/week daily	108	12 months	41 (38)	Mean: 49.0	White: 35 (32.4); Black: 45 (41.7); Latino: 32 (29.6); Native Hawaiian/PI: 1 (0.9%); Canadian/Alaska Native/First Nation/Asian: 9 (8.3); Native American, aboriginal: 3 (2.8); Other/mixed/unknown: 15 (13.9)	NR	NR
RCT: Chertow, 2010[3] FHN-Daily	2	All Arms	245	12 months	NR	NR	NR	NR	NR
RCT: Chertow, 2010[3] FHN-Daily	2	Arm 1: Conventional Hemodialysis	120	12 months	(39.2)	Mean: 52	White: (38.3); Black: (44.2); Asian/PI: (6.7); American Indian/Alaska Native: (3.3); Other/mixed: (7.5)	NR	NR

Study design: Author, year Study name	KQ	Arm Description	Arm N	Followup	Women N (%)	Age	Race N (%)	Education N (%)	Smoking N (%)
RCT: Chertow, 2010[3] FHN-Daily	2	Arm 2: Frequent Hemodialysis	125	12 months	(37.6)	Mean: 48.9	White: (34.4); Black: (39.2); Latino: NR; Asian/PI: (9.6); American Indian/Alaska Native: (3.2); Other/mixed: (13.6)	NR	NR
RCT: Chertow, 2016[21] FHN-Daily	2	All Arms	245	Median 3.6 years	NR	NR	NR	NR	NR
RCT: Chertow, 2016[21] FHN-Daily	2	Arm 1: conventional treatment three times	120		NR	Mean: 52	Black: 53 (44)	NR	NR
RCT: Chertow, 2016[21] FHN-Daily	2	Arm 2: frequent treatment 6 times	125		NR	Mean: 48.9	Black: 49 (39)	NR	NR
RCT: Rocco, 2011[23] FHN-Nocturnal	2-3	All Arms: All patients	87		(34.5)	Mean: 52.8	White: (55.2); Black: (26.4); Asian/PI: (14.9); American Indian/Alaska Native: (3.4)	NR	NR
RCT: Rocco, 2011[23] FHN-Nocturnal	2-3	Arm 1: Conventional	42		(33.3)	Mean: 54	White: (50); Black: (26.2); Asian/PI: (16.7); American Indian/Alaska Native: (4.8); Native Hawaiian or other Pacific Islander: (19.1)	NR	NR
RCT: Rocco, 2011[23] FHN-Nocturnal	2-3	Arm 2: Frequent nocturnal	45		(35.6)	Mean: 51.7	White: (60); Black: (26.7); Asian/PI: (11.1); American Indian/Alaska Native: (2.2)	NR	NR
RCT: Rocco, 2015[24] FHN-Nocturnal	2-3	FHN Nocturnal Trial: All Arms	87	Median 3.7 years	NR	NR	NR	NR	NR
RCT: Rocco, 2015[24] FHN-Nocturnal	2-3	Arm 1: Nocturnal 3x (conventional) dialysis	42		14 (33)	Mean: 54	Black: 11 (26)	Less than high school: 5 (12) Completed high school: 9 (21); Vocational/technical/business/some college, no degree: 16 (38); Associate degree and beyond: 12 (29); Unknown: 0 (0)	NR

Study design: Author, year Study name	KQ	Arm Description	Arm N	Followup	Women N (%)	Age	Race N (%)	Education N (%)	Smoking N (%)
RCT: Rocco, 2015[24] FHN-Nocturnal	2-3	Arm 2: Nocturnal 6x (frequent) dialysis	45		16 (36)	Mean: 51.7	Black: 12 (27)	Less than high school: 8 (18); Completed high school: 12 (27); Vocational/technical/business/some college, no degree: 13 (29); Associate degree and beyond: 11 (24)	NR
RCT: Dember, 2019[26] TiME	3	Primary Analysis Population: All Arms	4470	Median 1.1 (IQR 0.5-1.7) years	(58.8)	Mean: 66.6	NR	NR	NR
RCT: Dember, 2019[26] TiME	3	Arm 1: Usual care	2532	Median 1.1 (IQR 0.5-1.7) years	1539 (60.8)	Mean: 66.5	White: 1408 (56.4); Black: 616 (24.7); Latino: 328 (13.1); Asian/PI: 104 (4.5); Other: 41 (1.6); Missing: 36 (1.4)	NR	NR
RCT: Dember, 2019[26] TiME	3	Arm 2: Intervention	1938	Median 1.1 (IQR 0.5-1.7) years	1089 (56.2)	Mean: 66.7	White: 1069 (55.7); Black: 455 (23.7); Latino: 279 (14.5); Asian/PI: 87 (4.8); Other: 28 (1.5); Missing: 20 (1.0)	NR	NR
RCT: Dember, 2019[26] TiME	3	Full Analysis Population: All Arms	7035	Median 1.1 (IQR 0.5-1.7) years	NR	NR	NR	NR	NR
RCT: Dember, 2019[26] TiME	3	Arm 1: Usual Care	3966	Median 1.1 (IQR 0.5-1.7) years	1732 (43.7)	Mean: 64.1	White: 2316 (59.1); Black: 983 (25.1); Latino: 440 (11.2); Asian/PI: 120 (3.3); Other: 60 (1.5); Missing: 48 (1.2)	NR	NR
RCT: Dember, 2019[26] TiME	3	Arm 2: Intervention	3069	Median 1.1 (IQR 0.5-1.7) years	1237 (40.3)	Mean: 64.1	White: 1750 (57.5); Black: 758 (24.9); Latino: 388 (12.8); Asian/PI: 95 (3.2); Other: 52 (1.7); Missing: 27 (0.9%)	NR	NR
Observational prospective: Brunelli, 2010[27] ArMORR cohort	3	Study Cohort	8552	1 year	3866 (45.2)	Mean: 62.3	White: 5091 (59.5); Non-white: 3461 (40.5)	NR	NR

Study design: Author, year Study name	KQ	Arm Description	Arm N	Followup	Women N (%)	Age	Race N (%)	Education N (%)	Smoking N (%)
Observational prospective: Dixon, 2016[25] FHN-Nocturnal	2-3	All Arms		Mean 12 months	NR	NR	NR	NR	NR
Observational prospective: Dixon, 2016[25] FHN-Nocturnal	2-3	Arm 1: Conventional	31	12 months	(32)	Mean: 49.5	White: (68); Other, not specified: (32)	High School Diploma or Less: (48); Some College: (26); Bachelor's Degree or More: (26)	Current: (23); Former: (23); Never: (55)
Observational prospective: Dixon, 2016[25] FHN-Nocturnal	2-3	Arm 2: Nocturnal	18	12 months	(39)	Mean: 47.9	White: (50); Other, not specified: (50)	High School Diploma or Less: (50); Some College: (44); Bachelor's Degree or More: (6)	Current: (11); Former: (28); Never: (61)
Observational prospective: Dixon, 2016[25] FHN-Nocturnal	2-3	Arm 3: Transplant	28	12 months	(43)	Mean: 49.93	White: (71); Other, not specified: (29)	High School Diploma or Less: (29); Some College: (32); Bachelor's Degree or More: (39)	Current: (7); Former: (36); Never: (57)
Observational prospective: Lacson, 2012[28] NR	3	All Arms	2808	2 years	NR	NR	NR	NR	NR
Observational prospective: Lacson, 2012[28] NR	3	Arm 1: Conventional	2062	NR	(34.2)	Mean: 54.1	White: (48.1); Black: (48.8); Other: (3.1)	NR	NR
Observational prospective: Lacson, 2012[28] NR	3	Arm 2: Nocturnal, longer duration dialysis	746	NR	(32.3)	Mean: 52.8	White: (46.3); Black: (51.0); Other: (2.7)	NR	NR

Study design: Author, year Study name	KQ	Arm Description	Arm N	Followup	Women N (%)	Age	Race N (%)	Education N (%)	Smoking N (%)
Observational prospective: Troidle, 2007[29] NR	3	Overall	16	Mean 10 months (SD 6 months)	2 (12)	Mean: 51.5	White: 6 (37); Black 10 (63)	NR	NR
Observational retrospective: Brunelli, 2016[30] NR	2	All Arms		1 year	NR	NR	NR	NR	NR
Observational retrospective: Brunelli, 2016[30] NR	2	Arm 1: System One	69	1 year	25 (36.23)	Mean: 57.03	White: 42 (60.87); Black: 24 (34.78); Latino: 1 (1.45); Asian/PI: 2 (2.9); Other: 0 (0)	NR	NR
Observational retrospective: Brunelli, 2016[30] NR	2	Arm 2: 2008@home	69	1 year	17 (24.64)	Mean: 57.28	White: 41 (59.42); Black: 22 (31.88); Latino: 2 (2.9); Asian/PI: 2 (2.9); Other: 2 (2.9)	NR	NR
Observational retrospective: Hladunewich, 2014[31] Toronto PreKid	2-3	All Arms			NR	NR	NR	NR	NR
Observational retrospective: Hladunewich, 2014[31] Toronto PreKid	2-3	Toronto PreKid	22 pregnancies		17 (100)	Mean: 34; Range: 25-39	White: 10 (59); Black: 3 (17.6); Asian/PI: 4 (23.5)	NR	NR
Observational retrospective: Hladunewich, 2014[31] Toronto PreKid	2-3	United States ARPD Cohort	70 pregnancies		(100)	Mean: 27	NR	NR	NR

Study design: Author, year Study name	KQ	Arm Description	Arm N	Followup	Women N (%)	Age	Race N (%)	Education N (%)	Smoking N (%)
Observational retrospective: Johansen, 2009[32]		All Arms	NR	60 days (minimum)	NR	NR	White: 74.4; Black: 22.6; Asian: 2.2; Native American: 0.1; Other/unknown: 0.7	NR	NR
Observational retrospective: Johansen, 2009[32]	2 and 3	Arm 1	940	60 days (minimum)	(34)	Mean: 46.7	Native American (0); Black 24.5 White (75.5); Asian (0); other (0)	NR	NR
Observational retrospective: Johansen, 2009[32]	2 and 3	Arm 2	94	60 days (minimum)	(35.1)	Mean: 47.0	Native American (0); Black (23.4); White (76.6); Asian (0); other (0)	NR	NR
Observational retrospective: Johansen, 2009[32]	2	Arm 1	430	60 days (minimum)	(31.2)	Mean: 42.2	Native American (0); Black (18.6); White (72.1); Asian (7); other (2.3)	NR	NR
Observational retrospective: Johansen, 2009[32]	2	Arm 3	43	60 days (minimum)	(27.9)	Mean: 40.9	Native American (3); Black (18.6); White (70.2); Asian (5.8); other (2.3)	NR	NR
Observational retrospective: Lockridge, 2011[33] NR	2-3	All Arms			NR	NR	NR	NR	NR
Observational retrospective: Lockridge, 2011[33] NR	2-3	Arm 1: USRDS Dialysis patients			NR	Mean: 62	NR	NR	NR
Observational retrospective: Lockridge, 2011[33] NR	2-3	Arm 2: Nightly Home Hemodialysis (NHHD)	87	Mean 3.3 years	36 (41)	Mean: 52	White: 42 (48); Black: 44 (51); Asian/PI: 1 (1)	NR	NR
Observational retrospective: Mathew, 2016[34] NR	2	All Arms	NR		NR	NR	NR	NR	NR
Observational retrospective: Mathew, 2016[34] NR	2	Arm 1: Conventional HD	50,162	Maximum 4 years	(35)	Mean: 63	White: (58); Black: (29) Others - not specified: (12)	NR	NR

Study design: Author, year Study name	KQ	Arm Description	Arm N	Followup	Women N (%)	Age	Race N (%)	Education N (%)	Smoking N (%)
Observational retrospective: Mathew, 2016[34] NR	2	Arm 2: Frequent HD	160	Maximum 4 years	(35)	Mean: 62	White: (58); Black: (29); Others - not specified: (12)	NR	NR
Observational retrospective: Mathew, 2016[34] NR	2	Arm 3: Incremental HD	434	Maximum 4 years	(35)	Mean: 64	White: (58); Black: (29); Others - not specified: (11)	NR	NR
Observational retrospective: Miller, 2010[35] NR	3	All Patients	88153		(45)	Mean: 61.8	White: (41); Black: (32); Latino: (15); Asian/PI: 2.9	NR	NR
Observational retrospective: Miller, 2010[35] NR	3	Arm 2: <3	4889		(61)	Mean: 64.2	White: (47); Black: (24); Latino: (12); Asian/PI: (5)	NR	NR
Observational retrospective: Miller, 2010[35] NR	3	Arm 3: 3-<3.5	26603		(55)	Mean: 64.4	White: (43); Black: (25); Latino: (17); Asian/PI: (4.7)	NR	NR
Observational retrospective: Miller, 2010[35] NR	3	Arm 4: 3.5<4	29744		(45)	Mean: 62.1	White: (40); Black: (33); Latino: (16); Asian/PI: (2.5)	NR	NR
Observational retrospective: Miller, 2010[35] NR	3	Arm 5: >=4	26917		(34)	Mean: 58.7	White: (38); Black: (38); Latino: (13); Asian/PI: (1.2)	NR	NR
Observational retrospective: Nesrallah, 2012[36] NR	2-3	All Arms	1726		NR	Median: 52	NR	NR	NR

Study design: Author, year Study name	KQ	Arm Description	Arm N	Followup	Women N (%)	Age	Race N (%)	Education N (%)	Smoking N (%)
Observational retrospective: Nesrallah, 2012[36] NR	2-3	Arm 1: conventional dialysis (after matching)	1388		(35.8)	NR	NR	NR	NR
Observational retrospective: Nesrallah, 2012[36] NR	2-3	Arm 2: intensive dialysis (after matching)	338		(29.6)	NR	NR	NR	NR
Observational retrospective: Rivara, 2016[37] NR	3	All Arms		5 years	NR	NR	NR	NR	NR
Observational retrospective: Rivara, 2016[37] NR	3	Arm 1: Exclusively treated with conventional hemodialysis	111707	5 years	(43)	NR	White: (47); Black: (31); Latino: (15); Asian/PI: (3); Other: (4)	NR	NR
Observational retrospective: Rivara, 2016[37] NR	3	Arm 2: Ever treated with extended-hours hemodialysis	1206	5 years	(30)	Mean: NR; Median: NR; Range: NR	White: (47); Black: (37); Latino: (10); Asian/PI: (3); Other: (3)	NR	NR
Observational retrospective: Weinhandl, 2012[38] NR	2	All Arms		mean	NR	NR	NR	NR	NR
Observational retrospective: Weinhandl, 2012[38] NR	2	Arm 1: Matched In-Center	9365	1.7 years	(37.7)	Mean: 53.2	Black: (28.3); Other: (71.7)	NR	NR
Observational retrospective: Weinhandl, 2012[38] NR	2	Arm 2: DHHD	1873	1.8 years	(35.8)	Mean: 52.2	Black: (26.5); Other: (73.5)	NR	NR

Study design: Author, year Study name	KQ	Arm Description	Arm N	Followup	Women N (%)	Age	Race N (%)	Education N (%)	Smoking N (%)
Observational retrospective: Weinhandl, 2012[38] NR	2	Arm 3: All In-Center	262249		(45.3)	Mean: 62.6	Black: (38.8); Other: (61.2)	NR	NR
Observational retrospective: Weinhandl, 2015[39]	2	All Arms	20,880	NR	NR	NR	NR	NR	NR
Observational retrospective: Weinhandl, 2015[39]	2	Arm 1	17400	Era 1: 2.05 years Era 2: 1.54 years	(34.4)	53.6 years	Black (27); non-Black (73)	NR	NR
Observational retrospective: Weinhandl, 2015[39]	2	Arm 2	3480	Era 1: 2.10 years Era 2: 1.53 years	(34.7)	53.4 years	Black (26.8); non-Black (73.2)	NR	NR

3x=3 times; 6x=6 times; %=Percentage; ArMORR= Accelerated Mortality on Renal Replacement; ARPD= American Registry for Pregnancy in Dialysis Patients; CHD=conventional hemodialysis; DHHD=daily home hemodialysis; FHN=Frequent Hemodialysis Network trials; HD=hemodialysis; IQR=interquartile range; KQ=key question; N=number of patients; NHHD=nightly home hemodialysis; NR=not reported; PI=Pacific Islander; RCT = randomized controlled trial; TiME=Time to Reduce Mortality in ESRD; SD=standard deviation; SDHD=Short daily hemodialysis; Toronto Pre-Kid=Toronto Pregnancy and Kidney Disease Clinic; USRDS= United States Renal Data System

Evidence Table 5. Categorical renal function outcomes of studies comparing hemodialysis frequency in non-institutionalized patients

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	N, Arm3	N, Arm4	n / N (%), Arm1	n / N (%), Arm2	Treatment effect
Daugirdas, 2013[20]	FHN	RCT	Daily (Nonzero Urine Output)	Creatinine; (%) Below 1st tertile of measure at baseline	12 months	32	25	NA	NA	25/32 (78.1)	17/25 (68)	p= 0.48
Daugirdas, 2013[20]	FHN	RCT	Daily (Nonzero Urine Output)	Average of Urea + Creatinine; (%) Below 1st tertile measure at baseline	12 months	32	25	NA	NA	24/32 (75)	17/25 (68)	p= 0.42
Daugirdas, 2013[20]	FHN	RCT	Daily(Nonzero Urine Output)	Urine volume/24 hours; (%) Below 1st tertile of measure at baseline*	12 months	32	25	NA	NA	26/32 (81.3)	17/25 (68)	p= 0.99
Daugirdas, 2013[20]	FHN	RCT	Daily(Nonzero Urine Output)	Urea; (%) Below 1st tertile of measure at baseline*	12 months	32	25	NA	NA	24/32 (75)	16/25 (64)	p= 0.44
Daugirdas, 2013[20]	FHN	RCT	Daily (Nonzero Urine Output)	Urea; (%) Equalto 0	12 months	32	25	NA	NA	17/32 (53.1)	12/25 (48)	p= NR

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	N, Arm3	N, Arm4	n / N (%), Arm1	n / N (%), Arm2	Treatment effect
Daugirdas, 2013[20]	FHN	RCT	Daily(Nonzero Urine Output)	Creatinine; (%) Equal to 0	12 months	32	25	NA	NA	17/32 (53.1)	12/25 (48)	p= NR
Daugirdas, 2013[20]	FHN	RCT	Daily (Nonzero Urine Output)	Urine volume/24 hours; (%) Equal to 0	12 months	32	25	NA	NA	17/32 (53.1)	12/25 (48)	p= NR
Daugirdas, 2013[20]	FHN	RCT	Daily(Nonzero Urine Output)	Average of Urea + Creatinine; (%) Equal to 0	12 months	32	25	NA	NA	17/32 (53.1)	12/25 (48)	p= NR

%=percentage; FHN= Frequent Hemodialysis Network trials; N=number of total patients; n=number of patients in sample; NR=not reported; RCT=randomized controlled trial

Evidence Table 6. Continuous albumin outcomes of studies comparing hemodialysis frequency in non-institutionalized patients

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	Outcome, Arm1	Outcome, Arm2	Treatment Effect
Kaysen, 2012[13]	FHN	RCT	NA	Albumin level	12 months	42	45	Baseline: Mean 3.95 (SD: 0.44) Final: Mean 3.96 (SD: 0.4) Adjusted mean change: 0.00 (SE 0.03)	Baseline: Mean 3.96 (SD: 0.36) Final: Mean 3.98 (SD: 0.36) Adjusted mean change: 0.03 (SE 0.03)	Arm1 vs Arm2: Treatment effects (6x vs 3x, baseline to 12 months): 0.03 (95% CI: -0.04 to 0.10), p=0.41
Brunelli, 2016[30]	NR	Observational: retrospective	NA	Albumin level	12 months	69	69	Baseline: NR Final: Mean 3.94 (95% CI: 3.85 to 4.04)	Baseline: NR Final: Mean 4.04 (95% CI: 3.95 to 4.14)	p=0.15
Chertow, 2010[3]	FHN	RCT	NA	Albumin level	12 months	120	125	Baseline: Mean 3.98 (SD: 0.44) Final: Mean 3.96 (SD: 0.4)	Baseline: Mean 3.99 (SD: 0.37) Final: Mean 4 (SD: 0.36)	Arm1 vs Arm2: Mean difference: 0.02 (95% CI: -0.06 to 0.1), p=0.56 Arm1: Mean difference: -0.02 (SD: 0.36) Arm2: Mean difference: -0.01 (SD: 0.31)

3x=3 times; 6x=6 times; CI=confidence interval; FHN= Frequent Hemodialysis Network trials; NA=not applicable; NR=not reported; RCT=randomized controlled trial; SD=standard deviation; SE=standard error

Evidence Table 7. Categorical erythropoietin stimulating agents outcomes of studies comparing hemodialysis frequency in non-institutionalized patients

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	N, Arm3	N, Arm4	Outcome, Arm1	Outcome, Arm2	Outcome, Arm3	Outcome, Arm4	Treatment Effect
Kaysen, 2012[13]	FHN	RCT	NA	Normalized protein catabolic rate	12 months	42	45	120	125			Baseline: Mean 64.67 (SD: 17.86) Final: Mean 64.26 (SD: 20.02)	Baseline: Mean 65.37 (SD: 21.23) Final: Mean 65.13 (SD: 22.53)	Arm3 vs Arm4: Treatment comparison 6x vs 3x Daily, baseline to 12 months: 0.82 (95% CI: -2.54 to 4.19), p=0.63
Brunelli, 2016[30]	NR	Observational: retrospective	NA	Normalized protein catabolic rate	12 months	69	69	NA	NA	Final: Mean 0.99 (95% CI: 0.92 to 1.07)	Final: Mean 1.12 (95% CI: 1.02 to 1.23)			p=0.05

CI=confidence interval; FHN= Frequent Hemodialysis Network trials; N=number of patients; NA=not applicable; NR=not reported; RCT=randomized controlled trial; SD=standard deviation

Evidence Table 8. Continuous hemoglobin outcomes of studies comparing hemodialysis frequency in non-institutionalized patients

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	Outcome, Arm1	Outcome, Arm2	Treatment Effect	Comments
Ornt, 2013[9]	FHN	RCT	NA	Hemoglobin level	12 months	120	125	Baseline: Median 11.9 (10^{th}, 90^{th} percentile: 10.3, 13.8) Final: Median 11.7 (10^{th}, 90^{th} percentile: 10.6, 12.8)	Baseline: Median 12.0 (10^{th}, 90^{th} percentile: 10.6, 13.3) Final: Mean 11.9 (10^{th}, 90^{th} percentile: 10.9, 13.1)	Arm1 vs Arm2: Mean difference: 0.33 (95% CI: 0.05 to 0.61), p<0.05 Arm1, Change from baseline: -0.24 (95% CI: -0.48 to 0.00) Arm2, Change from baseline: 0.09 (95% CI: -0.15 to 0.32)	
Brunelli, 2016[30]	NR	Observational: retrospective	NA	Hemoglobin level	12 months	69	69	Final: Mean 11.4 (95% CI: 11.1 to 11.7)	Final: Mean 11.5 (95% CI: 11.2 to 11.8)	p=0.54	Similar findings in stratified analysis. Number not abstracted.

CI=confidence interval; FHN= Frequent Hemodialysis Network trials; N=number of patients; NA=not applicable; NR=not reported; RCT=randomized controlled trial

Evidence Table 9. Continuous metabolic outcomes of studies comparing hemodialysis frequency in non-institutionalized patients

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	Outcome, Arm1	Outcome, Arm2	Treatment Effect	Comments
Molfino, 2019[4]	FHN	RCT	Modality (Daily Trial)	bicarbonate	12 months	56	62	Baseline: Mean 24.0 (SD: 3.74) Final: Mean 23.7 (SD: 2.97) Mean change from baseline: 0.25 (95% CI: -0.51 to 1.01)	Baseline: Mean 23 (SD: 3.3) Final: Mean 24.2 (SD: 2.64) Mean change from baseline 1.11 (95% CI, 0.36-1.86)	Arm1 vs. Arm 2: Mean difference: 0.86 (95% CI: 0.02 to 1.70), p=0.045	Data for overall participants (Table 2 and Table 3, column overall participants
Lo, 2017[5]	NR	RCT	Daily Trial 3x vs 6x	Free T3	12 months	72	75	Baseline: Median 2.37 (IQR: 2.05 to 2.73) Final: Median 2.49 (IQR: 2.24 to 2.79)	Baseline: Median 2.59 (IQR: 2.14 to 3.03) Final: Median 2.78 (IQR: 2.26 to 3.33)	Arm1 vs Arm2: 0.14 (95% CI: -0.10 to 0.38), p=0.25 Arm1: Mean change: 0.10 (95% CI: -0.11 to 0.32) Arm2: Mean change: 0.24 (95% CI: 0.04 to 0.45)	
Lo, 2017[5]	NR	RCT	Daily Trial 3x vs. 6x	Free T4	12 months	72	75	Baseline: Mean 0.86 (SD: 0.23) Final: Mean 0.9 (SD: 0.27)	Baseline: Mean 0.84 (SD: 0.21) Final: Mean 0.91 (SD: 0.3)	Arm1: change: 0.04(0.15) Arm2: change: 0.07 (0.26)	Change in Free T4 between groups p=0.58

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	Outcome, Arm1	Outcome, Arm2	Treatment Effect	Comments
Lo, 2017[5]	NR	RCT	Daily Trial	TSH	12 months	72	75	Baseline: Mean 2.01 (SD: 1.33) Final: Mean 2.33 (SD: 1.44)	Baseline: Mean 2.06 (SD: 1.16) Final: Mean 2.02 (SD: 1.22)	Arm1 vs Arm2: p=0.15 Arm1: mean change: 0.32 (1.29) Arm2: mean change: -0.04 (0.89)	Change in TSH non-significant between groups (0.15). Not abstracted: Table 3 demonstrates the effect of hemodialysis frequency on changes in serum concentrations of TSH, FT4, and FT3, examined in all 147 Daily and 48 Nocturnal participants with endogenous thyroid function using mixed-effects models to account for missing values. Also not significant., although a significant increase in FT4 concentrations was observed in sensitivity analyses that included those receiving thyroid hormone therapy (treatment effect 0.10, 95% CI 0.01–0.20, P 5 0.03).
Brunelli, 2016[30]	NR	Observational : retrospective	NA	PTH	12 months	69	69	Baseline: NR Final: Mean 268 (95% CI: 206 to 331)	Baseline: NR Final: Mean 244 (95% CI: 186 to 301)	p=0.52	
Brunelli, 2016[30]	NR	Observational : retrospective	NA	serum calcium (mg/dl)	12 months	69	69	Baseline: NR Final: Mean 9.13 (95% CI: 8.98 to 9.28)	Baseline: NR Final: Mean 9.02 (95% CI: 8.87 to 9.17)	p=0.29	
Brunelli, 2016[30]	NR	Observational : retrospective	NA	Phosphorus level	12 months	69	69	Final: Mean 5.10 (95% CI: 4.81 to 5.40)	Final: Mean 5.38 (95% CI: 5.09 to 5.68)	p=0.19	

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	Outcome, Arm1	Outcome, Arm2	Treatment Effect	Comments
Daugirdas, 2012[14]	FHN	RCT	Daily	Phosphorus binders	12 months	120	125	Baseline: Mean 5.92 (SD: 4.32) Final: Mean 6.64 (SD: 4.95) adjusted mean change: 0.39 (SE 0.45)	Baseline: Mean 7.17 (SD: 5.48) Final: Mean 5.7 (SD: 4.94) adjusted mean change: -0.96 (SE 0.43)	Arm 1 vs. Arm 2: mean difference: -1.35 g/d (95% CI, –2.50 to -0.20 g/d; P=0.02).	
Daugirdas, 2012[14]	FHN	RCT	Daily	Phosphorous	12 months	120	125	Baseline: Mean 5.63 (SD: 1.51) Final (10-12 months): Mean 5.66 (SD: 1.75) adjusted mean change: -0.08 (SE 0.13)	Baseline: Mean 5.88 (SD: 1.69) Final: Mean 5.24 (SD: 1.19) adjusted mean change: -0.54 (SE 0.13)	Arm 1 vs. Arm 2: mean difference: -0.46 g/d (95% CI, –0.78 to -0.13 g/d; P=<0.01).	
Daugirdas, 2012[14]	FHN	RCT	Daily	PTH	12 months	120	125	Baseline: Median 282 (10^{th}, 90^{th} percentile: 44, 846) Final (10-12 months): Median 258 (10^{th}, 90^{th} percentile: 46, 832) adjusted mean change (SE): -7.9 (-24.8 to 12.8)	Baseline: Median 326 (10th, 90th percentile: 94, 859) Final: Median 369 (10th, 90th percentile: 118, 972) adjusted mean change: 16 (-4.0 to 40.0)	Arm 1 vs. Arm 2: mean difference: 26.02 pg/ml (95% CI, –3.4to 64.2), p=0.09	

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	Outcome, Arm1	Outcome, Arm2	Treatment Effect	Comments
Chertow, 2010[3]	FHN	RCT	NA	predialysis phosphorus - mg/dl	12 months	120	125	Baseline: Mean 5.68 (SD: 1.55) Final: Mean 5.65 (SD: 1.75)	Baseline: Mean 5.88 (SD: 1.65) Final: Mean 5.24 (SD: 1.20)	Arm1 vs Arm2: Mean difference: -0.56 (95% CI: -0.91 to -0.22, p=0.002 Arm1: Mean difference: -0.03 (SD: 1.54) Arm2: Mean difference: -0.63 (SD: 1.60) Arm1, Adjusted For: Mean difference: -0.08 (SD: 0.14) Arm1, Adjusted For: Mean difference: -0.64 (SD: 0.14)	Table 3

3x=3 times; 6x=6 times; CI=confidence interval; FHN= Frequent Hemodialysis Network trials; FT3=free triiodothyronine (T3); FT4=Free thyroxine (T4); IQR=interquartile range; N=number of patients; mg/dl=Milligrams per deciliter; NA=not applicable; NR=not reported; PTH=parathyroid-stimulating hormone; RCT=randomized controlled trial; SD=standard deviation; SE=standard error; T4=thyroxine; TSH=thyroid-stimulating hormone

Evidence Table 10. Continuous hospitalization outcomes of studies comparing hemodialysis frequency in non-institutionalized patients

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	Outcome, Arm1	Outcome, Arm2	Treatment Effect	Comments
Brunelli, 2016[30]	NR	Observational: retrospective	NA	Hospitalization rate	12 months	69	69		Final: Mean 1.14	Arm2, IRR: 1.14 (95% CI: 0.73 to 1.78), p-value 0.57	
Chertow, 2010[3]	FHN	RCT	NA	hospitalizations related to vascular access	12 months	120	125	Final, counts: 24 (14 patients with events)	Final, Counts: 30 (20 patients with events)	Arm1 vs Arm2: HR 0.99 (95% CI: 0.54 to 1.82), p=0.97	table 4 - The hazard ratios and P values for rates of events (including multiple events per patient) between the frequent-hemodialysis group and the conventional-hemodialysis group were calculated with the use of the Andersen–Gill model, except where otherwise noted.
Chertow, 2010[3]	FHN	RCT	NA	hospitalizations unrelated to vascular access	12 months	120	125	Final, counts: 90 (44 patients with events)	Final, Counts: 79 (47 patients with event)	Arm1 vs Arm2: 0.80 (95% CI: 0.53 to 1.21), p=0.30	table 4 - The hazard ratios and P values for rates of events (including multiple events per patient) between the frequent-hemodialysis group and the conventional-hemodialysis group were calculated with the use of the Andersen–Gill model, except where otherwise noted.

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	Outcome, Arm1	Outcome, Arm2	Treatment Effect	Comments
Chertow, 2010[3]	FHN	RCT	NA	infection related hospitalization	12 months	120	125	Final, counts: 20 patients with event (27 events)	Final, Counts: 23 patients with event (27 events)	Arm1 vs Arm2: HR 0.83 (95% CI: 0.49 to 1.40), p=NR	from Table 4 - The hazard ratios and P values for rates of events (including multiple events per patient) between the frequent-hemodialysis group and the conventional-hemodialysis group were calculated with the use of the Andersen–Gill model, except where otherwise noted.
Chertow, 2010[3]	FHN	RCT	NA	hospitalization secondary to/ cardiovascular-related	12 months	120	125	Final, counts: 15 events (12 patients)	Final, Counts: 17 events (15 patients)	Arm1 vs Arm2: HR 0.83 (95% CI: 0.44 to 1.59), p=NR	table 4 - The hazard ratios and P values for rates of events (including multiple events per patient) between the frequent-hemodialysis group and the conventional-hemodialysis group were calculated with the use of the Andersen–Gill model, except where otherwise noted.
Johansen, 2009[32]	NR	Retrospective cohort	NA	All cause hospitalization; non-vasuclar access-related hospitalization, cardiovascular hospitalization, infection related hospitalization	NR: 2 years, beyond 2 years	430	43	NR	NR	Not significantly associated	
Johansen, 2009[32]	NR	Retrospective cohort	NA	Hospitalization associated with congestive heart failure	NR: 2 years, beyond 2 years	430	43	NR	NR	HR: 0.77, 95% CI: 0.23 to 2.53; p-0.66	

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	Outcome, Arm1	Outcome, Arm2	Treatment Effect	Comments
Johansen, 2009[32]	NR	Retrospective cohort	NA	Hospitalization associated vascular access	NR: 2 years, beyond 2 years	430	43	NR	NR	HR: 0.71; 95% CI: 0.31 to 1.64; p=0.43	
Weinhandl, 2015[39]	NR	Retrospective cohort	NA	Cumulative incidence of first admission	1 year	NR	NR	58.3%	62.8%		Followup “n” not reported
Weinhandl, 2015[39]	NR	Retrospective cohort	NA	Cumulative incidence of first admission	2 years	NR	NR	74.9%	80.2%		Followup “n” not reported
Weinhandl, 2015[39]	NR	Retrospective cohort	NA	Cumulative incidence of CVD related admission	1 year	NR	NR	26.7%	24.1%		Followup “n” not reported
Weinhandl, 2015[39]	NR	Retrospective cohort	NA	Cumulative incidence of infection related admission	1 year	NR	NR	22.9%	29.5%		Followup “n” not reported
Weinhandl, 2015[39]	NR	Retrospective cohort	NA	Cumulative incidence of access dysfunction related admission	1 year	NR	NR	7.2%	7.8%		Followup “n” not reported
Weinhandl, 2015[39]	NR	Retrospective cohort	NA	Cumulative incidence of “other” related admission	1 year	NR	NR	34.1%	36.1%		Followup “n” not reported
Weinhandl, 2015[39]	NR	Retrospective cohort	NA	Cumulative incidence of readmission after discharge	1 year	NR	NR	82.6%	81.8%		Followup “n” not reported
Weinhandl, 2015[39]	NR	Retrospective cohort	NA	Cumulative incidence of readmission after discharge	2 years	NR	NR	90.3%	90.2%		Followup “n” not reported

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	Outcome, Arm1	Outcome, Arm2	Treatment Effect	Comments
Weinhandl, 2015[39]	NR	Retrospective cohort	NA	Cumulative incidence of CVD related readmission after discharge	1 year	NR	NR	55%	47.1%		Followup “n” not reported
Weinhandl, 2015[39]	NR	Retrospective cohort	NA	Cumulative incidence of infection related readmission after discharge	1 year	NR	NR	51.1%	53.5%		Followup “n” not reported
Weinhandl, 2015[39]	NR	Retrospective cohort	NA	Cumulative incidence of vascular access related related readmission after discharge	1 year	NR	NR	28.2$	31.5%		Followup “n” not reported
Weinhandl, 2015[39]	NR	Retrospective cohort	NA	Cumulative incidence of other related readmission after discharge	1 year	NR	NR	62.6%	60.8%		Followup “n” not reported
Weinhandl, 2015[39]	NR	Retrospective cohort	NA	ITT followup hospital admission	1 year	NR	NR	NR	NR	HR, 1.01; 95% CI, 0.98 to 1.03	Followup “n” not reported
Weinhandl, 2015[39]	NR	Retrospective cohort	NA	ITT follow up, first admission	1 year	NR	NR	NR	NR	HR, 1.14, 95% CI, 1.09 to 1.19	Followup “n” not reported
Weinhandl, 2015[39]	NR	Retrospective cohort	NA	ITT follow up readmission	1 year	NR	NR	NR	NR	HR, 0.96, 95% CI, 0.94 to 0.99	Followup “n” not reported
Weinhandl, 2015[39]	NR	Retrospective cohort	NA	ITT followup pooled CVD related admission	1 year	NR	NR	NR	NR	HR, 0.89; 95% CI, 0.86 to 0.93	Followup “n” not reported

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	Outcome, Arm1	Outcome, Arm2	Treatment Effect	Comments
Weinhandl, 2015[39]	NR	Retrospective cohort	NA	ITT followup pooled infection related re-admission	1 year	NR	NR	NR	NR	HR, 1.18, 95% CI, 1.13 to 1.23	Followup “n” not reported
Weinhandl, 2015[39]	NR	Retrospective cohort	NA	ITT followup pooled vascular access, related re-admission	1 year	NR	NR	NR	NR	HR, 1.01 (95% CI, 0.93-1.09)	Followup “n” not reported
Weinhandl, 2015[39]	NR	Retrospective cohort	NA	ITT followup pooled other related re-admission	1 year	NR	NR	NR	NR	HR, 1.02 (95% CI, 0.99-1.06)	Followup “n” not reported
Weinhandl, 2015[39]	NR	Retrospective cohort	NA	ITT followup admission rates	Era 1	NR	NR	NR	161.9 per 100 patient years		
Weinhandl, 2015[39]	NR	Retrospective cohort	NA	ITT followup admission rates	Era 2	NR	NR	NR	178.0 per 100 patient years		
Weinhandl, 2015[39]	NR	Retrospective cohort	NA	ITT followup admission day rates	Era 1	NR	NR	NR	985.1 per 100 patient years		
Weinhandl, 2015[39]	NR	Retrospective cohort	NA	ITT followup admission day rates	Era 2	NR	NR	NR	1025.1 per 100 patient years		
Weinhandl, 2015[39]	NR	Retrospective cohort	NA	Relative rates of admission		NR	NR	NR	NR	HR: 1.03 (95% CI, 0.99-1.08)	
Weinhandl, 2015[39]	NR	Retrospective cohort	NA	Relative rate of days		NR	NR	NR	NR	HR: 1.04 (95% CI, 0.98-1.11)	
Weinhandl, 2015[39]	NR	Retrospective cohort	NA	Relative rates of admission, CVD		NR	NR	NR	NR	HR: 0.83 (95% CI, 0.78-0.88)	

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	Outcome, Arm1	Outcome, Arm2	Treatment Effect	Comments
Weinhandl, 2015[39]	NR	Retrospective cohort	NA	Relative rates of admission, infection		NR	NR	NR	NR	HR: 1.32 (95% CI, 1.24-1.40)	
Weinhandl, 2015[39]	NR	Retrospective cohort	NA	Relative rates of admission, vascular access dysfunction		NR	NR	NR	NR	HR: 1.01 (95% CI, 0.90-1.13)	
Weinhandl, 2015[39]	NR	Retrospective cohort	NA	Relative rates of admission, other causes		NR	NR	NR	NR	HR: 1.02 (95% CI, 0.97-1.09)	

CI=confidence interval; FHN=Frequent Hemodialysis Network trials; HR=hazard ratio; IRR=incidence rate ratio; ITT=intention to treat; N=Number of patients; NA=not applicable; NR=not reported; RCT=randomized controlled trial

Evidence Table 11. Continuous cardiovascular outcomes of studies comparing hemodialysis frequency in non-institutionalized patients

Author, year	Study name	Study design	Subgroup	Followup	N, Arm1	N, Arm2	Outcome, Arm1	Outcome, Arm2	Treatment Effect	Comments
Chan, 2014[22]	FHN-Daily	RCT	No Diabetes	12 months	99	108	Baseline: NR Final: NR	Baseline: NR Final: NR	Arm1 vs Arm2: Treatment effects: 44.5 (3.8, 102), p=NR	All subgroup abstracted from Figure 1 using digitizer. Shown are estimated percent differences in geometric mean changes between the frequent and conventional HD groups, with 95% CIs. The P-values refer to tests of interactions of the treatment with age (as a continuous variable) and diabetic status. The P-values were not adjusted for multiple testing.
Chan, 2014[22]	FHN-Daily	RCT	Diabetes	12 months	99	108	Baseline: NR Final: NR	Baseline: NR Final: NR	Arm1 vs Arm2: Treatment effects: -15.1 (-42.6, 26.8), p=NR, p for interaction=0.046	All subgroup abstracted from Figure 1 using digitizer. Shown are estimated percent differences in geometric mean changes between the frequent and conventional HD groups, with 95% CIs. The P-values refer to tests of interactions of the treatment with age (as a continuous variable) and diabetic status. The P-values were not adjusted for multiple testing.
Chan, 2014[22]	FHN-Daily	RCT	Age <=50	12 months	99	108	Baseline: NR Final: NR	Baseline: NR Final: NR	Arm1 vs Arm2: Treatment effect: 118.0 (35.4, 252.3)	All subgroup abstracted from Figure 1 using digitizer. Shown are estimated percent differences in geometric mean changes between the frequent and conventional HD groups, with 95% CIs. The P-values refer to tests of interactions of the treatment with age (as a continuous variable) and diabetic status. The P-values were not adjusted for multiple testing.
Chan, 2014[22]	FHN-Daily	RCT	Age >50	12 months	99	108	Baseline: NR Final: NR	Baseline: NR Final: NR	Arm1 vs Arm2: treatment effect: -6.5 (-41.8, 52.7), p interaction 0.005	All subgroup abstracted from Figure 1 using digitizer. Shown are estimated percent differences in geometric mean changes between the frequent and conventional HD groups, with 95% CIs. The P-values refer to tests of interactions of the treatment with age (as a continuous variable) and diabetic status. The P-values were not adjusted for multiple testing.

Author, year	Study name	Study design	Subgroup	Followup	N, Arm1	N, Arm2	Outcome, Arm1	Outcome, Arm2	Treatment Effect	Comments
Chan, 2014[22]	FHN-Daily	RCT	No diabetes	12 months	99	108	Baseline: NR Final: NR	Baseline: NR Final: NR	Arm1 vs Arm2: Treatment effects: 120.1 (42.4, 242.1)	All subgroup abstracted from Figure 1 using digitizer. Shown are estimated percent differences in geometric mean changes between the frequent and conventional HD groups, with 95% CIs. The P-values refer to tests of interactions of the treatment with age (as a continuous variable) and diabetic status. The P-values were not adjusted for multiple testing.
Chan, 2014[22]	FHN-Daily	RCT	Diabetes	12 months	99	108	Baseline: NR Final: NR	Baseline: NR Final: NR	Arm1 vs Arm2: Treatment effects: -15.9 (-49.2, 41.6), p interaction =0.006	All subgroup abstracted from Figure 1 using digitizer. Shown are estimated percent differences in geometric mean changes between the frequent and conventional HD groups, with 95% CIs. The P-values refer to tests of interactions of the treatment with age (as a continuous variable) and diabetic status. The P-values were not adjusted for multiple testing.
Chan, 2014[22]	FHN-Daily	RCT	NA	48 months	99	108	Baseline: Observed Data median (10^{th}, 90^{th} percentiles) 46.3 (15.2, 77.0) Final: Observed Data median (10^{th}, 90th percentiles) 38.8 (17.6, 85.9)	Baseline: Observed Data median (10^{th}, 90^{th} percentiles) 41.1 (18.2, 76.9) Final: Observed Data median (10^{th}, 90^{th} percentiles) 44.5 (23.3, 81.2)	Arm1 vs Arm2: Treatment comparison (6× versus 3×): 17.2% (−8.8%, 50.6%), p=0.021 Arm1: Mean difference: −6.4% (95% CI: −24.5% to 16.1) Arm2: Mean difference: 9.8% (95% CI:−11.4% to 35.9%)	

Author, year	Study name	Study design	Subgroup	Followup	N, Arm1	N, Arm2	Outcome, Arm1	Outcome, Arm2	Treatment Effect	Comments
Chan, 2014[22]	FHN-Daily	RCT	NA	12 months	99	108	Baseline: Observed Data median (10^{th}, 90^{th} percentiles) 170.4 (37.5, 338.6) Final: Observed Data median (10^{th}, 90^{th} percentiles) 151.4 (42.0, 331.3)	Baseline: Observed Data median (10^{th}, 90^{th} percentiles) 128.2 (38.4, 355.3) Final: Observed Data median (10^{th}, 90^{th} percentiles) 175.9 (52.6, 469.3)	Arm1 vs Arm2: Treatment comparison (6× versus 3×): 39.5% (3.3%, 88.4%), p=0.030 Arm1: Mean difference: −12.6% (95% CI: −32.1% to 12.4%) Arm2: Mean difference: 21.9% (95% CI:−5.0% to 56.5%)	
Chan, 2014[22]	FHN-Daily	RCT	NA	12 months	99	108	Baseline: Observed Data median (10^{th}, 90^{th} percentiles) 2.5 (0.9, 5.5) Final: Observed Data median (10^{th}, 90^{th} percentiles) 2.4 (0.9, 4.8)	Baseline: Observed Data median (10^{th}, 90^{th} percentiles) 1.9 (1, 5.1) Final: Observed Data median (10th, 90^{th} percentiles) 2.8 (1.2, 6.2)	Arm1 vs Arm2: Treatment comparison (6× versus 3×): 0.5 (−0.1, 1.2), p=0.079 Arm1: Mean difference: −0.3 (95% CI: −0.8 to 0.3) Arm2: Mean difference: 0.3 (95% CI:-0.2 to 0.8)	
Chan, 2014[22]	FHN-Daily	RCT	NA	12 months	99	108	Baseline: Observed Data median (10^{th}, 90^{th} percentiles) 116.4 (19.6, 279.5) Final: Observed Data median (10^{th}, 90^{th} percentiles) 105.2 (21, 225.5)	Baseline: Observed Data median (10th, 90^{th} percentiles) 90.9 (20.2, 255.0) Final: Observed Data median (10^{th}, 90^{th} percentiles) 125.2 (23.9, 352.7)	Arm1 vs Arm2: Treatment comparison (6× versus 3×): 50.0% (6.1%, 112.0%), p=0.022 Arm1: Mean difference: −14.5% (95% CI: −36.0%, to 14.2%) Arm2: Mean difference: 28.2% (95% CI:−3.8% to 70.8%)	Table 2. Heart rate variability outcomes - The adjusted means and treatment effects were estimated under a mixed-effects analysis applied to the 207 subjects of the Daily Trial Holter Cohort. The low- and high-frequency components and their sum were log transformed for estimation of adjusted means and treatment effects; these results are expressed as percentage changes in geometric means. The medians, 10th and 90th percentiles are expressed in milliseconds-squared without log transformation.

Author, year	Study name	Study design	Subgroup	Followup	N, Arm1	N, Arm2	Outcome, Arm1	Outcome, Arm2	Treatment Effect	Comments
Chan, 2014[22]	FHN-Daily	RCT	NA	12 months	99	108	Baseline: Observed Data median (10th, 90th percentiles) 75.5 (45.0, 133.0) Final: Observed Data median (10th, 90th percentiles) 71.0 (38.0, 121.0)	Baseline: Observed Data median (10th, 90th percentiles) 70.0 (39.0, 116.0) Final: Observed Data median (10th, 90th percentiles) 72.0 (41.0, 114.0)	Arm1 vs Arm2: Treatment comparison (6× versus 3×: 0.7 (−9.2, 10.5), p=0.90 Arm1: Mean difference: −4.5 (95% CI: −13.1 to 4.2) Arm2: Mean difference: −3.8 (95% CI:−12.4 to 4.8)	
Chan, 2014[22]	FHN-Daily	RCT	NA	12 months	99	108	Baseline: Mean 3.11 (SD: 0.93) Final: Mean 3.04 (SD: 0.86)	Baseline: Mean 3.21 (SD: 0.98) Final: Mean 2.11 (SD: 0.78)	Arm1 vs Arm2: Mean difference: -0.97 (95% CI: -1.19 to -0.75), p<0.001	
Chan, 2014[22]	FHN-Daily	RCT	NA	12 months	99	108	Baseline: Mean 77.95 (SD: 16.88) Final: Mean 76.70 (SD: 12.42)	Baseline: Mean 74.46 (SD: 11.65) Final: Mean 77.17 (SD: 11.54)	Arm1 vs Arm2: Mean difference: 0.36 (95% CI: -3.68 to 4.39), p=0.862	
Chan, 2014[22]	FHN-Daily	RCT	NA	12 months	99	108	Baseline: Mean 3.11 (SD: 0.93) Final: Mean 3.04 (SD: 0.86)	Baseline: Mean 3.21 (SD: 0.98) Final: Mean 2.11 (SD: 0.78)	Arm1 vs Arm2: Mean difference: -0.97 (95% CI: -1.19 to -0.75), p<0.001	

3x=3 times; 6x=6 times; CI=confidence interval; FHN=Frequent Hemodialysis Network trials; HD=hemodialysis; N=number of patients; NA=not applicable; NR=not reported; RCT=randomized controlled trial; SD=standard deviation

Evidence Table 12. Continuous diastolic blood pressure outcomes of studies comparing hemodialysis frequency in non-institutionalized patients

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	Outcome, Arm1	Outcome, Arm2	Treatment effect	Comments
Kotanko, 2015[7]	FHN	RCT	daily	Clinic DBP (post-HD)	10-12 months	162	170	Baseline: Mean 71.9 (SD: 11.1) Final: Mean 74.1 (SD: 12.1)	Baseline: Mean 72.9 (SD: 11.7) Final: Mean 72.4 (SD: 13.4)	Arm1 vs Arm2: Mean difference: Change from baseline: -3.4 (95%CI: -5.6; -1.2), p<0.01	Main FHN BP Paper
Kotanko, 2015[7]	FHN	RCT	daily	Clinic DBP (pre-HD)	12 months	162	170	Baseline: Mean 78.2 (SD: 11.6) Final: Mean 79.6 (SD: 12)	Baseline: Mean 81.5 (SD: 11.7) Final: Mean 76 (SD: 11.5)	Arm1 vs Arm2: Mean difference: Change from baseline: -5.1 (95% CI: -7.4 to -2.8), p=<0.001	

BP=Blood pressure; CI=confidence interval; DBP=diastolic blood pressure; FHN=Frequent Hemodialysis Network trials; HD=hemodialysis; N=number of patients; RCT=randomized controlled trial; SD=standard deviation

Evidence Table 13. Continuous systolic blood pressure outcomes of studies comparing hemodialysis frequency in non-institutionalized patients

Author, year	Study name	Study design	Subgroup	Outcome definition	Follow up	N, Arm1	N, Arm2	N, Arm3	N, Arm4	Outcome, Arm1	Outcome, Arm2	Treatment Effect
Kotanko, 2015[7]	FHN	RCT	daily	SBP [mmHg]	10-12 months	120	125					Predialysis systolic blood pressure and post-dialysis systolic pressure (mean change from baseline to10-12 month follow-up: -10.0; 95% CI, -13.9 to -6.0 and -7.9; 95% CI -11.8 to -3.9, respectively
Chertow, 2010[3]	FHN	RCT	NA	Weekly average predialysis systolic blood pressure-mmHg	12 months	120	125	NA	NA	Baseline: Mean 146 (SD: 18) Final: Mean 147 (SD: 18)	Baseline: Mean 147 (SD: 19) Final: Mean 137 (SD: 19)	Arm1 vs Arm2: Mean difference: -10.1 (95% CI: -14.3 to -6, p=<0.001 Arm1: Mean difference: 0.9 (SD: 16.2) Arm2: Mean difference: -9.7 (SD: 18.2) Arm1, Adjusted For: Mean difference: 0.9 (SD: 1.6) Arm1, Adjusted For: Mean difference: -9.2 (SD: 1.5)
Chertow, 2010[3]	FHN	RCT	NA	Number of BP medications	NR	120	125	NA	NA	Baseline: 92 Mean (2.8: SD) Final: 92 Mean (2.58: SD)	Baseline: 103 Mean (2.69: SD) Final: 103 Mean (1.82: SD)	Arm1 vs Arm2: p<0.001 Arm1: Mean difference -0.23 (SD: 1.35) Arm2: Mean difference -0.87 (SD: 1.85)
Brunelli, 2016[30]	NR	Observational: retrospective	NA	Systolic blood pressure (mm Hg)		69	69			Final 140.3 (95% CI: 136.0 to 144.6)	Final 133.8 (95% CI: 129.5 to 138.1)	p=0.04
Kotanko, 2015[7]	FHN	RCT	daily	# of prescribed antihypertensive drugs (per patient)	10-12 months	120	125			Baseline: Mean (SD) 2.3 (1.4) Final: Mean (SD) 2.0 (1.4)	Baseline: Mean (SD) 2.2 (1.6) Final: Mean (SD) 1.4 (1.3)	Mean change from baseline: -0.36, 95% CI, -0.65 to -0.08)

#=number; BP=blood pressure; CI=confidence interval; FHN=Frequent Hemodialysis Network trials; mmHg=millimiters of mercury; N=number of patients; RCT=randomized controlled trial; SBP=systolic blood pressure; SD=standard deviation

Evidence Table 14. Continuous left ventricular mass outcomes of studies comparing hemodialysis frequency in non-institutionalized patients

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	N, Arm3	N, Arm4	Outcome, Arm1	Outcome, Arm2	Outcome, Arm3	Outcome, Arm4	Treatment Effect
Chan, 2013[8]	FHN	RCT	NA	LV mass	12 months	120	125	42	45					Mean difference: -13.1 g, 95% CI -21.3 to -5.0, p=0.002
Chan, 2013[8]	FHN	RCT	NA	LVEDV, LVESV, RVEDV, RVESV, EF	12 months	120	125	42	45					Frequent dialysis also resulted in significant reductions in LVEDV (-11.0%; 95% CI, -16.1% to -5.5%), LVESV (-14.8%; 95% CI, -22.7 to -6.2%), and RVEDV (-11.6%; 95% CI, -19.0% to -3.6%). No significant difference in RVESV or ejection fraction (There was no significant change in ratio of LV mass to LVEDV.
Chan, 2013[8]	FHN	RCT	NA	LV mass/LVEDV (g/ml)	12 months	120	125	42	45	Baseline: Median 76 g/ml (Quartile1, Quartile3: 59.7, 102.5:) Final: Median 74.2 g/ml (Quartile1, Quartile3: 58.7, 108.7:)	Baseline: Median 80.4 g/ml (Quartile 1, Quartile3 : 56.9, 110.2:) Final: Median 78.4 g/ml (Quartile 1, Quartile3 : 58.2, 116.5:)	Baseline: Median 81.5 g/ml (Quartile1, Quartile3: 62.9, 137.7:) Final: Median 80.4 g/ml (Quartile1, Quartile3: 58.3, 120.1:)	Baseline: Median 77.7 g/ml (Quartile 1, Quartile3 : 58.4, 123:) Final: Median 76.5 g/ml (Quartile 1, Quartile3 : 54.5, 120.1:)	Arm1 vs Arm2: Mean difference: 3.42 (95% CI: -1.91 to 8.75), p=0.21 Arm1: Mean difference: -2.04 (95% CI:-6.11 to 2.02) Arm2: Mean difference: 1.38 (95% CI:-2.33 to 5.10) Arm3: Mean difference: -3.48 (95% CI:-10.55 to 3.59) Arm4: Mean difference: -4.97 (95% CI:-12.2 to 2.26)
Chan, 2012[15]	FHN	RCT	For daily and nocturnal intervention arms only LVM, g	LV mass	12 months	120	125	42	45					Arm2: Mean difference: -13.1 (95% CI: -21.3 to -5.0), p=0.002 Arm4: Mean difference: -10.9 (95% CI:-23.7 to 1.8), p=0.09 Arm2: Hazard Ratio: 0.61 (95% CI:0.46 to 0.82), p<0.001 Arm4: Hazard Ratio: 0.68 (95% CI:0.44 to 1.07), p=0.095

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	N, Arm3	N, Arm4	Outcome, Arm1	Outcome, Arm2	Outcome, Arm3	Outcome, Arm4	Treatment Effect
Chan, 2012[15]	FHN	RCT	Daily and nocturnal intervention arms only LVM/baseline BSA, g/m^2	LV mass	12 months	120	125	42	45		Final: Mean -6.9 (95% CI: -11.3 to -2.4)		Final: Mean -5.2 (95% CI: -11.4 to 1.0)	Arm2: Mean difference: -6.9 (95% CI: -11.3 to -2.4), p=0.003 Arm4: Mean difference: -5.2 (95% CI:-11.4 to 1.0), p=0.10 Arm2: HR: 0.65 (95% CI:0.49 to 0.87), p0.003 Arm4: HR: 0.74 (95% CI:0.48 to 4.46), p=0.19
Chan, 2012[15]	FHN	RCT	Daily and nocturnal intervention arms only, % change in geometric mean of LVM	LV mass	12 months	120	125	42	45		Final: Mean -7.0 (95% CI: -12.6 to -1.0)		Final: Mean -9.1 (95% CI: -17.0 to -0.5)	Arm2: Mean difference: -7.0 (95% CI: -12.6 to -1.0), p=0.02 Arm4: Mean difference: -9.1 (95% CI:-17.0 to -0.5), p=0.04 Arm2: HR: 0.64 (95% CI:0.48 to 0.85), p0.002 Arm4: HR: 0.63 (95% CI:0.40 to 0.99), p=0.04
Chan, 2012[15]	FHN	RCT	Daily and nocturnal intervention arms only, Age </ 50yr subgroup	LV mass	12 months	120	125	42	45					Arm2: Treatment effect: -20.1 (95% CI: -31.6 to -8.6), p=0.24 Arm4: Treatment effect: -14.2 (95% CI:-34.7 to 6.3), p=NR
Chan, 2012[15]	FHN	RCT	Daily and nocturnal intervention arms only,. Age > 50yr subgroup	LV mass	12 months	120	125	42	45					Arm2: Treatment effect: -5.8 (95% CI: -17.5 to 5.9), p=NR Arm4: Treatment effect: -8.3 (95% CI:-24.8 to 8.2), p=NR
Chan, 2012[15]	FHN	RCT	Daily and nocturnal intervention arms only, Gender Male subgroup	LV mass	12 months	120	125	42	45					Arm2: Treatment effect: -12.8 (95% CI: -23.1 to -2.5), p=0.73 Arm4: Treatment effect: -12.0 (95% CI:-27.7 to 3.7), p=NR

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	N, Arm3	N, Arm4	Outcome, Arm1	Outcome, Arm2	Outcome, Arm3	Outcome, Arm4	Treatment Effect
Chan, 2012[15]	FHN	RCT	Daily and nocturnal intervention arms only, Gender Female subgroup	LV mass	12 months	120	125	42	45					Arm2: Treatment effect: -13.9 (95% CI: -27.5 to -0.2), p=NR Arm4: Treatment effect: -8.8 (95% CI:-31.7 to 14.0), p=NR
Chan, 2012[15]	FHN	RCT	Daily and nocturnal intervention arms only, Diabetes Nondiabetic subgroup	LV mass	12 months	120	125	42	45					Arm2: Treatment effect: -20.2 (95% CI: -30.7 to -9.8), p=0.15 Arm4: Treatment effect: -13.3 (95% CI:-30.3 to 3.7), p=NR
Chan, 2012[15]	FHN	RCT	Daily and nocturnal intervention arms only, Diabetes Diabetic subgroup	LV mass	12 months	120	125	42	45					Arm2: Treatment effect: -2.9 (95% CI: -15.5 to 9.7), p=NR Arm4: Treatment effect: -7.8 (95% CI:-27.4 to 11.5), p=NR
Chan, 2012[15]	FHN	RCT	Daily and nocturnal intervention arms only, Race White subgroup	LV mass	12 months	120	125	42	45					Arm2: Treatment effect: -18.8 (95% CI: -34.2 to -3.3), p=0.43 Arm4: Treatment effect: -13.7 (95% CI:-33 to 5.5), p=NR
Chan, 2012[15]	FHN	RCT	Daily and nocturnal intervention arms only, Race Black subgroup	LV mass	12 months	120	125	42	45					Arm2: Treatment effect: -14.8 (95% CI: -27.4 to -2.3), p=NR Arm4: Treatment effect: -13.2 (95% CI:-38.5 to 12.0), p=NR

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	N, Arm3	N, Arm4	Outcome, Arm1	Outcome, Arm2	Outcome, Arm3	Outcome, Arm4	Treatment Effect
Chertow, 2016[21]	FHN-Daily	RCT	Extended follow up group >24 months	LV mass	>24 months (median of 3.6 years (10%-90% range 1.5-5.3 years)	61 people total had CMRI at 12 month and extended time period.		NA	NA		Baseline: Mean 142 (SD: 53.1) 12 months: Mean 138.1 (SD: 51.5) Final, >24months: Mean 137.6 (SD: 50.7)	Baseline: Mean 139.8 (SD: 55.3) 12 months: Mean 125.5 (SD: 46) Final, >24 months: Mean 124 (SD: 43.8)		(-8.7; 95% CI -17.9 to 0.5)
Chertow, 2010[3]	FHN	RCT	NA	LV mass	12 months	120	125	NA	NA		Baseline: Mean 141 (SD: 49) Final: Mean 138 (SD: 52)	Baseline: Mean 142 (SD: 59) Final: Mean 125 (SD: 46)		Arm1 vs Arm2: Mean difference -13.8 (95% CI: -21.8 to -5.8), p<0.001 Arm1: Mean difference -2.4 (SD: 25.9) Arm2: Mean difference -16.3 (SD: 35.3) Arm1: Adjusted mean change -2.6 (SD: 3.2) Arm2: Adjusted mean change -16.4 (SD: 2.9)

BSA=body surface area; CI=confidence interval; EF=ejection fraction; FHN=Frequent Hemodialysis Network trials; g=grams; g/m2=grams per meters squared; g/ml=grams per milliliter; HR=hazard ratio; LV=left ventricular; LVEDV=left ventricular end diastolic volume; LVESV=left ventricular end systolic volume; LVM=left ventricular mass; N=number; NA=not applicable; NR=not reported; RCT=randomized controlled trial; RVEDV=right ventricular end diastolic volume; RVESV=right ventricular end systolic volume; y=years; SD=standard deviation

Evidence Table 15. Continuous quality of life outcomes of studies comparing hemodialysis frequency in non-institutionalized patients

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	N, Arm3	N, Arm4	Outcome, Arm1	Outcome, Arm2	Outcome, Arm3	Outcome, Arm4	Treatment Effect	Comments
Chertow, 2010[3]	FHN	RCT	NA	physical health composite score	12 months	120	125	NA	NA	Baseline: Mean 38.5 (SD: 9.3) Final: Mean 38.5 (SD: 9.6)	Baseline: Mean 38.4 (SD: 11) Final: Mean 41.7 (SD: 10.7)			Arm1 vs Arm2: Mean difference: 3.2 (95% CI: 1 to 5.4, p=0.004 Arm1: Mean difference: 0.1 (SD: 8.7) Arm2: Mean difference: 3.3 (SD: 8.9) Arm1, Adjusted For: Mean difference: 0.2 (SD: 0.8) Arm1, Adjusted For: Mean difference: 3.4 (SD: 0.8)	Patients in the frequent-hemodialysis group had an increase in adjusted mean RAND-36 physical-health composite score of 3.4±0.8; the corresponding change in patients in the conventional-hemodialysis group was 0.2±0.8 (P = 0.004) (Fig. 3 in the Supplementary Appendix).
Chertow, 2016[21]	FHN	RCT	Extended follow up of trial population	Rand-36 health survey PHC	>24 months	43	45	NA	NA	Baseline: Mean 38.1 (SD: 9.7) Final, 12 months: Mean 38.5 (SD: 9.3) Final, >24 months: Mean 37.7 (SD: 10.3) Adjusted change from baseline: -0.6 (SE 1.1)	Baseline: Mean 38.1 (SD: 11.2) Final, 12 months: Mean 38.4 (SD: 11) Final, >24 months: Mean 39.3 (SD: 12.1) Adjusted change from baseline: -0.3 (SE 1.0)			Arm 1 vs. Arm 2: Treatment comparison (6x vs. 3x) 0.2 (-2.6 to 3.1), p=0.87)	Extended follow up group >24 months

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	N, Arm3	N, Arm4	Outcome, Arm1	Outcome, Arm2	Outcome, Arm3	Outcome, Arm4	Treatment Effect	Comments
Hall, 2012[19]	FHN	RCT	Daily trial	RAND-36 Physical functioning (PF) in Daily Trial	12 months	42	45	81	96			Baseline: Mean 8.2 (SD: 2.6) Final: Mean 7.9 (SD: 2.8) Adjusted mean change from baseline: -0.41 (SE 0.21)	Baseline: Mean 8.6 (SD: 2.6) Final: Mean 8.4 (SD: 2.8) Adjusted mean change from baseline: -0.20 (SE 0.19)	Arm3 vs. 4: Mean difference: 0.21 (95% CI: -0.34 to 0.76)	
Hall, 2012[19]	FHN	RCT	Daily trial	RAND-36 Physical functioning (PF) in Daily Trial	12 months	42	45	90	102	Baseline: (:) Final: (:)	Baseline: (:) Final: (:)	Baseline: Mean 61 (SD: 24.7) Final: Mean 59.1 (SD: 24.7) Adjusted mean change from baseline: 0.0 (SE 2.2)	Baseline: Mean 58.6 (SD: 27) Final: Mean 64 (SD: 27.7) Adjusted mean change from baseline: 4.5 (SE 2.1)	Arm3 vs. 4: Mean difference: 4.4 (95% CI: -1.3 to 10.2)	Table 2

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	N, Arm3	N, Arm4	Outcome, Arm1	Outcome, Arm2	Outcome, Arm3	Outcome, Arm4	Treatment Effect	Comments
Hall, 2012[19]	FHN	RCT	Daily trial	RAND-36 PHC Daily in-center	12 months	42	45	90	100			Baseline: Mean 38.4 (SD: 9.4) Final: Mean 38.6 (SD: 9.5) Adjusted mean change from baseline: 0.4 (SE 0.8)	Baseline: Mean 38.7 (SD: 11) Final: Mean 42.1 (SD: 10.8) Adjusted mean change from baseline: 3.4 (SE 0.8)	Arm3 vs. 4: Mean difference: 2.9 (95% CI: 0.8 to 5.1)	
Unruh, 2013[11]	FHN	RCT	NA	RAND-36 Emotional well-being	12 months	90	102			Baseline: Mean 77.6 (SD: 16.3) Final: Mean 75.6 (SD: 20.9) Adjusted mean change from baseline: -0.3 (SE 1.7)	Baseline: Mean 73.1 (SD: 22.5) Final: Mean 80.3 (SD: 17.5) Adjusted mean change from baseline: 5.2 (SE 1.6)			Arm1 vs Arm2: Treatment comparison (6x vs 3x) baseline to 12 months: 5.5 (1.3 to 9.8), p=<=0.05	

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	N, Arm3	N, Arm4	Outcome, Arm1	Outcome, Arm2	Outcome, Arm3	Outcome, Arm4	Treatment Effect	Comments
Unruh, 2013[11]	FHN	RCT		RAND-36 Energy/Fatigue	12 months	90	102			Baseline: Mean 51.2 (SD: 20.8) Final: Mean 51.6 (SD: 20.5) Adjusted mean change from baseline: 1.6 (SE 2.0)	Baseline: Mean 47.1 (SD: 25.2) Final: Mean 58.6 (SD: 23.4) Adjusted mean change from baseline: 10.0 (SE 1.9)			Arm1 vs Arm2: Treatment comparison (6x vs 3x), baseline to 12 months: 8.3 (3.2 to 13.5), p=<=-.01	
Chertow, 2016[21]	FHN	RCT	Extended follow up of trial population	Rand-36 health survey PHC	>24 months	43	45	NA	NA	Baseline: Mean 38.1 (SD: 9.7) Final, 12 months: Mean 38.5 (SD: 9.3) Final, >24 months: Mean 37.7 (SD: 10.3) Adjusted change from baseline: -0.6 (SE 1.1)	Baseline: Mean 38.1 (SD: 11.2) Final, 12 months: Mean 38.4 (SD: 11) Final, >24 months: Mean 39.3 (SD: 12.1) Adjusted change from baseline: -0.3 (SE 1.0)			Arm 1 vs. Arm 2: Treatment comparison (6x vs. 3x) 0.2 (-2.6 to 3.1), p=0.87)	Extended follow up group >24 months

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	N, Arm3	N, Arm4	Outcome, Arm1	Outcome, Arm2	Outcome, Arm3	Outcome, Arm4	Treatment Effect	Comments
Unruh, 2013[11]	FHN	RCT		RAND-36 Mental Health Composite	12 months	89	100			Baseline: Mean 46.0 (SD: 10.3) Final: Mean 45.7 (SD: 11.8)	Baseline: Mean 44.3 (SD: 13.0) Final: Mean 48.8 (SD: 11.4)	Baseline: Mean 45.9 (SD: 12.6) Final: Mean 45.6 (SD: 12.2)	Baseline: Mean 45.6 (SD: 10.5) Final: Mean 48.2 (SD: 11.7)	Arm1 vs Arm2: Treatment comparison (6x vs 3x), baseline to 12 months: 3.5 (95% CI: 95% CI (LL) to 95% CI (UL)), p=<=0.01 Arm3 vs Arm4: Treatment comparison (6x vs 3x), baseline to 12 months: 3.7 (95% CI: 95% CI (LL) to 95% CI (UL)), p=NR	
Unruh, 2013[11]	FHN	RCT	NA	RAND-36 Role limitation due to emotional problems	12 months	90	102			Baseline: Mean 78.4 (SD: 35.2) Final: Mean 77.1 (SD: 38.4) Adjusted change from baseline: -0.1 (SE 3.5)	Baseline: Mean 73.6 (SD: 38.1) Final: Mean 80.2 (SD: 36.1) Adjusted change from baseline: 3.6 (SE 3.3)			Arm1 vs Arm2: Treatment comparison (6x vs 3x), baseline to 12 months: 3.8 (95% CI: -5.1 to 12.7), p=	

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	N, Arm3	N, Arm4	Outcome, Arm1	Outcome, Arm2	Outcome, Arm3	Outcome, Arm4	Treatment Effect	Comments
Unruh, 2013[11]	FHN	RCT	NA	RAND-36 Social Functioning	12 months	90	102			Baseline: Mean 72.3 (SD: 25.5) Final: Mean 72.8 (SD: 29.5) Adjusted change from baseline: 0.9 (SE 2.5)	Baseline: Mean 70.4 (SD: 28.0) Final: Mean 76.8 (SD: 25.5) Adjusted change from baseline: 5.0 (SE 2.4)			Arm1 vs Arm2: Treatment comparison (6x vs 3x), baseline to 12 months: 4.1 (95% CI: -2.4 to 10.6), p=	
Garg, 2017[16]	FHN	RCT	Daily trial	feeling thermometer	12 months	81	96	NA	NA	Baseline: Mean 70.5 (SD: 17.1) Final: Mean 71.3 (SD: 20.8) Adjusted mean change from baseline: -0.6 (SD: 1.9)	Baseline: Mean 73.8 (SD: 18.8) Final: Mean 79 (SD: 14.1) Adjusted mean change from baseline: +5.8 (SD 1.7)			Arm1 vs. Arm 2: Mean difference: 6.4 (95% CI: 1.8 to 11.1), adjusted for baseline value	FHN Daily

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	N, Arm3	N, Arm4	Outcome, Arm1	Outcome, Arm2	Outcome, Arm3	Outcome, Arm4	Treatment Effect	Comments
Garg, 2017[16]	FHN	RCT	Daily trial	General health scale	12 months	3	106	NA	NA	Baseline: Mean 43.7 (SD: 21.5) Final: Mean 41.3 (SD: 21.5) Adjusted mean change from baseline: -3.35 (SD 1.95)	Baseline: Mean 46.8 (SD: 21.9) Final: Mean 52.4 (SD: 22.7) Adjusted mean change from baseline: 6.34 (SD 1.83)			Arm1 vs. Arm 2: Mean difference: 9.69 (95% CI: 4.68 to 14.7), adjusted for baseline value	FHN Daily
Garg, 2017[16]	FHN	RCT	Daily trial	HUI-3 score	12 months	92	106	NA	NA	Baseline: Mean 0.53 (SD: 0.38) Final: Mean 0.63 (SD: 0.36) Adjusted mean change from baseline: 0.09 (SD 0.03)	Baseline: Mean 0.57 (SD: 0.39) Final: Mean 0.6 (SD: 0.37) Adjusted mean change from baseline: 0.04 (SD 0.03)			Arm1 vs. Arm 2: Mean difference: -0.06 (95% CI: -0.14 to 0.02), adjusted for baseline value	FHN Daily

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	N, Arm3	N, Arm4	Outcome, Arm1	Outcome, Arm2	Outcome, Arm3	Outcome, Arm4	Treatment Effect	Comments
Garg, 2017[16]	FHN	RCT	Daily trial	Time to recovery (min)	12 months	86	102	NA	NA	Baseline: Median 120 (10%, 90% percentile: 0, 480) Final: Median: 180 (10%, 90% percentile: 15, 1440) Adjusted mean change from baseline: 46 (95% CI: -69 to 161)	Baseline: Median (10%, 90% percentile: 5, 1440) Final: Median: 60 (10%, 90% percentile: 0, 180) Adjusted mean change from baseline (95% CI): -79 (-83 to -74)			Arm1 vs. Arm 2: Mean difference: -84 (95% CI: -89 to -80), p<0.0001, adjusted for baseline value	FHN Daily

3x=3 times; 6x=6 times; CI=confidence interval; FHN=Frequent Hemodialysis Network trials; HUI-3= Health Utilities Index-3; LL=lower limit; min=minutes; N=number of patients; NA=not applicable; PF=physical functioning; PHC= Physical health composite; RAND-36= RAND-36 Measure of Health-Related Quality of Life; RCT=randomized controlled trial; SD=standard deviation; SE=standard error; UL=upper limit

Evidence Table 16. Continuous symptomatic measure outcomes of studies comparing hemodialysis frequency in non-institutionalized patients

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	Outcome, Arm1	Outcome, Arm2	Treatment Effect	Comments
Unruh, 2013[11]	FHN	RCT	Daily and Nocturnal trials	BDI	12 months	86	95	Baseline: Mean 12.4 (SD: 9.5) Final: Mean 12.1 (SD: 9.9) adjusted change from baseline: -0.6 (SE 0.7)	Baseline: Mean 12.6 (SD: 8.6) Final: Mean 10.7 (SD: 8.8) adjusted change from baseline: -1.9 (SE 0.7)	Arm1 vs Arm2: Treatment comparison (6x vs 3x), baseline to 12 months: -1.4 (95% CI: -3.2 to 0.5), p=NR	Daily arm 1 and 2, Nocturnal arm 3 and 4
Unruh, 2013[11]	FHN	RCT	NA	Cognitive subscale of BDI score	12 months	86	95	Baseline: Mean 7.0 (SD: 7.4) Final: Mean 6.9 (SD: 7.4) adjusted change from baseline: 0.4 (SE 0.6)	Baseline: Mean 7.1 (SD: 6.3) Final: Mean 6.3 (SD: 6.5) adjusted change from baseline: -1.0 (SE 0.5)	Arm1 vs Arm2: Treatment comparison, 6x vs 3x, baseline to 12 months: -0.6 (95% CI: -2.0 to 0.9), p=NR	
Unruh, 2016[18]	FHN	RCT	NA	SPI-II: primary sleep outcome in Daily Trial (Only available for 81% of eligible study participants)	12 months	76	93	Baseline: Mean 34.7 (SD: 19.4) Final: Mean 34 (SD: 22.8)	Baseline: Mean 35.2 (SD: 20.5) Final: Mean 30.9 (SD: 22.2)	Arm1: change at 12 months (SE): −1.2 ± 1.9 Arm2: change at 12 months (SE): −3.8 ± 1.8 Treatment comparison at 12 months (6x versus 3x):−2.6 (−7.5 to 2.3) Values adjusted for clinical center and baseline score.	the observed data (Table 3) is the comparison of Daily Trial frequent (6x week) vs. conventional (3x week)
Unruh, 2016[18]	FHN	RCT	NA	% SPI-II score in Daily Trial >47	12 months	76 (Calculated form Figure 1)	93 (Calculated form Figure 1)	Baseline: 4.3% Final: 3.5%	Baseline: 2.4% Final: 1.8%	NR	Figure 2: % of participants in Daily Trial with SPI II score >47 by time and treatment CATEGORICAL OUTCOME

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	Outcome, Arm1	Outcome, Arm2	Treatment Effect	Comments
Unruh, 2016[18]	FHN	RCT	NA	hours of sleep in Daily Trial	12 months	76 (Calculated form Figure 1)	93 (Calculated form Figure 1)	Baseline: Mean 5.98 (SD: 1.44) Final: Mean 5.89 (SD: 1.77)	Baseline: Mean 5.94 (SD: 1.82) Final: Mean 6.04 (SD: 1.77)	Arm1: change from baselin 12 months (SE): −0.05 ± 0.16 Arm2: change from baselin 12 months (SE): −0.02 ± 0.15 12 mo Treatment comparison (6× versus 3×) :0.02(−0.39 to 0.43)	Table 3: We compared between-group mean changes in scores from baseline to Month 12 for the MOS SPI-II using linear mixed effects models with an unstructured covariance matrix incorporating baseline, 4-month and 12-month scores for each measure. In accordance with prespecified analysis plans, we adjusted for the baseline score in both trials and for the clinical center in the Daily Trial There were no differences observed in self-reported snoring or number of naps at 4 or 12 months (Supplementary data, Appendix). The effects of frequent hemodialysis on quality of sleep did not significantly differ according to age, sex, race/ethnicity, ESRD vintage, current or former smoking or score on the BDI

3x=3 times; 6x=6 times; BDI=Beck's Depression Inventory; CI=confidence interval; ESRD= End-stage renal disease; FHN=Frequent Hemodialysis Network trials; MOS=Medical Outcomes Study; N=number of patients; NA=not applicable; NR=not reported; RCT=randomized controlled trial; SD=standard deviation; SE=standard error; SPI-II= Medical Outcomes Study Sleep Problems Index-II

Evidence Table 17. Categorical cardiovascular mortality outcomes of studies comparing hemodialysis frequency in non-institutionalized patients

Author, year	Study name	Study design	Subgroup	Outcome definition	Follow up	N, Arm1	N, Arm2	N, Arm3	N, Arm4	n / N (%), Arm1	n / N (%), Arm2	n / N (%), Arm3	n / N (%), Arm4	Treatment Effect	Comments
Weinhandl, 2012[38]	NR	Observational: retrospective	NA	CVD mortality rate	48 months	9365	1873	262249	NA	Baseline: NR Final: NR	Baseline: NR Final: NR	NR	NR	Arm1 vs Arm2: HR = 0.92 (95% CI: 0.78 to 1.09), p=0.34	Referent: matched thrice-weekly in-center patients.

CI=confidence interval; CVD=cardiovascular disease; HR=hazard ratio; N=number of total patients; n=number of sample patients; NA=not applicable; NR=not reported

Evidence Table 18. Categorical infection mortality outcomes of studies comparing hemodialysis frequency in non-institutionalized patients

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm 1	N, Arm 2	N, Arm 3	N, Arm 4	n / N (%), Arm1	n / N (%), Arm2	n / N (%), Arm3	n / N (%), Arm4	Treatment Effect	Comments
Weinhandl, 2012[38]	NR	Observational: retrospective	NA	Infection mortality rate	48 months	9365	1873	262249	NA	Baseline: NR Final: NR	Baseline: NR Final: NR	NR	NR	Arm1 vs Arm2: HR = 1.13 (95% CI: 0.84 to 1.53), p=0.41	

CI=confidence interval; HR=hazard ratio; N=number of total patients; n=number of sample patients; NA=not applicable; NR=not reported

Evidence Table 19. Categorical all cause mortality outcomes of studies comparing hemodialysis frequency in non-institutionalized patients

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	N, Arm3	N, Arm4	n / N (%), Arm1	n / N (%), Arm2	n / N (%), Arm3	n / N (%), Arm4	Treatment Effect	Comments
Chertow, 2010[40]	FHN-Daily	RCT	NA	Overall mortality rate	12 months	120	125	NA	NA	Final: 9	Final: 5			NR	Of the 5 patients in the frequent hemodialysis group who died, 4 died suddenly, and the fifth died from hemorrhage (from the vascular access). In the conventional-hemodialysis group, 3 patients died suddenly, and 1 each died from myocardial infarction, stroke, sepsis, lung cancer, hemorrhage (from the gastrointestinal tract), and enterocolitis.
Chertow, 2016[21]	FHN-Daily	RCT	Extended follow up of trial population	Overall mortality rate	>24 months	120	125	NA	NA	Final: 0.082 deaths per patient-year	Final: 0.043 deaths per patient-year			Arm1, Full Follow-up: HR 0.54 (95% CI: 0.31 to 0.93), p=0.024 Arm1, Censor Kidney transplant: HR 0.56 (95% CI: 0.32 to 0.99), p=0.043	
Mathew, 2016[34]	NR	Observational: retrospective	NA	Overall mortality rate	4 years	50162	160	434	NA	Final: Mean: 17.8 deaths per 100 person years	Final: Mean: 17.6 deaths per 100 person years	Final: Mean: 35.2 deaths per 100 person years		Arm2: HR: 1.56 (95% CI: 1.21 to 2.03), p=NR	
Johansen, 2009[32]	NR	Retrospective cohort	NA	Overall mortality rate	2 years or greater than 2 years	43		430		139 per 1000 patient-ears		91 per 1000patient-ears		HR: 0.64; 95% CI: 0.31 to 1.31; p=0.22	

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	N, Arm3	N, Arm4	n / N (%), Arm1	n / N (%), Arm2	n / N (%), Arm3	n / N (%), Arm4	Treatment Effect	Comments
Weinhandl, 2012[38]	NR	Observational: retrospective	NA	Overall mortality rate	48 months	9365	1873	262249	NA					Arm1 vs Arm2: HR = 0.87 (95% CI: 0.78 to 0.97), p=0.01	Intention to treat analyses. Kaplan meier curves - Figure 1 - Survival percentages in DHHD versus in-center patients were 89.4% versus 87.4% at 1 year, 80.1% versus 77.8% at 2 years, and 72.9% versus 69.8% at 3 years. The difference in survival estimates was significant (log-rank test P=0.01). additional cause specific outcomes included cachexia/dialysis withdrawal (95%CI: 0.63 (0.41–0.95), p=0.03); other specified cause: 1.06 (0.81–1.37), p=0.69; unknown cause: 0.59 (0.44–0.79), p<0.01 Did not abstract interval specific mortality (i.e., 1-6 mo; 7-12months,
Weinhandl, 2012[38]	NR	Observational: retrospective	Age <52 yr	Overall mortality rate	48 months	9365	1873	262249	NA					Arm1 vs Arm2: 0.96 (95% CI: 0.79 to 1.2), p=NR	All subgroup analyses drawn from Figure 2 (95% CI obtained from digitizer program)
Weinhandl, 2012[38]	NR	Observational: retrospective	> 52 yr	Overall mortality rate	48 months	9365	1873	262249	NA					Arm1 vs Arm2: 0.84 (95% CI: 0.74 to 0.96), p=NR	All subgroup analyses drawn from Figure 2 (95% CI obtained from digitizer program)
Weinhandl, 2012[38]	NR	Observational: retrospective	Race: black	Overall mortality rate	48 months	9365	1873	262249	NA					Arm1 vs Arm2: 0.86 (95% CI: 0.67 to 1.11), p=NR	All subgroup analyses drawn from Figure 2 (95% CI obtained from digitizer program)

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	N, Arm3	N, Arm4	n / N (%), Arm1	n / N (%), Arm2	n / N (%), Arm3	n / N (%), Arm4	Treatment Effect	Comments
Weinhandl, 2012[38]	NR	Observational: retrospective	Race: other	Overall mortality rate	48 months	9365	1873	262249	NA					Arm1 vs Arm2: 0.86 (95% CI: 0.76 to 0.97), p=NR	All subgroup analyses drawn from Figure 2 (95% CI obtained from digitizer program)
Weinhandl, 2012[38]	NR	Observational: retrospective	Women	Overall mortality rate	48 months	9365	1873	262249	NA					Arm1 vs Arm2: 0.80 (95% CI: 0.66 to 0.97), p=NR	All subgroup analyses drawn from Figure 2 (95% CI obtained from digitizer program)
Weinhandl, 2012[38]	NR	Observational: retrospective	Men	Overall mortality rate	48 months	9365	1873	262249	NA					Arm1 vs Arm2: 0.91 (95% CI: 0.79 to 1.04), p=NR	All subgroup analyses drawn from Figure 2 (95% CI obtained from digitizer program)
Weinhandl, 2012[38]	NR	Observational: retrospective	No CVD	Overall mortality rate	48 months	9365	1873	262249	NA					Arm1 vs Arm2: 0.80 (95% CI: 0.65 to 0.99), p=NR	All subgroup analyses drawn from Figure 2 (95% CI obtained from digitizer program)
Weinhandl, 2012[38]	NR	Observational: retrospective	Yes CVD	Overall mortality rate	48 months	9365	1873	262249	NA					Arm1 vs Arm2: 0.85 (95% CI: 0.75 to 0.97), p=NR	All subgroup analyses drawn from Figure 2 (95% CI obtained from digitizer program)
Weinhandl, 2012[38]	NR	Observational: retrospective	No DM	Overall mortality rate	48 months	9365	1873	262249	NA					Arm1 vs Arm2: 0.94 (95% CI: 0.80 to 1.11), p=NR	All subgroup analyses drawn from Figure 2 (95% CI obtained from digitizer program)

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	N, Arm3	N, Arm4	n / N (%), Arm1	n / N (%), Arm2	n / N (%), Arm3	n / N (%), Arm4	Treatment Effect	Comments
Weinhandl, 2012[38]	NR	Observational: retrospective	Yes DM	Overall mortality rate	48 months	9365	1873	262249	NA					Arm1 vs Arm2: 0.81 (95% CI: 0.70 to 0.95), p=NR	All subgroup analyses drawn from Figure 2 (95% CI obtained from digitizer program)
Weinhandl, 2012[38]	NR	Observational: retrospective	BMI<27	Overall mortality rate	48 months	9365	1873	262249	NA					Arm1 vs Arm2: HR 0.96 (95% CI: 0.83 to 1.10), p=NR	All subgroup analyses drawn from Figure 2 (95% CI obtained from digitizer program)
Weinhandl, 2012[38]	NR	Observational: retrospective	BMI>27	Overall mortality rate	48 months	9365	1873	262249	NA					Arm1 vs Arm2: HR 0.77 (95% CI: 0.65 to 0.92), p=NR	All subgroup analyses drawn from Figure 2 (95% CI obtained from digitizer program)
Weinhandl, 2012[38]	NR	Observational: retrospective	ESRD duration <3 yr	Overall mortality rate	48 months	9365	1873	262249	NA					Arm1 vs Arm2: HR 0.91 (95% CI: 0.78 to 1.06), p=NR	All subgroup analyses drawn from Figure 2 (95% CI obtained from digitizer program)

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	N, Arm3	N, Arm4	n / N (%), Arm1	n / N (%), Arm2	n / N (%), Arm3	n / N (%), Arm4	Treatment Effect	Comments
Weinhandl, 2012[38]	NR	Observational: retrospective	ESRD duration >3 yr	Overall mortality rate	48 months	9365	1873	262249	NA					Arm1 vs Arm2: HR 0.83 (95% CI: 0.71 to 0.97), p=NR	All subgroup analyses drawn from Figure 2 (95% CI obtained from digitizer program)
Weinhandl, 2012[38]	NR	Observational: retrospective	DHHD initiation year 2005 or 2006	Overall mortality rate	48 months	9365	1873	262249	NA					Arm1 vs Arm2: HR 0.93 (95% CI: 0.81 to 1.07), p=NR	All subgroup analyses drawn from Figure 2 (95% CI obtained from digitizer program)
Weinhandl, 2012[38]	NR	Observational: retrospective	DHHD initiation year 2007	Overall mortality rate	48 months	9365	1873	262249	NA					Arm1 vs Arm2: HR 0.78 (95% CI: 0.65 to 0.94), p=NR	All subgroup analyses drawn from Figure 2 (95% CI obtained from digitizer program)
Weinhandl, 2012[38]	NR	Observational: retrospective	MPP: no	Overall mortality rate	48 months	9365	1873	262249	NA					Arm1 vs Arm2: HR 0.76 (95% CI: 0.54 to 1.09), p=NR	All subgroup analyses drawn from Figure 2 (95% CI obtained from digitizer program)

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	N, Arm3	N, Arm4	n / N (%), Arm1	n / N (%), Arm2	n / N (%), Arm3	n / N (%), Arm4	Treatment Effect	Comments
Weinhandl, 2012[38]	NR	Observational: retrospective	MPP: yes Medicare as primary payer	Overall mortality rate	48 months	9365	1873	262249	NA					Arm1 vs Arm2: HR 0.88 (95% CI: 0.79 to 0.99), p=NR	All subgroup analyses drawn from Figure 2 (95% CI obtained from digitizer program)

BMI=body mass index; CI=confidence interval; CVD=cardiovascular disease; DHHD=daily home hemodialysis; DM=Diabetes mellitus; ESRD= End-stage renal disease; HR=hazard ratio; MPP= Medicare as primary payer; N=number of total patients; n=number of sample patients; NA=not applicable; NR=not reported; yr=years

Evidence Table 20. Continuous weight outcomes of studies comparing hemodialysis frequency in non-institutionalized patients

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	N, Arm3	N, Arm4	Outcome, Arm1	Outcome, Arm2	Outcome, Arm3	Outcome, Arm4	Treatment Effect
Kaysen, 2012[13]	FHN	RCT	NA	Body cell mass (kg)	12 months			120	125			Baseline: Mean 26.6 (SD: 8.2) Final: Mean 27.3 (SD: 7.7)	Baseline: Mean 27.7 (SD: 8.8) Final: Mean 27.3 (SD: 9.3)	Arm3 vs Arm4: Treatment Comparison (6x vs. 3x), baseline to 12 months, Daily: -0.23 (95% CI: -1.03 to 0.56), p=0.56
Kaysen, 2012[13]	FHN	RCT	NA	Adiposity (%)	12 months			120	125			Baseline: Mean 37.6 (SD: 13.7) Final: Mean 37.3 (SD: 12.8)		Arm3 vs Arm4: 1.85: Treatment Comparison (6x vs. 3x), baseline to 12 months, Daily (95% CI: to -0.34), p=0.76
Kaysen, 2012[13]	FHN	RCT	NA	Adiposity (%)	12 months			120	125			Baseline: Mean 37.6 (SD: 13.7) Final: Mean 37.3 (SD: 12.8)		Arm3 vs Arm4: 1.85: Treatment Comparison (6x vs. 3x), baseline to 12 months, Daily (95% CI: to -0.34), p=0.76
Kaysen, 2012[13]	FHN	RCT	NA	Lean body mass (kg)	12 months			120	125			Baseline: Mean 44.0 (SD: 10.2) Final: Mean 45.0 (SD: 9.6)	Baseline: Mean 44.6 (SD: 9.8) Final: Mean 43.2 (SD: 10.3)	Arm3 vs Arm4: Treatment Comparison (6x vs. 3x), baseline to 12 months, Daily: −1.26 (95% CI: −2.12 to −0.41), p=0.004

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	N, Arm3	N, Arm4	Outcome, Arm1	Outcome, Arm2	Outcome, Arm3	Outcome, Arm4	Treatment Effect
Kaysen, 2012[13]	FHN	RCT	NA	Postdialysis weight	12 months			120	125			Baseline: Mean 78.9 (SD: 19.76) Final: Mean 79.19 (SD: 19.86) Adjusted mean change: 0.23 (SE 0.45)	Baseline: Mean 77.0 (SD: 20.84) Final: Mean 78.15 (SD: 21.2) Adjusted mean change: 0.85 (SE 0.43)	Arm3 vs Arm4: Treatment comparison baseline to 12 months, Daily: 0.62 (95% CI: −0.59 to 1.83), p=0.32
Kaysen, 2012[13]	FHN	RCT	NA	Predialysis weight	12 months			120	125			Baseline: Mean 81.75 (SD: 20.26) Final: Mean 81.97 (SD: 20.37) Adjusted mean change: 0.15 (SE 0.38)	Baseline: Mean 80.17 (SD: 21.26) Final: Mean 80.28 (SD: 21.51) Adjusted mean change: -0.06 (SE 0.36)	Arm3 vs Arm4: Treatment effect (6x vs 3x) in 12 months, Daily: −0.21 (95% CI: −1.24 to 0.82), p=0.69
Kaysen, 2012[13]	FHN	RCT	NA	Extra-cellular water (L)	12 months			120	125			Baseline: Mean 22.9 (SD: 4.7) Final: Mean 23.4 (SD: 4.9)	Baseline: Mean 22.7 (SD: 4.4) Final: Mean 21.6 (SD: 4.4)	Arm3 vs Arm4: Treatment comparison from 6x to 3x, baseline to 12 months, Daily: −1.12 (95% CI: −1.83 to −0.41), p=0.002
Kaysen, 2012[13]	FHN	RCT	NA	Intracellular water (L)	12 months			120	125			Baseline: Mean 21.0 (SD: 6.5) Final: Mean 21.6 (SD: 6.1)	Baseline: Mean 21.9 (SD: 6.9) Final: Mean 21.5 (SD: 7.4)	Arm3 vs Arm4: Treatment comparison, 6x to 3x, baseline to 12 months, Daily Trial: −0.19 (95% CI: −0.81 to 0.44), p=0.562

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	N, Arm3	N, Arm4	Outcome, Arm1	Outcome, Arm2	Outcome, Arm3	Outcome, Arm4	Treatment Effect
Kaysen, 2012[13]	FHN	RCT	NA	Kinetic Volume	12 months			120	125			Baseline: Mean 36.2 (SD: 8.6) Final: Mean 37.1 (SD: 8.5)	Baseline: Mean 36.8 (SD: 9.5) Final: Mean 35.6 (SD: 9.1)	Arm3 vs Arm4: Treatment comparison, baseline to 12 months, 6x to 3x, Daily: -1.55 (95% CI: -2.8 to -0.29), p=0.02
Kaysen, 2012[13]	FHN	RCT	NA	Phase angle (degrees)	12 months			120	125			Baseline: Mean 5.21 (SD: 1.21) Final: Mean 5.34 (SD: 1.58)	Baseline: Mean 5.65 (SD: 1.74) Final: Mean 5.78 (SD: 1.96)	Arm3 vs Arm4: Treatment comparison, baseline to 12 months, Nocturnal: −0.05 (95% CI: −0.66 to 0.56), p=0.87
Kaysen, 2012[13]	FHN	RCT	NA	Reactance (ohms)	12 months			120	125			Baseline: Mean 48.2 (SD: 12.6) Final: Mean 47.4 (SD: 15.2)	Baseline: Mean 48.9 (SD: 14.1) Final: Mean 53.3 (SD: 15.3)	Arm3 vs Arm4: Treatment comparison baseline to 12 months, Daily: 5.2 (95% CI: 1.3 to 9.2), p=0.010
Kaysen, 2012[13]	FHN	RCT	NA	Resistance (ohms)	12 months			120	125			Baseline: Mean 488 (SD: 99) Final: Mean 466 (SD: 91)	Baseline: Mean 460 (SD: 89) Final: Mean 492 (SD: 93)	Arm3 vs Arm4: Treatment comparison 6x to 3x, 12 months to baseline, Daily: 30.4 (95% CI: 11.1 to 49.6), p=0.002

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	N, Arm3	N, Arm4	Outcome, Arm1	Outcome, Arm2	Outcome, Arm3	Outcome, Arm4	Treatment Effect
Kaysen, 2012[13]	FHN	RCT	NA	Total body water	12 months			120	125			Baseline: Mean 43.9 (SD: 10.2) Final: Mean 44.9 (SD: 9.6)	Baseline: Mean 44.5 (SD: 9.7) Final: Mean 43.1 (SD: 10.2)	Arm3 vs Arm4: Treatment comparison from baseline to 12 months, 6x to 3x, Daily: -1.3 (95% CI: -2.1 to -0.4), p=0.004
Kaysen, 2012[13]	FHN	RCT	NA	Vector Length	12 months			120	125			Baseline: Mean 291.8 (SD: 64.2) Final: Mean 278.1 (SD: 58.2)	Baseline: Mean 278.0 (SD: 61.1) Final: Mean 297.4 (SD: 65.2)	Arm3 vs Arm4: Treatment comparison, baseline to 12 months, 6x to 3x, Daily: 19.6 (95% CI: 7.6 to 31.6), p=0.0015
Raimann, 2016[6]	FHN	RCT	NA	time-integrated estimate of ECF load (TIFL)	12 months	120	125			Baseline: Mean 10.57 (SD: 3.68) Final: Mean 9.34 (SD: 3.57)	Baseline: Mean 10.28 (SD: 4.13) Final: Mean 6.01 (SD: 3.2)			Arm1 vs Arm2: Mean difference: -2.97 (95% CI: -3.79 to -2.15, p<0.001 Arm1: Mean difference: -1.01 (95% CI: -1.66 to -0.36) Arm2: Mean difference: -3.99 (95% CI:-4.60 to -3.38)

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	N, Arm3	N, Arm4	Outcome, Arm1	Outcome, Arm2	Outcome, Arm3	Outcome, Arm4	Treatment Effect
Raimann, 2016[6]	FHN	RCT	NA	interdialytic weight gain (IDWG)	12 months	120	125			Baseline: Mean 3.14 (SD: 0.96) Final: Mean 3.1 (SD: 1.04)	Baseline: Mean 3.16 (SD: 0.99) Final: Mean 2.11 (SD: 0.86)			Arm1 vs Arm2: Mean difference: -0.95 (95% CI: -1.12 to -0.78, p<0.001 Arm1: Mean difference: -0.07 (95% CI: -0.2 to 0.06) Arm2: Mean difference: -1.03 (95% CI:-1.2 to -0.9)
Raimann, 2016[6]	FHN	RCT	NA	interdialytic weight gain (IDWG)	12 months	120	125							In the Daily Trial, there were significant interactions between the assigned modality and the residual UVol; patients with lower residual UVol exhibited more pronounced effects on IDWG and TIFL. The slope estimates for IDWG were 1.2 liter × days per liter/day residual UVol (p = 0.03) and 4.7 liter × days per liter/day residual UVol (p = 0.02) for TIFL.

%=percentage; 3x=3 times; 6x=6 times; CI=confidence interval; ECF=extracellular fluid; FHN=Frequent Hemodialysis Network trials; kg=kilograms; IDWG= Interdialytic weight gain; L=liters; N=number of patients; NA=not applicable; RCT=randomized controlled trial; SD=standard deviation; SE=standard error; TIFL=Time-integrated estimate of extracellular fluid load; UVol= Urine volume

Evidence Table 21. Continuous other outcomes of studies comparing hemodialysis frequency in non-institutionalized patients

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	N, Arm3	N, Arm4	Outcome, Arm1	Outcome, Arm2	Outcome, Arm3	Outcome, Arm4	Treatment Effect	Comments
Chan, 2012[15]	FHN	RCT	NA	Predialysis Heart rate, /min	12 months	120	125	42	45	Baseline: NR Final: Mean -0.4 (SD: 1.4)	Baseline: NR Final: Mean 2.9 (SD: 1.3)	Baseline: NR Final: Mean 0.5 (SD: 2.4)	Baseline: NR Final: Mean 4.0 (SD: 2.4)	Arm1 vs Arm2: p=0.06 Arm3 vs Arm4: p=0.27 Arm1: Mean difference: -0.4 (SD: 1.4) Arm2: Mean difference: 2.9 (SD: 1.3) Arm3: Mean difference: 0.5 (SD: 2.4) Arm4: Mean difference: 4.0 (SD: 2.4)	
Johansen, 2009[32]	NR	Retrospective cohort		Composite moratlity or major morbitity	2 years or greater than 2 years	43		430						HR, 0.83; 95% CI: 0.42 to 1.65. p=0.60	
Lo, 2017[17]	FHN	RCT	NA	prolactin, ng/ml	12 months	91	86			Baseline: Median 64.3 (IQR: 34.9 to 108.7) Final: Median 45.8 (IQR: 29.0 to 90.4)	Baseline: Median 59.7 (IQR: 40.5 to 99.1) Final: Median 58.4 (IQR: 36.0 to 110.1)			Arm1 vs Arm2: treatment effect: -1% (95% CI: -26.7% to 33.5%, p=0.95 Arm1: Mean difference: -14.6% adjusted mean change from baseline (95% CI: -33.1% to 8.9%) Arm2: Mean difference: -15.5% adjusted mean change from baseline (95% CI:-34.6% to 9.1%)	
Kurella, 2013[12]	FHN	RCT	Daily	3MS, MMSE	12 months	101	117			Baseline: Mean 87 (SD: 10) Final: Mean 89 (SD: 9)	Baseline: Mean 87 (SD: 9) Final: Mean 89 (SD: 10)			Mean difference: +0.2 (-1.8 to 2.2)	figure 3 and maybe figure 1 and s1 give numbers of f/u

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	N, Arm3	N, Arm4	Outcome, Arm1	Outcome, Arm2	Outcome, Arm3	Outcome, Arm4	Treatment Effect	Comments
Kurella, 2013[12]	FHN	RCT	daily	Improvement in trail B score	12 months	101	117							Arm1 vs Arm2: OR 0.99 (95% CI: 0.59 to 1.66), p=NR	
Kurella, 2013[12]	FHN	RCT	daily	Extended cognitive battery	12 months	31	28							No significant differences in tests of attention or psychomotor speed. Significantly larger improvements in Rey Auditory Verbal Learning Test Immediate Recall and the Controlled Oral Word Association Tests	
Chertow, 2010[3]	FHN	RCT	NA	failure to complete trail making test part B in 5 min	12 months	120	125	NA	NA	6 months, counts: 22 (Proportion: 27.2) Final, counts: 19 (Proportion: 23.5)	6 months, Counts: 25 (Proportion: 26.3) Final, Counts: 23 (Proportion: 24.2)			Arm1 vs Arm2: RR 0.99 (95% CI: 0.81 to 1.21), p=0.27	table 3 - P values for the number of antihypertensive agents and the failure to complete the Trail Making Test Part B in 5 minutes were calculated with the use of exact Wilcoxon rank-sum tests, stratified according to quartiles of the corresponding baseline values.

3MS= Modified Mini-Mental State Examination; /min=per minute; CI=confidence interval; FHN=Frequent Hemodialysis Network trials; f/u=followup; MMSE= Mini-Mental State Examination; N=number of patients; NA=not applicable; ng/ml=nanograms per milliliter; NR=not reported; OR=odds ratio; RCT=randomized controlled trial; RR=relative risk; SD=standard deviation

Evidence Table 22. Continuous albumin outcomes of studies comparing hemodialysis duration in non-institutionalized patients

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	N, Arm3	N, Arm4	Outcome, Arm1	Outcome, Arm2	Outcome, Arm3	Outcome, Arm4	Treatment Effect
Lacson, 2012[28]	NR	Observational: prospective	Pre-conversion to INHD, a subset of 725 patients (97% of intervention group)	Albumin level	180 days	2062	746	NA	NA	Baseline: NR Final: Increase in albumin, not described whether mean/median: 0.2	Baseline: NR Final: Increase in albumin, not described whether mean/median: 0.6			NR

INHD=in-center nocturnal hemodialysis; N=number of patients; NA=not applicable; NR=not reported

Evidence Table 23. Continuous hemoglobin outcomes of studies comparing hemodialysis duration in non-institutionalized patients

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	N, Arm3	N, Arm4	Outcome, Arm1	Outcome, Arm2	Outcome, Arm3	Outcome, Arm4	Treatment Effect
Lacson, 2012[28]	NR	Observational: prospective	Pre-conversion to INHD, a subset of 725 patients (97% of intervention group)	Hemoglobin level	180 days	2062	746	NA	NA					Arm1, Change in hemoglobin, no mean/median described: 0.1 Arm2, Change in hemoglobin, no mean/median described: 0.4

INHD=in-center nocturnal hemodialysis; N=number of patients; NA=not applicable; NR=not reported

Evidence Table 24. Continuous phosphorous outcomes of studies comparing hemodialysis duration in non-institutionalized patients

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	N, Arm3	N, Arm4	Outcome, Arm1	Outcome, Arm2	Outcome, Arm3	Outcome, Arm4	Treatment Effect	Comments
Lacson, 2012[28]	NR	Observational: prospective	Subgroup of 725 patients with data prior to conversion from CHD to nocturnal HD (97% of full nocturnal group)	Phosphorus level	180 days	2062	746	NA	NA	Baseline: not stated whether mean or median 5.75 Final: not stated whether mean or median 5.85	Baseline: not stated whether mean or median 5.73 Final: not stated whether mean or median 5.02			Arm2: p<0.001	Described p-values for WBC's, but no data presented.
Troidle, 2007[29]	NR	Observational: prospective	NA	Phosphorus level	NR	14	NA	NA	NA	Baseline: Mean 5.3 (SD: 1.27) Final, 6 months: NR	Baseline: NR Final, 4 months: Mean 4.4 (SD: 1.1)			Arm1 vs Arm2: p=0.049	Serum phosphorus (mg/dL), pre-post comparison, p=0.049

CHD=conventional hemodialysis; HD=hemodialysis; mg/dL=milligrams per deciliter; N=number of patients; NA=not applicable; NR=not reported; WBC=white blood cells

Evidence Table 25. Continuous calcium outcomes of studies comparing hemodialysis duration in non-institutionalized patients

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	N, Arm3	N, Arm4	Outcome, Arm1	Outcome, Arm2	Outcome, Arm3	Outcome, Arm4	Treatment Effect	Comments
Lacson, 2012[28]	NR	Observational: prospective	Pre-conversion to INHD, a subset of 725 patients (97% of intervention group)	Calcium	180 days	2062	746	NA	NA	Baseline: NR Final: NR	Baseline: NR Final: Mean 0.1-0.2 increase in mean serum calcium			Arm2: p=<0.001	not described, between baseline and 180 days for subgroup after conversion
Troidle, 2007[29]	NR	Observational: prospective	NA	Serum calcium (mg/dL)	6 months	14	NA	NA	NA	Baseline: Mean 9.3 (SD: 1.0) Final: NR	Baseline: NR Final: Mean 9.3 (SD: 0.81)			Pre-post comparison, p=0.94	Pre-post comparison, p=0.94

INHD=in-center nocturnal hemodialysis; mg/dL=milligrams per deciliter; N=number of patients; NA=not applicable; NR=not reported; SD=standard deviation

Evidence Table 26. Categorical compliance outcomes of studies comparing hemodialysis duration in non-institutionalized patients

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	n / N (%), Arm1	n / N (%), Arm2	Treatment Effect	Comments
Dember, 2019[26]	TiME	RCT	Full Analysis Population	Compliance and adherence	36 months	6498	5007	Baseline: NR Final: 3305/3966 (83.3)	Baseline: NR Final: 2526/3069 (82.3)	NR	
Dember, 2019[26]	TiME	RCT	the primary analysis population excluded patients who had, at baseline, an estimated body water volume .42.5 L as determined by the Watson formula	Compliance and adherence	36 months	6498	5007	Baseline: NR Final: 2103/2532 (83.1)	Baseline: NR Final: 1584/1938 (81.7)	NR	
Dember, 2019[26]	TiME	RCT	NA	Compliance and adherence	Mean 13.2 months	6498	5007	Baseline: NR Final: 2103/2532 (83.1)	Baseline: NR Final: 1584/1938 (81.7)	Arm1 vs Arm2: RR 0.99 (95% CI: 0.85 to 1.16), p=0.94	Missed dialysis sessions. data from primary analysis population

CI=confidence interval; L=liters; N=number of total patients; n=number of sample patients; NA=not applicable; NR=not reported; RCT=randomized controlled trial; RR=relative risk; TiME=Time to Reduce Mortality in ESRD

Evidence Table 27. Continuous compliance outcomes of studies comparing hemodialysis duration in non-institutionalized patients

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	Outcome, Arm1	Outcome, Arm2	Effect
Dember, 2019[26]	TiME	RCT	Full Analysis Population	Compliance and adherence	36 months	6498	5007			Arm1: Missed dialysis sessions per 100 patient-years: 1351 (1237-1475) per 100 patient-yr Arm2: Missed dialysis sessions per 100 patient-years: 1285 (1169-1413) per 100 patient-yr
Dember, 2019[26]	TiME	RCT	the primary analysis population excluded patients who had, at baseline, an estimated body water volume .42.5 L as determined by the Watson formula	Compliance and adherence	36 months	6498	5007			Arm2: Rate ratio of missed dialysis sessions: 0.99 (0.85-1.16)
Dember, 2019[26]	TiME	RCT	Full Analysis Population	Compliance and adherence	36 months	6498	5007			Arm2: Rate ratio Missed dialysis sessions: 0.95 (0.84-1.08)
Dember, 2019[26]	TiME	RCT	the primary analysis population excluded patients who had, at baseline, an estimated body water volume .42.5 L as determined by the Watson formula	Compliance and adherence	36 months	6498	5007			Arm1: Missed dialysis sessions per 100 patient-years: 1253 (1133-1386) per 100 patient-yr Arm2: Missed dialysis sessions per 100 patient-years: 1246 (1103-1407) per 100 patient-yr

L=liters; N=number of patients; patient-yr=patient-years; RCT=randomized controlled trial; TiME=Time to Reduce Mortality in ESRD

Evidence Table 28. Categorical hospitalization outcomes of studies comparing hemodialysis duration in non-institutionalized patients

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	n (%), Arm1	n (%), Arm2	Treatment Effect	Comments
Dember, 2019[26]	TiME	RCT	NA	Hospitalization rate	Mean 13.2 months	6498	5007	Final, counts: 1792 (70.8)	Final, Counts: 1.64 (70.4)	Arm1 vs Arm2: RR 0.96 (95% CI: 0.86 to 1.06), p=0.40	Data from primary analysis population
Dember, 2019[26]	TiME	RCT	the primary analysis population excluded patients who had, at baseline, an estimated body water volume .42.5 L as determined by the Watson formula	Hospitalizations	36 months	6498	5007	Final, counts: 1792 (70.8)	Final, Counts: 1364 (70.4)	Arm1 vs Arm2: HR 0.95 (95% CI: 0.87 to 1.05), p=NR	
Dember, 2019[26]	TiME	RCT	Full Analysis Population	Hospitalizations	36 months	6498	5007	Final, counts: 2751 (69.4)	Final, Counts: 2116 (68.9)	Arm1 vs Arm2: HR 0.98 (95% CI: 0.9 to 1.06), p=NR	

CI=confidence interval; HR=hazard ratio; L=liters; N=number of total patients; n=number of sample patients; NA=not applicable; NR=not reported; RCT=randomized controlled trial; TiME=Time to Reduce Mortality in ESRD

Evidence Table 29. Continuous hospitalization outcomes of studies comparing hemodialysis duration in non-institutionalized patients

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	Outcome, Arm1	Outcome, Arm2	Treatment Effect
Dember, 2019[26]	TiME	RCT	the primary analysis population excluded patients who had, at baseline, an estimated body water volume .42.5 L as determined by the Watson formula	Hospitalization rate	36 months	6498	5007			Arm1, hospitalizations per 100 person-year: 214.1 (202.5-226.3) per 100 py Arm2, hospitalizations per 100 person-year: 204.5 (186.9-223.7) per 100 py
Dember, 2019[26]	TiME	RCT	Full Analysis Population	Hospitalization rate	36 months	6498	5007			Arm1, Hospitalizations per 100 person-years: 204.6 (194.5-215.2) per 100 py Arm2, Hospitalizations per 100 person-years: 196.0 (181.5-211.7) per 100 py
Dember, 2019[26]	TiME	RCT	the primary analysis population excluded patients who had, at baseline, an estimated body water volume .42.5 L as determined by the Watson formula	Hospitalization rate	36 months	6498	5007			Arm2, Hospitalization Rate ratio: 0.96 (0.86-1.06)
Dember, 2019[26]	TiME	RCT	Full Analysis Population	Hospitalization rate	36 months	6498	5007			Arm2, Hospitalization Rate Ratio: 0.97(0.87-1.05)
Dember, 2019[26]	TiME	RCT	The primary analysis population excluded patients who had, at baseline, an estimated body water volume .42.5 L as determined by the Watson formula	Hospitalization rate	36 months	6498	5007			Arm2, Hazard ratio: 0.95 (95% CI: 0.87 to 1.05)
Dember, 2019[26]	TiME	RCT	Full analysis	Hospitalization rate	36 months	6498	5007			Arm2, Hazard Ratio: 0.98 (95% CI: 0.90 to 1.06)

L=liters; N=number of patients; py=person-years; RCT=randomized controlled trial; TiME=Time to Reduce Mortality in ESRD

Evidence Table 30. Continuous diastolic blood pressure outcomes of studies comparing hemodialysis duration in non-institutionalized patients

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	Outcome, Arm1	Outcome, Arm2	Treatment effect
Dember, 2019[26]	TiME	RCT	the primary analysis population excluded patients who had, at baseline, an estimated body water volume .42.5 L as determined by the Watson formula	Clinic DBP (NR, assumed predialysis)	Weighted average of all predialysis DBP per patient over length of trial (median 1.1 years) months	6498	5007	Baseline: Mean 73.6 (SD: 14.7) Final: Mean 73.5 (SD: 11.0)	Baseline: Mean 74.2 (SD: 14.8) Final: Mean 73.9 (SD: 11.4)	NR
Dember, 2019[26]	TiME	RCT	NA	Clinic DBP (predialysis DBP, measured at every dialysis session)	Mean 13.2 months	6498	5007	Baseline: NR Final: Mean 73.5 (SD: 11)	Baseline: NR Final: Mean 73.9 (SD: 11.4)	Arm1 vs Arm2: p=0.80
Dember, 2019[26]	TiME	RCT	Full Analysis Population	Clinic DBP (predialysis)	weighted average of all sessions' BP with median length of 1.1 years months	6498	5007	Baseline: Mean 74.8 (SD: 15.3) Final: Mean 74.6 (SD: 11.3)	Baseline: Mean 75.3 (SD: 15.1) Final: Mean 74.8 (SD: 11.5)	NR

DBP=diastolic blood pressure; N=number of patients; NR=not reported; RCT=randomized controlled trial; SD=standard deviation; TiME=Time to Reduce Mortality in ESRD

Evidence Table 31. Continuous systolic blood pressure outcomes of studies comparing hemodialysis duration in non-institutionalized patients

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	Outcome, Arm1	Outcome, Arm2	Treatment Effect	Comments
Dember, 2019[26]	TiME	RCT	NA	Clinic SBP (predialysis SBP, measured at every dialysis section)	Mean 13.2 months	6498	5007	Baseline: (:) Final: Mean 143 (SD: 19.1)	Baseline: (:) Final: Mean 143.3 (SD: 19.2)	Arm1 vs Arm2: p=0.88	Data for primary analysis population.
Dember, 2019[26]	TiME	RCT	The primary analysis population excluded patients who had, at baseline, an estimated body water volume .42.5 L as determined by the Watson formula	Clinic SBP (Predialysis)	weighted average of all dialysis sessions per patient, median length 1.1 years for full trial	6498	5007	Baseline: Mean 142.5 (SD: 25.8) Final: Mean 143 (SD: 19.1)	Baseline: Mean 144.5 (SD: 26.1) Final: Mean 143.3 (SD: 19.2)	NR	Assume baseline data table is predialysis
Dember, 2019[26]	TiME	RCT	Full analysis population	Clinic SBP (predialysis)	weighted average over all dialysis sessions per patient, median follow-up of 1.1 for entire trial	6498	5007	Baseline: Mean 143.2 (SD: 26.1) Final: Mean 143.4 (SD: 19.1)	Baseline: Mean 144.4 (SD: 25.9) Final: Mean 143.0 (SD: 19.0)	NR	
Troidle, 2007[29]	NR	Observational: prospective	NA	Clinic SBP (Systolic blood pressure (post))	6 months	14	NA	Pre: Mean 136 (SD: 24)	Post: Mean: 128 (SD: 20)	Pre vs Post: p=NR	Pre-post comparison

L=liters; N=number of patients; NA=not applicable; NR=not reported; RCT=randomized controlled trial; SBP=systolic blood pressure; SD=standard deviation; TiME=Time to Reduce Mortality in ESRD

Evidence Table 32. Continuous quality of life outcomes of studies comparing hemodialysis duration in non-institutionalized patients

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	Outcome, Arm1	Outcome, Arm2	Treatment Effect	Comments
Dember, 2019[26]	TiME	RCT	Primary Analysis Population	KDQOL Short form-36, burden	Mean 13.2 months	6498	5007	Baseline: Mean 54.0 (SD: 29.2) Final: Mean 54.9 (SD: 29.0)	Baseline: Mean 51.2 (SD: 29.3) Final: Mean 53.0 (SD: 28.7)	Arm1 vs Arm2: p=0.62	Data from primary analysis population
Dember, 2019[26]	TiME	RCT	Primary Analysis Population	KDQOL Short form-36, effect	Mean 13.2 months	6498	5007	Baseline: Mean 78.0 (SD: 20.7) Final: Mean 79.7 (SD: 19.3)	Baseline: Mean 74.4 (SD: 22.8) Final: Mean 78.4 (SD: 19.6)	Arm1 vs Arm2: p=0.07	Data from primary analysis population
Dember, 2019[26]	TiME	RCT	Primary Analys Population	KDQOL Short form-36, symptoms	Mean 13.2 months	6498	5007	Baseline: Mean 80.9 (SD: 14.8) Final: Mean 81.0 (SD: 14.0)	Baseline: Mean 79.0 (SD: 16.0) Final: Mean 80.2 (SD: 14.6)	Arm1 vs Arm2: p=0.48	
Dember, 2019[26]	TiME	RCT	NA	KDQOL Short form-36, mental component score	Mean 13.2 months	6498	5007	Baseline: Mean 51.5 (SD: 10.9) Final: Mean 51.5 (SD: 10.6)	Baseline: Mean 49.9 (SD: 12.0) Final: Mean 51.0 (SD: 11.1)	Arm1 vs Arm2: p=0.16	Data from primary analysis population
Dember, 2019[26]	TiME	RCT	NA	KDQOL Short form-36, physical component score	Mean 13.2 months	6498	5007	Baseline: Mean 37.7 (SD: 10.9) Final: Mean 37.9 (SD: 10.4)	Baseline: Mean 37.9 (SD: 10.6) Final: Mean 37.8 (SD: 10.9)	Arm1 vs Arm2: p=0.63	Data from primary analysis population

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	Outcome, Arm1	Outcome, Arm2	Treatment Effect	Comments
Troidle, 2007[29]	NR	Observational: prospective	NA	SF-36, mental component score	6 months	NR	NR	Baseline: Mean 56 (SD: 4.8) Final, 4 months: NR	Baseline: NR Final, 4 months: Mean 48 (SD: 9.8)		Conventional hemodialysis patient reference values: 49 (SD 10.5)
Troidle, 2007[29]	NR	Observational: prospective	NA	SF-36, physical component score	6 months	14	NR	Baseline: Mean 45 (SD: 7.5) Final, 4 months: NR	Baseline: NR Final, 4 months: Mean 44 (SD: 0.8)		Conventional hemodialysis patient reference values: 33 (SD 10.8)

KDQOL=Kidney Disease Quality of Life; N=number of patients; NA=not applicable; NR=not reported; RCT=randomized controlled trial; SD=standard deviation; SF-36=Short Form-36; TiME=Time to Reduce Mortality in ESRD

Evidence Table 33. Categorical all cause mortality outcomes of studies comparing hemodialysis duration in non-institutionalized patients

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	n / N (%), Arm1	n / N (%), Arm2	Treatment Effect	Comments
Dember, 2019[26]	TiME	RCT	NA	Overall mortality rate	Mean 13.2 months	6498	5007	Final: 565/2532	Final: 425/1938	Arm1 vs Arm2: HR 1.04 (95% CI: 0.91 to 1.19), p=NR	Data for primary analysis population. For unadjusted mortality outcome, HR 0.97 (95% CI 0.84, 1.12)
Dember, 2019[26]	TiME	RCT	The primary analysis population excluded patients who had, at baseline, an estimated body water volume .42.5 L as determined by the Watson formula	Deaths	36 months	6498	5007	Final, counts: 565	Final, Counts: 425	NR	
Dember, 2019[26]	TiME	RCT	Full Analysis Population	Deaths	36 months	6498	5007	Final, counts: 804	Final, Counts: 602	NR	

CI=confidence interval; HR=hazard ratio; L=liters; N=number of total patients; n=number of sample patients; NA=not applicable; NR=not reported; RCT=randomized controlled trial; TiME=Time to Reduce Mortality in ESRD

Evidence Table 34. Continuous all cause mortality outcomes of studies comparing hemodialysis duration in non-institutionalized patients

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	Outcome, Arm1	Outcome, Arm2	Treatment effect
Lacson, 2012[28]	NR	Observational: prospective	NA	Overall mortality rate	2 year	2062	746	1 year: mortality rate in percent 15% 2 year: mortality rate in percent: 27%	1 year: mortality rate in percent for in-center hemodialysis (INHD) 9% 2 year: mortality rate in percent: 19%	1 year: Arm1 vs Arm2, hazard ratio for INHD vs. conventional: 0.73 (95% CI: 0.56 to 0.96), p=0.02 2 year: Arm1 vs Arm2, hazard ratio for INHD: 0.75 (95% CI: 0.61 to 0.91), p=0.004
Brunelli, 2010[27]	ArMORR cohort	Observational: prospective	NA	Overall mortality rate	12 months	NR	NR			Arm1 vs Arm2 vs Arm3: Hazard ratio, females, < 240 min/session vs >=240 min/session: 1.24(1.01-1.52), p=
Brunelli, 2010[27]	ArMORR cohort	Observational: prospective	NA	Overall mortality rate	12 months	NR	NR			Arm1 vs Arm2 vs Arm3: Baseline exposure (0-30 days): Hazard ratio, <240 min vs >=240 min/session: 1.24 (1.10-1.41), p=0.001 Arm1 vs Arm2 vs Arm3: Time-adjusted exposure hazard ratio, <240 min vs >=240 min per session: 0.89 (0.78-1.02), p=0.09 Arm1 vs Arm2 vs Arm3: Hazard ratio (marginal struc analysis), quantified in each 15 min decrement in session length: 1.12 (1.08-1.16), p<0.001
Brunelli, 2010[27]	ArMORR cohort	Observational: prospective	Age <65 subgroup for <240 min dialysis group	Overall mortality rate	12 months	NR	NR			Arm1 vs Arm2 vs Arm3: Hazard ratio <240 vs >=240 min in age<65: 1.25 (0.99-1.57), p=
Brunelli, 2010[27]	ArMORR cohort	Observational: prospective	Age >65 subgroup for <240 min dialysis group	Overall mortality rate	12 months	NR	NR			Arm1 vs Arm2 vs Arm3: Hazard ratio <240 min vs >=240 min for age >=65: 1.19 (1.00-1.40), p=

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	Outcome, Arm1	Outcome, Arm2	Treatment effect
Brunelli, 2010[27]	ArMORR cohort	Observational: prospective	HR for <240 fistula/graft access	Overall mortality rate	12 months	NR	NR			Arm1 vs Arm2 vs Arm3: Hazard ratio <240 min vs >=240 min for fistula/graft access: 1.30 (1.02-1.65), p=
Brunelli, 2010[27]	ArMORR cohort	Observational: prospective	HR for <240 min by catheter access	Overall mortality rate	12 months	NR	NR			Arm1 vs Arm2 vs Arm3: Hazard ratio <240 min vs >=240 min for catheter access: 1.50 (1.28-1.76), p=
Brunelli, 2010[27]	ArMORR cohort	Observational: prospective	HR for + congestive heart failure (yes)	Overall mortality rate	12 months	NR	NR			Arm1 vs Arm2 vs Arm3: Hazard ratio for <240 min vs >=240 min in congestive heart failure-yes: 1.32 (0.97-1.81), p=
Brunelli, 2010[27]	ArMORR cohort	Observational: prospective	<240 vs >=240 min/session in congestive heart failure-NO	Overall mortality rate	12 months	NR	NR			Arm1 vs Arm2 vs Arm3: hazard ratio <240 min vs >=240 min for NO congestive heart failure: 1.44 (1.24-1.67), p=
Brunelli, 2010[27]	ArMORR cohort	Observational: prospective	HR for <240 vs >=240 min/session in males	Overall mortality rate	12 months	NR	NR			Baseline Arm1 vs Arm2 vs Arm3: Hazard ratio for <240 min vs >=240 min in males: 1.57 (1.31-1.87), p=NR
Brunelli, 2010[27]	ArMORR cohort	Observational: prospective	baseline eKt/v <=1.2	Overall mortality rate	12 months	NR	NR			Arm1 vs Arm2 vs Arm3: hazard ratio <240 vs >=240 min in <=1.2 eKt/V at baseline: 1.35 (1.10-1.65), p=

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	Outcome, Arm1	Outcome, Arm2	Treatment effect
Brunelli, 2010[27]	ArMORR cohort	Observational: prospective	HR in baseline eKt/v >1.2	Overall mortality rate	12 months	NR	NR			Arm1 vs Arm2 vs Arm3: Hazard ratio at baseline eKt/V >1.2: 1.45 (1.21-1.72), p=
Brunelli, 2010[27]	ArMORR cohort	Observational: prospective	HR for <240 vs >=240 among NO hospitalizations in days 0-30 of study	Overall mortality rate	12 months	NR	NR			Arm1 vs Arm2 vs Arm3: hazard ratio for <240 min vs >=240 min in no hospitalizations: 1.40 (1.20-1.63), p=
Brunelli, 2010[27]	ArMORR cohort	Observational: prospective	hospitalizations: yes in days 0-30 of study	Overall mortality rate	12 months	NR	NR			Arm1 vs Arm2 vs Arm3: hazard ratio <240 vs >=240 min for yes-hospitalization: 1.46 (1.10-1.93), p=
Dember, 2019[26]	TiME	RCT	Full Analysis Population	Overall mortality rate	36 months	6498	5007	Final: deaths per 100 person-years: 17.4 (16.2-18.6) per 100 py	Final: deaths per 100 person-years: 16.9 (15.5-18.2) per 100 py	NR
Dember, 2019[26]	TiME	RCT	primary analysis population	Overall mortality rate	36 months	6498	5007	Final: deaths per 100 person-years: 19.7 (18.1-21.4) per 100 py	Final: deaths per 100 person-years: 19.2 (17.4-21.0) per 100 py	NR
Dember, 2019[26]	TiME	RCT	primary analysis population	Overall mortality rate	36 months	6498	5007	NR	Final: Mortality hazard ratio: 0.97 (95% CI: 0.84 to 1.12), p=NR	NR
Dember, 2019[26]	TiME	RCT	Full Analysis Population	Overall mortality rate	36 months	6498	5007	NR	Final: Mortality Hazard Ratio: 0.97 (0.85-1.12) (95% CI: 0.85 to 1.12), p=NR	NR

ArMORR=Accelerated Mortality on Renal Replacement cohort; eKt/V= Equilibrated Kt/V (urea clearance); HR=hazard ratio; INHD= In-center nocturnal hemodialysis; L=liters; min=minutes; N=number of patients; NR=not reported; py=person-years; RCT=randomized controlled trial; TiME=Time to Reduce Mortality in ESRD

Evidence Table 35. Categorical hypotension outcomes of studies comparing hemodialysis duration in non-institutionalized patients

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	n (%), Arm1	n (%), Arm2	Treatment Effect
Dember, 2019[26]	TiME	RCT	NA	Hypotension	Mean 13.2 months	6498	5007	Final, counts: 475 (18.8)	Final, Counts: 325 (16.89)	Arm1 vs Arm2: RR 1.02 (95% CI: 0.57 to 1.83), p=0.95
Dember, 2019[26]	TiME	RCT	Full Analysis population	Postdialysis hypotension	36 months	6498	5007	Final, counts: 774 (19.5)	Final, Counts: 539 (17.6)	NR
Dember, 2019[26]	TiME	RCT	The primary analysis population excluded patients who had, at baseline, an estimated body water volume .42.5 L as determined by the Watson formula	Postdialysis hypotension	36 months	6498	5007	Final, counts: 475 (18.8)	Final, Counts: 325 (16.8)	NR

L=liters; N=number of total patients; n=number of sample patients; NA=not applicable; NR=not reported; RCT=randomized controlled trial; RR=relative risk; TiME=Time to Reduce Mortality in ESRD

Evidence Table 36. Continuous hypotension outcomes of studies comparing hemodialysis duration in non-institutionalized patients

Author, year	Study name	Study design	Subgroup	=Outcome definition	Followup	N, Arm1	N, Arm2	Outcome, Arm1	Outcome, Arm2	Treatment Effect
Dember, 2019[26]	TiME	RCT	Full Analysis population	Postdialysis hypotension	36 months	6498	5007			Arm2: Rate ratio: 1.11 (0.69-1.77)
Dember, 2019[26]	TiME	RCT	the primary analysis population excluded patients who had, at baseline, an estimated body water volume .42.5 L as determined by the Watson formula	Postdialysis hypotension	36 months	6498	5007			Arm2: Rate ratio: 1.02 (0.57-2.83)
Dember, 2019[26]	TiME	RCT	Full Analysis population	Postdialysis hypotension	36 months	6498	5007	Baseline: NR Final: Postdialysis hypotension per 100 person-years 68.1 (51.8-89.6) per 100 patient-years	Baseline: NR Final: Postdialysis hypotension per 100 person-years 75.2 (51.2-110.4) per 100 patients-yr	NR
Dember, 2019[26]	TiME	RCT	the primary analysis population excluded patients who had, at baseline, an estimated body water volume .42.5 L as determined by the Watson formula	Postdialysis hypotension	36 months	6498	5007	Baseline: NR Final: Postdialysis hypotension per 100 patient-years 74.0 (51.8-105.8) per 100 patient-yr	Baseline: NR Final: Postdialysis hypotension per 100 patient-years 75.5 (47.6-119.9) per 100 patient-yr	NR

L=liters; N=number of patients; NR=not reported; patient-yr=patient-years; RCT=randomized controlled trial; RR=relative risk; TiME=Time to Reduce Mortality in ESRD

Evidence Table 37. Continuous equilibrated KtIV outcomes of studies comparing hemodialysis duration in non-institutionalized patients

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	Outcome, Arm1	Outcome, Arm2	Treatment effect	Comments
Lacson, 2012[28]	NR	Observational: prospective	Pre-conversion to INHD, a subset of 725 patients (97% of intervention group)	eKT/V	90-180 days after conversion to INHD	2062	746		Baseline is prior to Nocturnal HD: Mean 1.4 90-180 days after conversion to INHD: Mean 2.3	NR	Study compared CHD eKt/v but did not report these numbers, just the p-value

CHD=conventional hemodialysis; eKt/V=equilibrated Kt/V (urea clearance); INHD=In-center nocturnal hemodialysis; N=number of patients; NR=not reported

Evidence Table 38. Categorical other outcomes of studies comparing hemodialysis duration in non-institutionalized patients

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	n (%), Arm1	n (%), Arm2	Treatment Effect	Comments
Rivara, 2016[37]	NR	Observational: retrospective	NA	Current dialysis modality at time of death	60 months	111707	1206	Final, counts: 29,796	Final, Counts: 62	Arm1 vs Arm2: HR - 0.67 (95% CI: 0.49 to 0.93), p=NR	- Hazard ratio from marginal structural Cox model comparing extended-hours hemodialysis to conventional hemodialysis, reference group: conventional hemodialysis, adjusted for age, sex, race, year of incidence, insurance, congestive heart failure, diabetes, arteriosclerotic heart disease, and other cardiovascular comorbidities. - Dialysis modality of 91 day period prior to death (HR 0.68 (0.49, 0.93) - Extended -hours for all events after extend-hours initiation (HR 0.62 (0.47, 0.81) - Finally, in interaction analyses, no evidence of effect modification by age, sex, or race was found (P > 0.2 for each).
Dember, 2019[26]	TiME	RCT	Primary Analysis Population	Hypokalemia events	1.1 years	2532	1938	Final, counts: 888 (35.1)	Final, counts: 615 (31.7)	Arm1 vs Arm2: Rate Ratio=NR, p=0.14	Rate ratio not reported
Dember, 2019[26]	TiME	RCT	Full Analysis Population	Hypokalemia events	1.1 years	3966	3069	Final, counts: 1291 (32.6)	Final, counts: 915 (29.8)	Arm1 vs Arm2: Rate Ratio=NR, p=0.07	Rate ratio not reported
Dember, 2019[26]	TiME	RCT	Primary Analysis Population	Hypophosphatemia events	1.1 years	2532	1938	Final, counts: 979 (38.7)	Final, counts: 753 (38.9)	Arm1 vs Arm2: Rate Ratio=NR, p=0.12	Rate ratio not reported
Dember, 2019[26]	TiME	RCT	Full Analysis Population	Hypophosphatemia events	1.1 years	3966	3069	Final, counts: 1375 (34.7)	Final, counts: 1092 (35.6)	Arm1 vs Arm2: Rate Ratio=NR, p=0.06	Rate ratio not reported

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	n (%), Arm1	n (%), Arm2	Treatment Effect	Comments
Dember, 2019[26]	TiME	RCT	Primary Analysis Population	Hyperbicarbonatemia events	1.1 years	2532	1938	Final, counts: 1548 (61.1)	Final, counts: 1249 (64.4)	Arm1 vs Arm2: Rate Ratio=NR, p=0.32	Rate ratio not reported
Dember, 2019[26]	TiME	RCT	Full Analysis Population	Hyperbicarbonatemia events	1.1 years	3966	3069	Final, counts: 2397 (60.4)	Final, counts: 1959 (63.8)	Arm1 vs Arm2: Rate Ratio=NR, p=0.13	Rate ratio not reported
Dember, 2019[26]	TiME	RCT	Primary Analysis Population	Hypoalbuminemia events	1.1 years	2532	1938	Final, counts: 1349 (53.3)	Final, counts: 1036 (53.5)	Arm1 vs Arm2: Rate Ratio=NR, p=0.96	Rate ratio not reported
Dember, 2019[26]	TiME	RCT	Full Analysis Population	Hypoalbuminemia events	1.1 years	3966	3069	Final, counts: 1984 (50.0)	Final, counts: 1572 (51.2)	Arm1 vs Arm2: Rate Ratio=NR, p=0.79	Rate ratio not reported

HR=hazard ratio; N=number of total patients; n=number of sample patients; NA=not applicable; NR=not reported; RCT=randomized controlled trial; TiME=Time to Reduce Mortality in ESRD

Evidence Table 39. Continuous other outcomes of studies comparing hemodialysis duration in non-institutionalized patients

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	n (%), Arm1	n (%), Arm2	Treatment Effect	Comments
Dember, 2019[26]	TiME	RCT	Primary Analysis Population	Interdialytic weight gain in kg (SD)	1.1 years	2532	1938	Final: 1.65 (SD: 0.84)	Final: 1.69 (SD: 0.81)	Arm1 vs Arm2: Rate Ratio=NR, p=0.25	Rate ratio not reported
Dember, 2019[26]	TiME	RCT	Full Analysis Population	Interdialytic weight gain in kg (SD)	1.1 years	3966	3069	Final: 1.88 (SD: 1.00)	Final: 1.93 (SD: 0.98)	Arm1 vs Arm2: Rate Ratio=NR, p=0.28	Rate ratio not reported
Dember, 2019[26]	TiME	RCT	Primary Analysis Population	Ultrafiltration rate, ml/h per kg (SD)	1.1 years	2532	1938	Final: 7.51 (SD: 3.02)	Final: 7.37 (SD: 2.77)	Arm1 vs Arm2: Rate Ratio=NR, p=0.42	Rate ratio not reported
Dember, 2019[26]	TiME	RCT	Full Analysis Population	Ultrafiltration rate, ml/h per kg (SD)	1.1 years	3966	3069	Final: 7.14 (SD: 2.82)	Final: 7.01 (SD: 2.60)	Arm1 vs Arm2: Rate Ratio=NR, p=0.29	Rate ratio not reported
Dember, 2019[26]	TiME	RCT	Primary Analysis Population	Hypokalemia events per 100 patient-years	1.1 years	2532	1938	Final: 81.1 events per 100 patient-years (CI: 73.0, 90.2 CI)	Final: 71.4 events per 100 patient-years (CI: 62.6, 81.5)	Arm1 vs Arm2: Rate Ratio=NR, p=0.14	Rate ratio not reported
Dember, 2019[26]	TiME	RCT	Full Analysis Population	Hypokalemia events per 100 patient-years	1.1 years	3966	3069	Final: 74.1 events per 100 patient-years (CI: 63.3, 82.9)	Final: 64.3 events per 100 patient-years (CI: 57.6, 71.7)	Arm1 vs Arm2: Rate Ratio=NR, p=0.07	Rate ratio not reported
Dember, 2019[26]	TiME	RCT	Primary Analysis Population	Hypophosphatemia events per 100 patient-years	1.1 years	2532	1938	Final: 72.6 events per 100 patient-years (CI: 65.8, 80.2)	Final: 81.9 events per 100 patient-years (CI: 72.8, 92.2)	Arm1 vs Arm2: Rate Ratio=NR, p=0.12	Rate ratio not reported
Dember, 2019[26]	TiME	RCT	Full Analysis Population	Hypophosphatemia events per 100 patient-years	1.1 years	3966	3069	Final: 61.2 events per 100 patient-years (CI: 56.4, 66.5)	Final: 69.7 events per 100 patient-years (CI: 62.8, 77.3)	Arm1 vs Arm2: Rate Ratio=NR, p=0.06	Rate ratio not reported

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	n (%), Arm1	n (%), Arm2	Treatment Effect	Comments
Dember, 2019[26]	TiME	RCT	Primary Analysis Population	Hyperbicarbonatemia events per 100 patient-years	1.1 years	2532	1938	Final: 188.3 events per 100 patient-years (CI: 167.4, 211.7)	Final: 205.9 events per 100 patient-years (CI: 180.2, 235.3)	Arm1 vs Arm2: Rate Ratio=NR, p=0.32	Rate ratio not reported
Dember, 2019[26]	TiME	RCT	Full Analysis Population	Hyperbicarbonatemia events per 100 patient-years	1.1 years	3966	3069	Final: 177.0 events per 100 patient-years (CI: 157.6, 198.8)	Final: 202.7 events per 100 patient-years (CI: 177.4, 231.6)	Arm1 vs Arm2: Rate Ratio=NR, p=0.13	Rate ratio not reported
Dember, 2019[26]	TiME	RCT	Primary Analysis Population	Hypoalbuminemia events per 100 patient-years	1.1 years	2532	1938	Final: 173.4 events per 100 patient-years (CI: 158.3, 190.9)	Final: 174.0 events per 100 patient-years (CI: 156.9, 192.9)	Arm1 vs Arm2: Rate Ratio=NR, p=0.96	Rate ratio not reported
Dember, 2019[26]	TiME	RCT	Full Analysis Population	Hypoalbuminemia events per 100 patient-years	1.1 years	3966	3069	Final: 156.5 events per 100 patient-years (CI: 145.0, 169.0)	Final: 159.1 events per 100 patient-years (CI: 145.1, 174.6)	Arm1 vs Arm2: Rate Ratio=NR, p=0.79	Rate ratio not reported
Troidle, 2007[29]	NR	Observational: prospective	NA	Time to recovery (minutes)		14	NR	Baseline: Mean 198 (SD: 240) Final: NR	Baseline: NR Final: Mean 126 (SD: 120)	NR	Conventional hemodialysis patient reference values: 375 (SD 461)
Troidle, 2007[29]	NR	Observational: prospective	NA	Kt/V urea	6 months	14	NR	Baseline: Mean 1.2 (SD: 0.16) Final: NR	Baseline: NR Final: Mean 2.6 (SD: 0.65)	Arm1 vs Arm2: p=0.003	Pre-post comparison, p=0.003
Troidle, 2007[29]	NR	Observational: prospective	NA	Total ultrafiltration (L/Rx)	6 months	14	NR	Baseline: Mean 3.9 (SD: 1.4) Final: NR	Baseline: NR Final: Mean 5.0 (SD: 1.9)	Arm1 vs Arm2: p=NR	pre-post comparison

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	n (%), Arm1	n (%), Arm2	Treatment Effect	Comments
Troidle, 2007[29]	NR	Observational: prospective	NA	Ultrafiltration rate (mL/h/kg)	6 months	14	NR	Baseline: Mean 10.3 (SD: 4.5) Final: NR	Baseline: NR Final: Mean 5.9 (SD: 1.7)	Arm1 vs Arm2: p=NR	Pre-post comparison

CI=confidence interval; HR=hazard ratio; kg=kilograms; Kt/V=urea clearance; L/Rx= Total ultrafiltration in liters per dialysis session; mL/h/kg=milliliters per hours per kilogram; N=number of total patients; n=number of sample patients; NA=not applicable; NR=not reported; RCT=randomized controlled trial; SD=standard deviation; TiME=Time to Reduce Mortality in ESRD

Evidence Table 40. Categorical renal function outcomes of studies comparing hemodialysis frequency and duration in non-institutionalized patients

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	n / N (%), Arm1	n / N (%), Arm2	Treatment effect
Daugirdas, 2013[20]	FHN	RCT	Nocturnal (Nonzero Urine Output)	Urine volume/24 hours; (%) Below 1st tertile of measure at baseline	12 months	79	67	11.99/22 (54.5)	19.992/24 (83.3)	p= 0.06
Daugirdas, 2013[20]	FHN	RCT	Nocturnal(Nonzero Urine Output)	Urea, Creatinine Kr, Average of Urea + Creatinine; (%) Below 1st tertile of measure at baseline	12 months	79	67	14/20 (70)	18.009/23 (78.3)	p= 0.003
Daugirdas, 2013[20]	FHN	RCT	Daily (Nonzero Urine Output)	Creatinine; (%) Below 1st tertile of measure at baseline	12 months	79	67	24.992/32 (78.1)	17/25 (68)	p= 0.48
Daugirdas, 2013[20]	FHN	RCT	Daily (Nonzero Urine Output)	Average of Urea + Creatinine; (%) Below 1st tertile of measure at baseline	12 months	79	67	24/32 (75)	17/25 (68)	p= 0.42
Daugirdas, 2013[20]	FHN	RCT	Daily(Nonzero Urine Output)	Urine volume/24 hours; (%) Below 1st tertile of measure at baseline*	12 months	79	67	26.016/32 (81.3)	17/25 (68)	p= 0.99
Daugirdas, 2013[20]	FHN	RCT	Daily(Nonzero Urine Output)	Urea; (%) Below 1st tertile of measure at baseline*	12 months	79	67	24/32 (75)	16/25 (64)	p= 0.44
Daugirdas, 2013[20]	FHN	RCT	Daily (Nonzero Urine Output)	Urea; (%) Equal to 0	12 months	79	67	16.992/32 (53.1)	12/25 (48)	p= NR
Daugirdas, 2013[20]	FHN	RCT	Daily(Nonzero Urine Output)	Creatinine; (%) Equal to 0	12 months	79	67	16.992/32 (53.1)	12/25 (48)	p= NR

%=percentage; FHN=Frequent Hemodialysis Network trials; N=number of total patients; n=number of sample patients; NR=not reported; RCT=randomized controlled trial

Evidence Table 41. Continuous albumin outcomes of studies comparing hemodialysis frequency and duration in non-institutionalized patients

Author, year	Study name	Study design	Subgroup	Outcome definition	Follow up	N, Arm 1	N, Arm 2	N, Arm 3	N, Arm 4	Outcome, Arm1	Outcome, Arm2	Outcome, Arm3	Outcome, Arm4	Treatment Effect	Comments
Kaysen, 2012[13]	FHN	RCT	NA	Albumin level	12 months	42	45	NA	NA	Baseline: Mean 3.93 (SD: 0.53) Final: Mean 4.12 (SD: 0.39)	Baseline: Mean 3.88 (SD: 0.49) Final: Mean 4.08 (SD: 0.53)	Baseline: Mean 3.95 (SD: 0.44) Final: Mean 3.96 (SD: 0.4)	Baseline: Mean 3.96 (SD: 0.36) Final: Mean 3.98 (SD: 0.36)	Arm1 vs Arm2: Treatment effects (6x vs 3x, baseline to 12 months): 0.01 (95% CI: -0.14 to 0.12), p=0.88 Arm3 vs Arm4: Treatment effects (6x vs 3x, baseline to 12 months): 0.03 (95% CI: -0.04 to 0.10), p=0.41	
Ayus, 2005[1]	NR	NRCT	NA	Albumin level	12 months	51	26	NA	NA	Baseline: Mean 4.06 (SD: 0.26) Final: Mean 4.08 (SD: 0.25)	Baseline: Mean 3.96 (SD: 0.40) Final: Mean 4.07 (SD: 0.33)			Change from baseline: Arm1, p=<0.05 Change from baseline: Arm2, p=NS	
Dixon, 2016[25]	FHN-Nocturnal	Observational: prospective	NA	Albumin level	12 months	31	18	NA	NA	Baseline: Mean 4.1 (SD: 0.5) Final: Mean 4.1 (SD: 0.5)	Baseline: Mean 3.8 (SD: 0.7) Final: Mean 4.0 (SD: 0.4)	Baseline: Mean 4.1 (SD: 0.5) Final: Mean 4.5 (SD: 0.4)		NR	
Rocco, 2015[24]	FHN-Nocturnal	RCT	NA	Albumin level	12 months	42	45	NA	NA	Baseline: Mean 3.92 (SD: 0.51) Final: Mean 4.13 (SD: 0.39)	Baseline: Mean 3.90 (SD: 0.48) Final: Mean 4.06 (SD: 0.52)			NR	Predialysis serum albumin (g/dl)

Author, year	Study name	Study design	Subgroup	Outcome definition	Follow up	N, Arm 1	N, Arm 2	N, Arm 3	N, Arm 4	Outcome, Arm1	Outcome, Arm2	Outcome, Arm3	Outcome, Arm4	Treatment Effect	Comments
Rocco, 2011[23]	FHN-Nocturnal	RCT	NA	Albumin level	12 months	42	45	NA	NA	Baseline: Mean 3.93 (SD: 0.53) Final: Mean 4.12 (SD: 0.38)	Baseline: Mean 3.88 (SD: 0.49) Final: Mean 4.08 (SD: 0.53)			Arm1 vs Arm2: Treatment comparison of change: nocturnal vs conventional (95% CI): −0.02 (−0.18, 0.15), p=0.85 Arm1: Change from baseline to follow-up: 0.19±0.46 Arm1: Mean difference: 0.19 (se: ±0.06) Arm2: Change from baseline to follow-up: 0.20±0.41 Arm2: Mean difference: 0.18 (se: ±0.06)	d To convert values for serum albumin to grams per liter, multiply by 10.

CI=confidence interval; FHN=Frequent Hemodialysis Network trials; g/dl=grams per deciliter; N=number of patients; NA=not applicable; NR=not reported; NRCT=non-randomized controlled trial; RCT=randomized controlled trial; SD=standard deviation; SE=standard error

Evidence Table 42. Continuous C-reactive protein level outcomes of studies comparing hemodialysis frequency and duration in non-institutionalized patients

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	Outcome, Arm1	Outcome, Arm2	Treatment Effect
Ayus, 2005[1]	NR	NRCT	NA	CRP level	12 months	51	26	Baseline: Mean 0.50 (IQR: 0.32 to 0.75) Final: Mean 0.64 (IQR: 0.27 to 1.20)	Baseline: Mean 1.22 (IQR: 0.37 to 3.70) Final: Mean 0.05 (IQR: 0.05 to 1.17)	Arm1 vs Arm2: p<0.01

IQR=interquartile range; N=number of patients; NA=not applicable; NR=not reported; NRCT=non-randomized controlled trial

Evidence Table 43. Continuous erythropoiesis-stimulating agent outcomes of studies comparing hemodialysis frequency and duration in non-institutionalized patients

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	N, Arm3	N, Arm4	Outcome, Arm1	Outcome, Arm2	Outcome, Arm3	Outcome, Arm4	Treatment Effect
Ornt, 2013[9]	FHN	RCT	NA	ESA use	12 months	120	125	42	45	Baseline: Mean 8638 Final: Mean 8925	Baseline: Mean 8500 Final: Mean 7000	Baseline: Mean 7750 Final: Mean 7000	Baseline: Mean 6563 Final: Mean 6250	Arm1 vs Arm2: Mean difference: -17.2 (95% CI: -35.8 to 6.8), p=NR Arm3 vs Arm4: Mean difference: 38.8 (95% CI: -9.87 to 113.9), p=NR
Rocco, 2011[23]	FHN-Nocturnal	RCT	NA	ESA use	12 months	42	45	NA	NA	Baseline: Mean 42600 (SD: 53761) Final: Mean 42735 (SD: 53261)	Baseline: Mean 43939 (SD: 68173) Final: Mean 56678 (SD: 58436)			Arm1 vs Arm2: Treatment comparison of change: nocturnal vs conventional (95% CI): 1.35 (0.87, 2.09) p=0.18 Arm1: Change from baseline to follow-up: 135±75,813 Arm1: Mean difference: −2 (se: ±17%) Arm2: Change from baseline to follow-up: 12,739±63,244 Arm2: Mean difference: 33 (se: ±24%)

CI=confidence interval; ESA=erythropoietin-stimulating agent; FHN=Frequent Hemodialysis Network trials; N=number of patients; NA=not applicable; NR=not reported; RCT=randomized controlled trial; SD=standard deviation

Evidence Table 44. Continuous normalized protein catabolic outcomes of studies comparing hemodialysis frequency and duration in non-institutionalized patients

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	N, Arm3	N, Arm4	Outcome, Arm1	Outcome, Arm2	Outcome, Arm3	Outcome, Arm4	Treatment Effect
Molfino, 2019[4]	FHN	RCT	Modality (Daily Trial)	Normalized protein catabolic rate	12 months	79	80	NA	NA	Baseline: Mean 1.04 (SD: 0.25) Final: Mean 0.99 (SD: 0.23)	Baseline: Mean 1.06 (SD: 0.25) Final: Mean 1.09 (SD: 0.29)			NR
Molfino, 2019[4]	FHN	RCT	modality (Nocturnal Trial)	Normalized protein catabolic rate	12 months	79	80	NA	NA	Baseline: Mean 0.96 (SD: 0.21) Final: Mean 1.11 (SD: 0.2)	Baseline: Mean 0.87 (SD: 0.19) Final: Mean 1.09 (SD: 0.36)			NR
Kaysen, 2012[13]	FHN	RCT	NA	Normalized protein catabolic rate	12 months	42	45	120	125	Baseline: Mean 62.86 (SD: 21.15) Final: Mean 74.55 (SD: 38.81)	Baseline: Mean 64.42 (SD: 21.6) Final: Mean 69.97 (SD: 24.23)	Baseline: Mean 64.67 (SD: 17.86) Final: Mean 64.26 (SD: 20.02)	Baseline: Mean 65.37 (SD: 21.23) Final: Mean 65.13 (SD: 22.53)	Arm1 vs Arm2: Treatment comparison 6x vs 3x Nocturnal, baseline to 12 months: 5.65 (95% CI: -2.98 to 14.27), p=0.20 Arm3 vs Arm4: Treatment comparison 6x vs 3x Daily, baseline to 12 months: 0.82 (95% CI: -2.54 to 4.19), p=0.63

CI=confidence interval; FHN=Frequent Hemodialysis Network trials; N=number of patients; NA=not applicable; NR=not reported; RCT=randomized controlled trial; SD=standard deviation

Evidence Table 45. Continuous hemoglobin outcomes of studies comparing hemodialysis frequency and duration in non-institutionalized patients

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	N, Arm3	N, Arm4	Outcome, Arm1	Outcome, Arm2	Outcome, Arm3	Outcome, Arm4	Treatment Effect
Ornt, 2013[9]	FHN	RCT	NA	Hemoglobin level	12 months	120	125	42	45	Baseline: Mean 11.9 Final: Mean 11.7	Baseline: Mean 12.0 Final: Mean 11.9	Baseline: Mean 11.9 Final: Mean 11.7	Baseline: Mean 12.1 Final: Mean 11.9	Arm1 vs Arm2: Mean difference: 0.33 (95% CI: 0.05 to 0.61), p<0.05 Arm1, Change from baseline: -0.24 Arm2, Change from baseline: 0.09 Arm3 vs Arm4: Mean difference: -0.12 (95% CI: -0.61 to 0.37), p=NR Arm3, Change from baseline: 0.13 Arm4, Change from baseline: 0.01
Ayus, 2005[1]	NR	NRCT	NA	Hemoglobin level	12 months	51	26	NA	NA	Baseline: Mean 12.7 (SD: 1.31) Final: Mean 12.0 (SD: 0.7	Baseline: Mean 10.8 (SD: 1.93) Final: Mean 12.7 (SD: 1.00)			Arm1 vs Arm2: p<0.05 Arm2: p<0.0001
Dixon, 2016[25]	FHN-Nocturnal	Observational: prospective	NA	Hemoglobin level	12 months	31	18	28	NA	Baseline: Mean 11.5 (SD: 1.3) Final: Mean 11.9 (SD: 1.5	Baseline: Mean 11.5 (SD: 1.3) Final: Mean 11.3 (SD: 2.1)	Baseline: Mean 12.0 (SD: 1.8) Final: Mean 13.8 (SD: 1.2)		NR
Rocco, 2015[24]	FHN-Nocturnal	RCT	NA	Hemoglobin level	12 months	42	45	NA	NA	Baseline: Mean 11.93 (SD: 1.09) Final: Mean 11.94 (SD: 1.10	Baseline: Mean 11.63 (SD: 1.12) Final: Mean 11.73 (SD: 1.17)			NR

CI=confidence interval; FHN=Frequent Hemodialysis Network trials; N=number of patients; NA=not applicable; NR=not reported; RCT=randomized controlled trial; SD=standard deviation

Evidence Table 46. Continuous phosphorous binder outcomes of studies comparing hemodialysis frequency and duration in non-institutionalized patients

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	Outcome, Arm1	Outcome, Arm2	Treatment effect
Daugirdas, 2012[14]	FHN	RCT	Daily	Phosphorus binders	12 months	162	170	Baseline: Mean 5.92 (SD: 4.32) Final: Mean 6.64 (SD: 4.95)	Baseline: Mean 7.17 (SD: 5.48) Final: Mean 5.7 (SD: 4.94)	NR

CI=confidence interval; FHN=Frequent Hemodialysis Network trials; N=number of patients; NR=not reported; RCT=randomized controlled trial; SD=standard deviation

Evidence Table 47. Continuous phosphorous outcomes of studies comparing hemodialysis frequency and duration in non-institutionalized patients

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	N, Arm3	N, Arm4	Outcome, Arm1	Outcome, Arm2	Outcome, Arm3	Outcome, Arm4	Treatment Effect	Comments
Daugirdas, 2012[14]	FHN	RCT	Daily trial	Phosphorus level	10-12 months	162	170	NA	NA	Baseline: Mean 5.63 (SD: 1.51) Final: Mean 5.65 (SD: 1.75)	Baseline: Mean 5.88 (SD: 1.69) Final: Mean 5.24 (SD: 1.19)			NR	Baseline data in table 1 is different than their outcomes data. Some patients missing but assumed pts were same as baseline data
Daugirdas, 2012[14]	FHN	RCT	Nocturnal	Phosphorus level	10-12 months	162	170	NA	NA	Baseline: Mean 5.66 (SD: 1.65) Final: Mean 5.9 (SD: 1.99)	Baseline: Mean 5.74 (SD: 1.53) Final: Mean 4.72 (SD: 1.32)			NR	baseline data in table 1 is different than analyzed data. Also, numbers would likely be smaller as a result, but they don't report

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	N, Arm3	N, Arm4	Outcome, Arm1	Outcome, Arm2	Outcome, Arm3	Outcome, Arm4	Treatment Effect	Comments
Chan, 2012[15]	FHN	RCT	NA	Phosphorus level	12 months	120	125	42	45					Arm1 vs Arm2: p=0.005 Arm3 vs Arm4: p<0.001 Arm1: Mean difference: -0.08 (SD: 0.13) Arm2: Mean difference: -0.54 (SD: 0.13) Arm3: Mean difference: 0.12 (SD: 0.23) Arm4: Mean difference: -1.11 (SD: 0.23)	predialysis phosphate level, millimoles per liter
Ayus, 2005[1]	NR	NRCT	NA	Phosphorus level	12 months	51	26	NA	NA	Baseline: Mean 4.98 (SD: 1.49) Final: Mean 5.02 (SD: 1.14)	Baseline: Mean 6.26 (SD: 2.57) Final: Mean 4.20 (SD: 1.16)			Arm1 vs Arm2: p<0.05 Arm1: p<0.0001	
Troidle, 2007[29]	NR	Observational: prospective	NA	Phosphorus level	NR	NR	NR	NA	NA	Baseline: Mean 5.3 (SD: 1.27) Final, 6 months: NR	Baseline: NR Final, 4 months: Mean 4.4 (SD: 1.1)			Arm1 vs Arm2: p=0.049	Serum phosphorus (mg/dL), pre-post comparison, p=0.049

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	N, Arm3	N, Arm4	Outcome, Arm1	Outcome, Arm2	Outcome, Arm3	Outcome, Arm4	Treatment Effect	Comments
Dixon, 2016[25]	FHN-Nocturnal	Observational: prospective	NA	Phosphorus level	12 months	31	18	28	NA	Baseline: Mean 5.4 (SD: 1.6) Final: Mean 5.8 (SD: 1.6)	Baseline: Mean 5.3 (SD: 1.8) Final: Mean 4.3 (SD: 1.6)	Baseline: Mean 5.1 (SD: 1.6) Final: Mean 2.7 (SD: 0.4)		NR	
Rocco, 2015[24]	FHN-Nocturnal	RCT	NA	Phosphorus level	12 months	42	45	NA	NA	Baseline: Mean 5.77 (SD: 1.65) Final: Mean 5.96 (SD: 1.97)	Baseline: Mean 5.82 (SD: 1.59) Final: Mean 4.73 (SD: 1.33)			NR	Predialysis phosphorus (mg/dl)
Rocco, 2011[23]	FHN-Nocturnal	RCT	NA	Phosphorus level	12 months	42	45	NA	NA	Baseline: Mean 5.65 (SD: 1.84) Final: Mean 5.91 (SD: 2)	Baseline: Mean 5.75 (SD: 1.63) Final: Mean 4.72 (SD: 1.31)			Arm1 vs Arm2: Treatment comparison of change: nocturnal vs conventional (95% CI): −1.4 (−2.1, −0.7), p=<0.001 Arm1: Mean difference: 0.3 (se: ±0.3 Arm2: Mean difference: −1.1 (se: ±0.3	

CI=confidence interval; FHN=Frequent Hemodialysis Network trials; mg/dl=milligrams per deciliter; N=number of patients; NA=not applicable; NR=not reported; RCT=randomized controlled trial; SD=standard deviation; SE=standard error

Evidence Table 48. Categorical metabolic outcomes of studies comparing hemodialysis frequency and duration in non-institutionalized patients

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	n (%), Arm1	n (%), Arm2	Treatment Effect
Rocco, 2011[23]	FHN-Nocturnal	RCT	NA	Hypokalemia (Potassium <3.5 mEq/l)	12 months	42	45	Final, counts: 9 (total numbers of events: 16)	Final, Counts: 13 (total numbers of events: 62)	Arm1 vs Arm2: p=0.47
Rocco, 2011[23]	FHN-Nocturnal	RCT	NA	Hypophosphatemia <2.17 mg/dl(With phosphorus added to the dialysate)	NR	42	45	Final, counts: 2 (total numbers of events: 4)	Final, Counts: 3 (total numbers of events: 6)	Arm1 vs Arm2: p=1.0
Rocco, 2011[23]	FHN-Nocturnal	RCT	NA	Hypophosphatemia<2.17mg/dl) (Without phosphorus added to the dialysate)	12 months	42	45	Final, counts: 3 (total numbers of events: 5)	Final, Counts: 10 (total numbers of events: 11)	Arm1 vs Arm2: p=0.071
Rocco, 2011[23]	FHN-Nocturnal	RCT	NA	Potassium <3.0 mEq/l	12 months	42	45	Final, counts: 0 (Number of events: 0)	Final, Counts: 2 (Number of events: 8)	Arm1 vs Arm2: p=0.49

FHN=Frequent Hemodialysis Network trials; mEq/l=milliequivalents per liter; mg/dl=milligrams per deciliter; N=number of total patients; n=number of sample patients; NA=not applicable; NR=not reported; RCT=randomized controlled trial

Evidence Table 49. Continuous metabolic outcomes of studies comparing hemodialysis frequency and duration in non-institutionalized patients

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	N, Arm3	N, Arm4	Outcome, Arm1	Outcome, Arm2	Outcome, Arm3	Outcome, Arm4	Treatment Effect	Comments
Molfino, 2019[4]	FHN	RCT	Modality (Daily Trial)	Bicarbonate	12 months	79	80	NA	NA	Baseline: Mean 24.0 (SD: 3.74) Final: Mean 23.7 (SD: 2.97)	Baseline: Mean 23 (SD: 3.3) Final: Mean 24.2 (SD: 2.64)			Arm1: Mean difference: 0.92 (95% CI: 0.04 to 1.81), p=0.04	Data for Euthyroid patients
Molfino, 2019[4]	FHN	RCT	Modality (Nocturnal Trial)	Bicarbonate	12 months	79	80	NA	NA	Baseline: Mean 21.6 (SD: 3.47) Final: Mean 22.1 (SD: 2.23)	Baseline: Mean 21.8 (SD: 4.09) Final: Mean 25.4 (SD: 3.67)			Arm1: Mean difference: 3.25 (95% CI: 1.46 to 5.04), p=0.001	Euthyroid
Lo, 2017[5]	NR	RCT	Daily Trial 3x vs 6x	Free T3	12 months	72	75	25	23	Baseline: Mean 2.46 (SD: 0.75) Final: Mean 2.59 (SD: 0.74)	Baseline: Mean 2.57 (SD: 0.88) Final: Mean 2.81 (SD: 0.95)			Arm1 vs Arm2: p=0.71 Arm1: change: 0.12 (0.43) Arm2: Change: 0.24 (0.64)	
Lo, 2017[5]	NR	RCT	Nocturnal Trial 3x vs. 6x	Free T3	12 months	72	75	25	23	Baseline: Mean 3.27 (SD: 1.42) Final: Mean 2.97 (SD: 1.2)	Baseline: Mean 2.83 (SD: 0.38) Final: Mean 3.17 (SD: 0.99)			Arm1 vs Arm2: p=0.07 Arm1: Change: -0.30 (-0.36) Arm2: Change: 0.34 (1)	
Lo, 2017[5]	NR	RCT	Daily Trial 3x vs. 6x	Free T4	12 months	72	75	25	23	Baseline: Mean 0.86 (SD: 0.23) Final: Mean 0.9 (SD: 0.27)	Baseline: Mean 0.84 (SD: 0.21) Final: Mean 0.91 (SD: 0.3)			Arm1: change: 0.04(0.15) Arm2: change: 0.07 (0.26)	Change in Free T4 between groups p=0.58
Lo, 2017[5]	NR	RCT	Nocturnal Trial	Free T4	12 months	72	75	25	23	Baseline: Mean 0.96 (SD: 0.11) Final: Mean 0.93 (SD: 0.14)	Baseline: Mean 1.02 (SD: 0.18) Final: Mean 1.04 (SD: 0.18)			Arm1 vs Arm2: p=0.12 Arm1: Change: -0.04 (0.14) Arm2: Change: 0.02 (0.11)	p=0.12

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	N, Arm3	N, Arm4	Outcome, Arm1	Outcome, Arm2	Outcome, Arm3	Outcome, Arm4	Treatment Effect	Comments
Lo, 2017[5]	NR	RCT	Nocturnal Trial	TSH	12 months	72	75	25	23	Baseline: Mean 1.71 (SD: 0.75) Final: Mean 1.86 (SD: 0.89)	Baseline: Mean 1.93 (SD: 1) Final: Mean 1.87 (SD: 0.97)			Arm1 vs Arm2: p=0.84 Arm1: Change: 0.15 (1.06) Arm2: Change: -0.06 (0.68)	p=0.84
Lo, 2017[5]	NR	RCT	Daily Trial	TSH	12 months	72	75	25	23	Baseline: Mean 2.01 (SD: 1.33) Final: Mean 2.33 (SD: 1.44)	Baseline: Mean 2.06 (SD: 1.16) Final: Mean 2.02 (SD: 1.22)			Arm1 vs Arm2: p=0.15 Arm1: mean change: 0.32 (1.29) Arm2: mean change: -0.04 (0.89)	Change in TSH non-significant between groups (0.15).

3x=3 times; 6x=6 times; CI=confidence interval; N=number of patients; NA=not applicable; NR=not reported; RCT=randomized controlled trial; SD=standard deviation; T3= triiodothyronine; T4=thyroxine; TSH=thyroid-stimulating hormone

Evidence Table 50. Continuous calcium outcomes of studies comparing hemodialysis frequency and duration in non-institutionalized patients

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	Outcome, Arm1	Outcome, Arm2	Treatment Effect
Ayus, 2005[1]	NR	NRCT	NA	Calcium phosphorus product	6 months	51	26	Baseline: Mean 44.8 (SD: 13.2) Final: Mean 44.3 (SD: 10.6)	Baseline: Mean 52.5 (SD: 23.0) Final: Mean 37.5 (SD: 11.1)	Arm1: p<0.0001 Arm2: p<0.001
Troidle, 2007[29]	NR	Observational: prospective	NA	Serum calcium (mg/dL)	6 months	NR	NR	Baseline: Mean 9.3 (SD: 1.0) Final: NR	Baseline: NR Final: Mean 9.3 (SD: 0.81)	Pre-post comparison, p=0.94

mg/dL=milligrams per deciliter; N=number of patients; NA=not applicable; NR=not reported; NRCT=non-randomized controlled trial; SD=standard deviation

Evidence Table 51. Categorical calcium outcomes of studies comparing hemodialysis frequency and duration in non-institutionalized patients

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	n / N (%), Arm1	n / N (%), Arm2	Treatment Effect
Rocco, 2015[24]	FHN-Nocturnal	RCT	NA	CHF events	12 months	42	45	Baseline: 7/42 (17) Final: 6/39 (15)	Baseline: 5/45 (11) Final: 3/38 (8)	NR

CHF=congestive heart failure; FHN=Frequent Hemodialysis Network trials; N=number of total patients; n=number of sample patients; NA=not applicable; NR=not reported; RCT=randomized controlled trial

Evidence Table 52. Categorical stroke outcomes of studies comparing hemodialysis frequency and duration in non-institutionalized patients

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	n (%), Arm1	n (%), Arm2	Treatment Effect
Rocco, 2015[24]	FHN-Nocturnal	RCT	NA	Stroke events	12 months	42	45	6 months, counts: 1 (2) 12 months, counts: 0(0)	6 months, Counts: 1 (2) 12 months, Counts: 1(3)	NR

FHN=Frequent Hemodialysis Network trials; N=number of total patients; n=number of sample patients; NA=not applicable; NR=not reported; RCT=randomized controlled trial

Evidence Table 53. Categorical hospitalization outcomes of studies comparing hemodialysis frequency and duration in non-institutionalized patients

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	n (%), Arm1	n (%), Arm2	Treatment Effect
Johansen, 2009[32]	NR	Retrospective cohort	NA	All cause hospitalization	2 years; greater than 2 years	940	94	NR	NR	HR: 0.87; 95% CI: 0.42b tp 1.81; p=0.71
Rocco, 2011[23]	FHN-Nocturnal	RCT	NA	Hospitalization rate	12 months	42	45	Final, counts: 30 (Numbers of patients with events: 16)	Final, Counts: 43 (Numbers of patients with events: 19)	Arm1 vs Arm2: HR 1.42 (95% CI: 0.69 to 2.90), p=0.34
Rocco, 2011[23]	FHN-Nocturnal	RCT	NA	Infection hospitalizations	12 months	42	45	Final, counts: 5 (Number of events: 7)	Final, Counts: 14 (Number of events: 8)	Arm1 vs Arm2: 2.04 (95% CI: 0.80 to 5.17), p=NR
Rocco, 2011[23]	FHN-Nocturnal	RCT	NA	Non-access hospitalizations	12 months	42	45	Final, counts: 15 (Number of events: 26)	Final, Counts: 17 (Number of events: 35)	Arm1 vs Arm2: HR 1.32 (95% CI: 0.60 to 2.89), p=0.48
Rocco, 2011[23]	FHN-Nocturnal	RCT	NA	Cardiovascular hospitalizations	12 months	42	45	Final, counts: 3 (: 4)	Final, Counts: 5 (: 6)	Arm1 vs Arm2: HR 1.60 (95% CI: 0.49 to 5.22), p=NR

FHN=Frequent Hemodialysis Network trials; HR=hazard ratio; N=number of total patients; n=number of sample patients; NA=not applicable; NR=not reported; RCT=randomized controlled trial

Evidence Table 54. Categorical myocardial infarction outcomes of studies comparing hemodialysis frequency and duration in non-institutionalized patients

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	n (%), Arm1	n (%), Arm2	Treatment Effect
Rocco, 2015[24]	FHN-Nocturnal	RCT	NA	MI events	12 months	42	45	6 months, counts: 4 (10) 12 months, counts: 4(11)	6 months, Counts: 5 (11) 12 months, Counts: 4(10)	NR

FHN=Frequent Hemodialysis Network trials; MI=myocardial infarction; N=number of total patients; n=number of sample patients; NA=not applicable; NR=not reported; RCT=randomized controlled trial

Evidence Table 55. Categorical peripheral arterial disease outcomes of studies comparing hemodialysis frequency and duration in non-institutionalized patients

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	n (%), Arm1	n (%), Arm2	Treatment Effect
Rocco, 2015[24]	FHN-Nocturnal	RCT	NA	PAD events	12 months	42	45	6 months, counts: 7 (17) 12 months, counts: 6(15)	6 months, Counts: 8 (18) 12 months, Counts: 7(18)	NR

FHN=Frequent Hemodialysis Network trials; N=number of total patients; n=number of sample patients; NA=not applicable; NR=not reported; PAD=peripheral arterial disease; RCT=randomized controlled trial

Evidence Table 56. Categorical vascular access length outcomes of studies comparing hemodialysis frequency and duration in non-institutionalized patients

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	n (%), Arm1	n (%), Arm2	Hazard ratio (95% CI)	Comments
Rocco, 2011[23]	FHN-Nocturnal	RCT	NA	Vascular access complications/thrombosis-vascular access failures	12 months	42	45	Final, counts: 10 (total numbers of events: 13)	Final, Counts: 13 (total numbers of events: 17)	Arm1 vs Arm2: HR 1.27 (95% CI: 0.60 to 2.71), p=0.54	
Rocco, 2011[23]	FHN-Nocturnal	RCT	NA	Vascular Access interventions/thrombosis	12 months	42	45	Final, counts: 15 (total numbers of events: 21)	Final, Counts: 23 (total numbers of events: 34)	6 months, Arm1 vs Arm2: Hazard ratio (95% confidence interval) 1.62 (0.91, 2.87), p=0.10 Final, Arm1 vs Arm2: HR 1.62 (95% CI: 0.91 to 2.87), p=0.10	The fraction of events affecting fistulas, grafts, and catheters were 50, 6, and 44% in the frequent nocturnal arm and 19, 24, and 57% in the conventional arm. A total of 51% of patients in the frequent nocturnal arm and 36% of patients in the conventional arm suffered a vascular access failure or underwent at least one vascular access procedure (time to first access event HR = 1.88, 95% CI 0.97–3.64, P = 0.06, Figure 6)

CI=confidence interval; FHN=Frequent Hemodialysis Network trials; HR=hazard ratio; N=number of total patients; n=number of sample patients; NA=not applicable; RCT=randomized controlled trial

Evidence Table 57. Categorical other morbidity outcomes of studies comparing hemodialysis frequency and duration in non-institutionalized patients

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	n (%), Arm1	n (%), Arm2	Treatment Effect
Rocco, 2015[24]	FHN-Nocturnal	RCT	NA	Abdominal aortic aneurysm repair or bypass grafting	12 months	42	45	6 months, counts: 5 (12) Final, counts: 4 (10)	6 months, Counts: 2 (4) Final, Counts: 1 (3)	NR
Rocco, 2015[24]	FHN-Nocturnal	RCT	NA	Atrial fibrillation	12 months	42	45	6 months, counts: 0 (0) Final, counts: 0 (0)	6 months, Counts: 6 (13) Final, Counts: 5 (13)	NR
Rocco, 2015[24]	FHN-Nocturnal	RCT	NA	Chronic pulmonary disease	12 months	42	45	6 months, counts: 2 (5) Final, counts: 2 (5)	6 months, Counts: 2 (4) Final, Counts: 2 (5)	NR
Rocco, 2015[24]	FHN-Nocturnal	RCT	NA	Dementia	12 months	42	45	6 months, counts: 0 (0) Final, counts: 0 (0)	6 months, Counts: 0 (0) Final, Counts: 0 (0)	NR
Rocco, 2015[24]	FHN-Nocturnal	RCT	NA	Diabetes and diabetic complications	12 months	42	45	6 months, counts: 18 (43) Final, counts: 16 (41)	6 months, Counts: 19 (42) Final, Counts: 18 (47)	NR

FHN=Frequent Hemodialysis Network trials; N=number of total patients; n=number of sample patients; NA=not applicable; NR=not reported; RCT=randomized controlled trial

Evidence Table 58. Continuous diastolic blood pressure outcomes of studies comparing hemodialysis frequency and duration in non-institutionalized patients

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	N, Arm3	N, Arm4	Outcome, Arm1	Outcome, Arm2	Outcome, Arm3	Outcome, Arm4	Treatment effect
Daugirdas, 2013[10]	FHN	RCT	NA	Clinic DBP (mm Hg)	12 months	48	35	31	32	Baseline: Mean 78.3 (SD: 10.4)	Baseline: Mean 83.1 (SD: 10.9)	Baseline: Mean 84.8 (SD: 12.1)	Baseline: Mean 80.1 (SD: 8.9)	Arm1: Spearman R (change from baseline) 0.12, p=0.51 Arm2: Spearman R (change from baseline) 0.33, p=0.11 Arm3: Spearman R (change from baseline) 0.21, p=0.34 Arm4: Spearman R (change from baseline) 0.11, p=0.60
Dixon, 2016[25]	FHN-Nocturnal	Observational: prospective	NA	Clinic DBP (mmHg)	12 months	31	18	28	NA	Baseline: Mean 80 (SD: 16) Final: Mean 84 (SD: 12)	Baseline: Mean 79 (SD: 19) Final: Mean 76 (SD: 12)	Baseline: Mean 81 (SD: 16) Final: NR		NR
Kotanko, 2015[7]	FHN	RCT	nocturnal	Clinic DBP (post-HD)	10-12 months	162	170	NA	NA	Baseline: Mean 76.3 (SD: 14.9) Final: Mean 74.1 (SD: 12.1)	Baseline: Mean 75.1 (SD: 11.9) Final: Mean 72.4 (SD: 13.4)			Arm1 vs Arm2: Mean difference: Change from baseline: -1.3 (95% CI: -5.2 to 2.6), p=NS

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	N, Arm3	N, Arm4	Outcome, Arm1	Outcome, Arm2	Outcome, Arm3	Outcome, Arm4	Treatment effect
Rocco, 2015[24]	FHN-Nocturnal	RCT	NA	Clinic DBP (predialysis DBP (mmHg)	12 months	42	45	NA	NA	Baseline: Mean 83.1 (SD: 23.8) Final: Mean 82.9 (SD: 12.9)	Baseline: Mean 79.6 (SD: 10.6) Final: Mean 75.9 (SD: 14.2)			NR
Chan, 2012[15]	FHN	RCT	NA	Clinic DBP (predialysis DBP, mmHg)	12 months	120	125	42	45	Final: Mean 0.6 (SD: 0.9)	Final: Mean -4.5 (SD: 0.9)	Final: Mean 0.3 (SD: 1.5)	Final: Mean -4.2 (SD: 1.5)	Arm1 vs Arm2: p<0.001, arm1 vs arm2 Arm3 vs Arm4: p=0.02 Arm1: Mean difference 0.6 (SD: 0.9), p=NR Arm2: Mean difference -4.5 (SD: 0.9), p=NR Arm3: Mean difference 0.3 (SD: 1.5), =NR Arm4: Mean difference -4.2 (SD: 1.5), p=NR
Kotanko, 2015[7]	FHN	RCT	nocturnal	Clinic DBP (pre-HD)	10-12 months	162	170	NA	NA	Baseline: Mean 82.9 (SD: 13.9) Final: Mean 83.0 (SD: 12.7)	Baseline: Mean 79.5 (SD: 11.0) Final: Mean 76 (SD: 13.9)			Arm1 vs Arm2: Mean difference: Change from baseline: -4.5 (95% CI: -8.3 to -0.7), p=<0.05

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	N, Arm3	N, Arm4	Outcome, Arm1	Outcome, Arm2	Outcome, Arm3	Outcome, Arm4	Treatment effect
Ayus, 2005[1]	NR	NRCT	NA	Clinic DBP (mmHg)	12 months	51	26	NA	NA	Baseline: Mean 75 (SD: 9.10) 6 months: Mean 74 (SD: 7.1) Final: Mean 75 (SD: 6.8)	Baseline: Mean 73 (SD: 7.62) 6 months: Mean 72 (SD: 6.95) Final: Mean 73 (SD: 7.07)			6 months, Arm1 vs Arm2: p=NS Final, Arm1 vs Arm2: p=NS

CI=confidence interval; DBP=diastolic blood pressure; FHN=Frequent Hemodialysis Network trials; mmHg=millimeters of mercury; N=number of patients; NA=not applicable; NR=not reported; NRCT=non-randomized controlled trial; NS=not significant; RCT=randomized controlled trial; SD=standard deviation

Evidence Table 59. Continuous systolic blood pressure outcomes of studies comparing hemodialysis frequency and duration in non-institutionalized patients

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	N, Arm3	N, Arm4	Outcome, Arm1	Outcome, Arm2	Outcome, Arm3	Outcome, Arm4	Treatment Effect
Daugirdas, 2013[10]	FHN	RCT	NA	Clinic SBP (mm Hg)	12 months	48	35	31	32	Baseline: Mean 146.5 (SD: 17.7)	Baseline: Mean 153.8 (SD: 15.5)	Baseline: Mean 155.5 (SD: 20.8)	Baseline: Mean 145.8 (SD: 13.1)	Arm1: Spearman R (change from baseline) 0.09, p=0.61 Arm2: Spearman R (change from baseline) 0.45, p=0.02 Arm3: Spearman R (change from baseline) -0.20, p=0.38 Arm4: Spearman R (change from baseline) 0.02, p=0.94
Chan, 2012[15]	FHN	RCT	NA	Clinic SBP (mm Hg)	12 months	120	125	42	45					Arm1: Mean difference: 0.7 (SD: 1.6), p<0.001 Arm2: Mean difference: -9.3 (SD: 1.5), p<0.001 Arm3: Mean difference: -1.4 (SD: 2.5), p=0.02 Arm4: Mean difference: -9.4 (SD: 2.5), p=0.02
Dixon, 2016[25]	FHN-Nocturnal	Observational: prospective	NA	Clinic SBP (mm Hg)	12 months	31	18	28	NA	Baseline: Mean 147 (SD: 27) Final: Mean 149 (SD: 26)	Baseline: Mean 143 (SD: 31) Final: Mean 135 (SD: 17)			NR

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	N, Arm3	N, Arm4	Outcome, Arm1	Outcome, Arm2	Outcome, Arm3	Outcome, Arm4	Treatment Effect
Kotanko, 2015[7]	FHN	RCT	nocturnal	Clinic SBP (post-HD)	10-12 months	162	170	NA	NA	Baseline: Mean 139.2 (SD: 21.2) Final: Mean 132.3 (SD: 2.8)	Baseline: Mean 136.1 (SD: 18.5) Final: Mean 129.3 (SD: 20.3)			Arm1 vs Arm2: Mean difference: Change from baseline: -2.0 (95% CI: -9.2 to 5.2), p=NS
Rocco, 2011[23]	FHN-Nocturnal	RCT	NA	Clinic SBP (predialysis)	12 months	42	45	NA	NA	Baseline: Mean 153 (SD: 22) Final: Mean 151 (SD: 19)	Baseline: 153 SD (22:) Final: Mean 137 (SD: 21)			Arm1 vs Arm2: Treatment comparison of change: nocturnal vs conventional (95% CI): −9.7 (−16.9, −2.5), p=0.009 Arm1: Mean difference: −0.1 (se: ±2.6) Arm2: Mean difference: −9.8 (se: ±2.7)
Kotanko, 2015[7]	FHN	RCT	nocturnal	Clinic SBP (Pre-HD)	10-12 months	162	170	NA	NA	Baseline: Mean 152.6 (SD: 22.2) Final: Mean 150.7 (SD: 18.6)	Baseline: Mean 144.9 (SD: 13.7) Final: Mean 137 (SD: 20.5)			Arm1 vs Arm2: Mean difference: CHange from baseline: -8.0 (95% CI: -14.5 to -1.6), p<0.05
Troidle, 2007[29]	NR	Observational: prospective	NA	Clinic SBP (Systolic blood pressure (post))	6 months	0	0	NA	NA	Pre: Mean 136 (SD: 24)	Post: Mean: 128 (SD: 20)			Pre vs Post: p=NR

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	N, Arm3	N, Arm4	Outcome, Arm1	Outcome, Arm2	Outcome, Arm3	Outcome, Arm4	Treatment Effect
Daugirdas, 2013[10]	FHN	RCT	NA	Lowest intradialytic systolic BP (mm Hg)	12 months	48	35	31	32					Arm1: Spearman R (change from baseline): 0.06, p=0.05 Arm2: Spearman R (change from baseline): 0.39, p=0.73 Arm3: Spearman R (change from baseline): 0.07, p=0.76 Arm2: Spearman R (change from baseline): 0.77, p=0.00
Ayus, 2005[1]	NR	NRCT	NA	Clinic SBP (mmHg)	12 months	51	26	NA	NA	Baseline: Mean 143 (SD: 12.4) Final: Mean 145 (SD: 11.6)	Baseline: Mean 145 (SD: 13.0) Final: Mean 142 (SD: 11.3)			Arm1 vs Arm2: p=NS

CI=confidence interval; FHN=Frequent Hemodialysis Network trials; HD=hemodialysis; mm Hg=millimeters of mercury; N=number of patients; NA=not applicable; NR=not reported; NRCT=non-randomized controlled trial; NS=not significant; RCT=randomized controlled trial; SBP=systolic blood pressure; SD=standard deviation

Evidence Table 60. Continuous blood pressure medication outcomes of studies comparing hemodialysis frequency and duration in non-institutionalized patients

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	Outcome, Arm1	Outcome, Arm2	Treatment Effect
Kotanko, 2015[7]	FHN	RCT	nocturnal	Number of BP meds	10-12 months	162	170	Baseline: 42 Mean (1.6: SD) Final: 42 Mean (1.6: SD)	Baseline: 45 Mean (1.9: SD) Final: 45 Mean (1.1: SD)	Arm1 vs Arm2: Change from baseline: -0.44 (95% CI: -0.89 to -0.03), p<0.05
Rocco, 2011[23]	FHN-Nocturnal	RCT	NA	Number of BP meds	12 months	42	45	Baseline: 39 Mean (1.74: SD) Final: 39 Mean (2: SD)	Baseline: 37 Mean (2.38: SD) Final: 37 Mean (1.41: SD)	Arm1 vs Arm2: p<0.001 Arm1: Change from baseline to follow-up 0.26±1.43 Arm2: Change from baseline to follow-up -0.97±2.09

BP=blood pressure; FHN=Frequent Hemodialysis Network trials; N=number of patients; NA=not applicable; RCT=randomized controlled trial; SD=standard deviation

Evidence Table 61. Continuous left ventricular mass outcomes of studies comparing hemodialysis frequency and duration in non-institutionalized patients

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	N, Arm3	N, Arm4	Outcome, Arm1	Outcome, Arm2	Outcome, Arm3	Outcome, Arm4	Treatment Effect
Chan, 2013[8]	FHN	RCT	NA	LV mass	12 months	120	125	42	45	Baseline: Median 76 g/ml (Quartile1, Quartile3: 59.7, 102.5:) Final: Median 74.2 g/ml (Quartile1, Quartile3: 58.7, 108.7:)	Baseline: Median 80.4 g/ml (Quartile1, Quartile3: 56.9, 110.2:) Final: Median 78.4 g/ml (Quartile1, Quartile3: 58.2, 116.5:)	Baseline: Median 81.5 g/ml (Quartile1, Quartile3: 62.9, 137.7:) Final: Median 80.4 g/ml (Quartile1, Quartile3: 58.3, 120.1:)	Baseline: Median 77.7 g/ml (Quartile1, Quartile3: 58.4, 123:) Final: Median 76.5 g/ml (Quartile1, Quartile3: 54.5, 120.1:)	Arm1 vs Arm2: Mean difference: 3.42 (95% CI: -1.91 to 8.75), p=0.21 Arm1: Mean difference: -2.04 (95% CI:-6.11 to 2.02) Arm2: Mean difference: 1.38 (95% CI:-2.33 to 5.10) Arm3: Mean difference: -3.48 (95% CI:-10.55 to 3.59) Arm4: Mean difference: -4.97 (95% CI:-12.2 to 2.26)
Chan, 2012[15]	FHN	RCT	NA	LV mass	12 months	120	125	42	45					Arm2: Mean difference: -13.1 (95% CI: -21.3 to -5.0), p=0.002 Arm4: Mean difference: -10.9 (95% CI:-23.7 to 1.8), p=0.09 Arm2: Hazard Ratio: 0.61 (95% CI:0.46 to 0.82), p<0.001 Arm4: Hazard Ratio: 0.68 (95% CI:0.44 to 1.07), p=0.095
Chan, 2012[15]	FHN	RCT	NA	LV mass	12 months	120	125	42	45		Final: Mean -6.9 (95% CI: -11.3 to -2.4)		Final: Mean -5.2 (95% CI: -11.4 to 1.0)	Arm2: Mean difference: -6.9 (95% CI: -11.3 to -2.4), p=0.003 Arm4: Mean difference: -5.2 (95% CI:-11.4 to 1.0), p=0.10 Arm2: HR: 0.65 (95% CI:0.49 to 0.87), p0.003 Arm4: HR: 0.74 (95% CI:0.48 to 4.46), p=0.19
Chan, 2012[15]	FHN	RCT	NA	LV mass	12 months	120	125	42	45		Final: Mean -7.0 (95% CI: -12.6 to -1.0)		Final: Mean -9.1 (95% CI: -17.0 to -0.5)	Arm2: Mean difference: -7.0 (95% CI: -12.6 to -1.0), p=0.02 Arm4: Mean difference: -9.1 (95% CI:-17.0 to -0.5), p=0.04 Arm2: HR: 0.64 (95% CI:0.48 to 0.85), p0.002 Arm4: HR: 0.63 (95% CI:0.40 to 0.99), p=0.04

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	N, Arm3	N, Arm4	Outcome, Arm1	Outcome, Arm2	Outcome, Arm3	Outcome, Arm4	Treatment Effect
Chan, 2012[15]	FHN	RCT	Age	LV mass	12 months	120	125	42	45					Arm2: Treatment effect: -20.1 (95% CI: -31.6 to -8.6), p=0.24 Arm4: Treatment effect: -14.2 (95% CI:-34.7 to 6.3), p=NR
Chan, 2012[15]	FHN	RCT	Age	LV mass	12 months	120	125	42	45					Arm2: Treatment effect: -5.8 (95% CI: -17.5 to 5.9), p=NR Arm4: Treatment effect: -8.3 (95% CI:-24.8 to 8.2), p=NR
Chan, 2012[15]	FHN	RCT	Sex	LV mass	12 months	120	125	42	45					Arm2: Treatment effect: -12.8 (95% CI: -23.1 to -2.5), p=0.73 Arm4: Treatment effect: -12.0 (95% CI:-27.7 to 3.7), p=NR
Chan, 2012[15]	FHN	RCT	Sex	LV mass	12 months	120	125	42	45					Arm2: Treatment effect: -13.9 (95% CI: -27.5 to -0.2), p=NR Arm4: Treatment effect: -8.8 (95% CI:-31.7 to 14.0), p=NR
Chan, 2012[15]	FHN	RCT	Diabetes	LV mass	12 months	120	125	42	45					Arm2: Treatment effect: -20.2 (95% CI: -30.7 to -9.8), p=0.15 Arm4: Treatment effect: -13.3 (95% CI:-30.3 to 3.7), p=NR
Chan, 2012[15]	FHN	RCT	Diabetes	LV mass	12 months	120	125	42	45					Arm2: Treatment effect: -2.9 (95% CI: -15.5 to 9.7), p=NR Arm4: Treatment effect: -7.8 (95% CI:-27.4 to 11.5), p=NR
Chan, 2012[15]	FHN	RCT	Race/ethnicity	LV mass	12 months	120	125	42	45					Arm2: Treatment effect: -18.8 (95% CI: -34.2 to -3.3), p=0.43 Arm4: Treatment effect: -13.7 (95% CI:-33 to 5.5), p=NR

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	N, Arm3	N, Arm4	Outcome, Arm1	Outcome, Arm2	Outcome, Arm3	Outcome, Arm4	Treatment Effect
Chan, 2012[15]	FHN	RCT	Race/ethnicity	LV mass	12 months	120	125	42	45					Arm2: Treatment effect: -14.8 (95% CI: -27.4 to -2.3), p=NR Arm4: Treatment effect: -13.2 (95% CI:-38.5 to 12.0), p=NR
Ayus, 2005[1]	NR	NRCT	NA	LV mass	12 months	51	26	NA	NA	Baseline: Mean 148 (SD: 34) Final: NR	Baseline: Mean 154 (SD: 33) Final: Mean 108 (SD: 25)			Arm1: Mean difference: NR, p=NS Arm2: Mean difference: -30%, p<0.0001
Rocco, 2015[24]	FHN-Nocturnal	RCT	NA	LV mass	12 months	42	45	NA	NA	Baseline: Mean 134.9 (SD: 41.8) Final: Mean 132.8 (SD: 41.7)	Baseline: Mean 138.5 (SD: 47.9) Final: Mean 133.3 (SD: 56.5)			Arm1 vs Arm2: p=NR
Rocco, 2011[23]	FHN-Nocturnal	RCT	NA	LV mass	12 months	42	45	NA	NA	Baseline: Mean 132 (SD: 41) Final: Mean 133 (SD: 42)	Baseline: Mean 141 (SD: 48) Final: Mean 132 (SD: 55)			Arm1 vs Arm2: Treatment comparison of change: nocturnal vs conventional (95% CI) −10.9 (−23.7, 1.8), p=0.09 Arm1: Mean difference 1.7 (SD: 4.5) Arm1: Change from baseline to follow-up 0.6±24.9 Arm2: Mean difference −9.2 (SD: ±4.6) Arm2: Change from baseline to follow-up -8.2±31.7

CI=confidence interval; FHN=Frequent Hemodialysis Network trials; g/ml=grams per milliliter; HR=hazard ratio; LV=left ventricular; N=number of patients; NA=not applicable; NR=not reported; NRCT=non-randomized controlled trial; NS=not significant; RCT=randomized controlled trial; SD=standard deviation

Evidence Table 62. Categorical hypertension outcomes of studies comparing hemodialysis frequency and duration in non-institutionalized patients

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	n (%), Arm1	n (%), Arm2	Treatment Effect
Rocco, 2015[24]	FHN-Nocturnal	RCT	NA	Hypertension	12 months	42	45	6 months, counts: 39 (93) Final, counts: 36 (92)	6 months, Counts: 41 (91) Final, Counts: 35 (92)	NR

FHN=Frequent Hemodialysis Network trials; N=number of total patients; n=number of sample patients; NA=not applicable; NR=not reported; RCT=randomized controlled trial

Evidence Table 63. Continuous quality of life outcomes of studies comparing hemodialysis frequency and duration in non-institutionalized patients

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	N, Arm3	N, Arm4	Outcome, Arm1	Outcome, Arm2	Outcome, Arm3	Outcome, Arm4	Treatment Effect	Comments
Unruh, 2016[18]	FHN	RCT	NA	% SPI II score>47 : Nocturnal Trial	12 months	120	125	42	45	Baseline: 4.3% Final: 3.5%	Baseline: 2.4% Final: 1.8%			NR	Figure 2: Percent of participants in the Nocturnal Trial with SPI II score >47 by time and treatment.
Troidle, 2007[29]	NR	Observational: prospective	NA	Beck Depression Inventory.	6 months	NR	NR	NA	NA	Baseline: Mean 10.1 (SD: 5.6) Final: NR	Baseline: NR Final, 6 months: Mean: 6.9 (SD: 6.2)			NR	Conventional hemodialysis patient reference values: 10.7 (SD 7.4)
Hall, 2012[19]	FHN	RCT	Nocturnal Trial	RAND-36 PHC in Nocturnal Trial	12 months	42	45	120	125	Baseline: Mean 38.4 (SD: 8.5) Final: Mean 40.6 (SD: 9.2)	Baseline: Mean 35.8 (SD: 8.7) Final: Mean 39.8 (SD: 12.2)			Arm1: Mean difference: 0.6 (95% CI: -3.4 to 4.7)	Table 3
Unruh, 2013[11]	FHN	RCT	NA	RAND-36 Emotional well-being	12 months	120	125	42	45	Baseline: Mean 77.6 (SD: 16.3) Final: Mean 75.6 (SD: 20.9)	Baseline: Mean 73.1 (SD: 22.5) Final: Mean 80.3 (SD: 17.5)	Baseline: Mean 77.1 (SD: 21.7) Final: Mean 75.6 (SD: 21.4)	Baseline: Mean 75.7 (SD: 18.1) Final: Mean 78.4 (SD: 18.0)	Arm1 vs Arm2: Treatment comparison (6x vs 3x) baseline to 12 months: 5.5 (95% CI: 95% CI (LL) to 95% CI (UL)), p=<=0.05 Arm3 vs Arm4: Treatment comparison (6x vs 3x) baseline to 12 months: 5.3 (95% CI: 95% CI (LL) to 95% CI (UL)), p=NR	

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	N, Arm3	N, Arm4	Outcome, Arm1	Outcome, Arm2	Outcome, Arm3	Outcome, Arm4	Treatment Effect	Comments
Unruh, 2013[11]	FHN	RCT		RAND-36 Energy/Fatigue	12 months	120	125	42	45	Baseline: Mean 51.2 (SD: 20.8) Final: Mean 51.6 (SD: 20.5)	Baseline: Mean 47.1 (SD: 25.2) Final: Mean 58.6 (SD: 23.4)	Baseline: Mean 48.4 (SD: 19.5) Final: Mean 49.6 (SD: 22.6)	Baseline: Mean 48.6 (SD: 22.9) Final: Mean 51.4 (SD: 25.0)	Arm1 vs Arm2: Treatment comparison (6x vs 3x), baseline to 12 months: 8.3 (95% CI: 95% CI (LL) to 95% CI (UL)), p=<=-.01 Arm3 vs Arm4: Treatment comparison (6x vs 3x), baseline to 12 months: 3.0 (95% CI: 95% CI (LL) to 95% CI (UL)), p=NR	
Unruh, 2013[11]	FHN	RCT		RAND-36 Mental Health Composite	12 months	120	125	42	45	Baseline: Mean 46.0 (SD: 10.3) Final: Mean 45.7 (SD: 11.8)	Baseline: Mean 44.3 (SD: 13.0) Final: Mean 48.8 (SD: 11.4)	Baseline: Mean 45.9 (SD: 12.6) Final: Mean 45.6 (SD: 12.2)	Baseline: Mean 45.6 (SD: 10.5) Final: Mean 48.2 (SD: 11.7)	Arm1 vs Arm2: Treatment comparison (6x vs 3x), baseline to 12 months: 3.5 (95% CI: 95% CI (LL) to 95% CI (UL)), p=<=0.01 Arm3 vs Arm4: Treatment comparison (6x vs 3x), baseline to 12 months: 3.7 (95% CI: 95% CI (LL) to 95% CI (UL)), p=NR	
Hall, 2012[19]	FHN	RCT	Nocturnal trial	RAND-36 Physical Functioning (PF) in Nocturnal Trial	12 months	42	45	120	125	Baseline: Mean 62.6 (SD: 18.3) Final: Mean 63.5 (SD: 23.4)	Baseline: Mean 57.7 (SD: 25.2) Final: Mean 55 (SD: 34.3)			Arm1: Mean difference: -4.2 (95% CI: -14.1 to 5.7)	Table 3

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	N, Arm3	N, Arm4	Outcome, Arm1	Outcome, Arm2	Outcome, Arm3	Outcome, Arm4	Treatment Effect	Comments
Unruh, 2013[11]	FHN	RCT	NA	RAND-36 Role limitation due to emotional problems	12 months	120	125	42	45	Baseline: Mean 78.4 (SD: 35.2) Final: Mean 77.1 (SD: 38.4)	Baseline: Mean 73.6 (SD: 38.1) Final: Mean 80.2 (SD: 36.1)	Baseline: Mean 77.0 (SD: 39.3) Final: Mean 82.9 (SD: 33.2)	Baseline: Mean 87.4 (SD: 24.9) Final: Mean 89.7 (SD: 26.7)	Arm1 vs Arm2: Treatment comparison (6x vs 3x), baseline to 12 months: 3.8 (95% CI: 95% CI (LL) to 95% CI (UL)), p= Arm3 vs Arm4: Treatment comparison (6x vs 3x), baseline to 12 months: 4.9 (95% CI: 95% CI (LL) to 95% CI (UL)), p=NR	
Unruh, 2013[11]	FHN	RCT	NA	RAND-36 Social Functioning	12 months	120	125	42	45	Baseline: Mean 72.3 (SD: 25.5) Final: Mean 72.8 (SD: 29.5)	Baseline: Mean 70.4 (SD: 28.0) Final: Mean 76.8 (SD: 25.5)	Baseline: Mean 75.6 (SD: 25.6) Final: Mean 76.0 (SD: 26.2)	Baseline: Mean 73.1 (SD: 25.3) Final: Mean 80.4 (SD: 26.1)	Arm1 vs Arm2: Treatment comparison (6x vs 3x), baseline to 12 months: 4.1 (95% CI: 95% CI (LL) to 95% CI (UL)), p= Arm3 vs Arm4: Treatment comparison (6x vs 3x), baseline to 12 months: 7.2 (95% CI: 95% CI (LL) to 95% CI (UL)), p=NR	
Troidle, 2007[29]	NR	Observational: prospective	NA	SF-36, mental component score	6 months	NR	NR	NA	NA	Baseline: Mean 56 (SD: 4.8) Final, 4 months: NR	Baseline: NR Final, 4 months: Mean 48 (SD: 9.8)				Conventional hemodialysis patient reference values: 49 (SD 10.5)
Troidle, 2007[29]	NR	Observational: prospective	NA	SF-36, physical component score	6 months	NR	NR	NA	NA	Baseline: Mean 45 (SD: 7.5) Final, 4 months: NR	Baseline: NR Final, 4 months: Mean 44 (SD: 0.8)				Conventional hemodialysis patient reference values: 33 (SD 10.8)

3x=3 times; 6x=6 times; CI=confidence interval; FHN=Frequent Hemodialysis Network trials; LL=lower limit; N=number of patients; NA=not applicable; NR=not reported; PHC=Physical health composite; RAND=36= RAND-36 Measure of Health-Related Quality of Life; RCT=randomized controlled trial; SD=standard deviation; SF-36=Short Form-36; SPI=II= Medical Outcomes Study Sleep Problems Index-II; UL=upper limit

Evidence Table 64. Continuous symptom measures outcomes of studies comparing hemodialysis frequency and duration in non-institutionalized patients

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	N, Arm3	N, Arm4	Outcome, Arm1	Outcome, Arm2	Outcome, Arm3	Outcome, Arm4	Treatment Effect
Unruh, 2013[11]	FHN	RCT	Daily and Nocturnal trials	BDI	12 months	120	125	42	45	Baseline: Mean 12.4 (SD: 9.5) Final: Mean 12.1 (SD: 9.9)	Baseline: Mean 12.6 (SD: 8.6) Final: Mean 10.7 (SD: 8.8)	Baseline: Mean 12.2 (SD: 9.2) Final: Mean 11.1 (SD: 10.2)	Baseline: Mean 11.2 (SD: 8.1) Final: Mean 9.7 (SD: 8.6)	Arm1 vs Arm2: Treatment comparison (6x vs 3x), baseline to 12 months: -1.4 (95% CI: -3.2 to 0.5), p=NR Arm3 vs Arm4: Treatment comparison (6x vs 3x), baseline to 12 months: -0.6 (95% CI: -2.0 to 0.9), p=NR
Rocco, 2011[23]	FHN-Nocturnal	RCT	NA	Beck depression	12 months	42	45	NA	NA	Baseline: Mean 11.7 (SD: 9.3) Final: Mean 11.1 (SD: 10.2)	Baseline: Mean 11.8 (SD: 7.9) Final: Mean 9.7 (SD: 8.6)			Arm1 vs Arm2: Treatment comparison of change: nocturnal vs conventional (95% CI): −1.5 (−4.9, 1.9), p=0.39 Arm1: Mean difference: −0.4 (se: ±1.3) Arm1: Change from baseline to follow-up: -0.6±9.6 Arm2: Mean difference: −1.9 (se: ±1.2) Arm2: Change from baseline to follow-up: -2.1±5.2

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	N, Arm3	N, Arm4	Outcome, Arm1	Outcome, Arm2	Outcome, Arm3	Outcome, Arm4	Treatment Effect
Unruh, 2013[11]	FHN	RCT	NA	Cognitive subscale of BDI score	12 months	120	125	42	45	Baseline: Mean 7.0 (SD: 7.4) Final: Mean 6.9 (SD: 7.4)	Baseline: Mean 7.1 (SD: 6.3) Final: Mean 6.3 (SD: 6.5)	Baseline: Mean 6.5 (SD: 6.9) Final: Mean 6.6 (SD: 7.8)	Baseline: Mean 6.2 (SD: 6.1) Final: Mean 5.3 (SD: 5.9)	Arm1 vs Arm2: Treatment comparison, 6x vs 3x, baseline to 12 months: 2.0 (95% CI: -2.0 to 0.9), p=NR Arm3 vs Arm4: Treatment comparison, 6x vs 3x, baseline to 12 months: -1.6 (95% CI: -4.1 to 0.8), p=NR
Troidle, 2007[29]	NR	Observational: prospective	NA	Fatigue scale.	6 months	NR	NR	NA	NA	Baseline: Mean 19 (SD: 6.5) Final, 4 months: NR	Baseline: NR Final, 4 months: Mean 19 (SD: 6.6)			
Garg, 2017[16]	FHN	RCT	Nocturnal	General health scale	12 months	162	170	NA	NA	Baseline: Mean 45 (SD: 20.4) Final: Mean 46.5 (SD: 18.5)	Baseline: Mean 40.3 (SD: 18.4) Final: Mean 51.8 (SD: 24.5)			Arm1: Mean difference: 6.56 (95% CI: -1.54 to 14.66)
Garg, 2017[16]	FHN	RCT	Nocturnal trial	HUI-3 score	12 months	162	170	NA	NA	Baseline: Mean 0.64 (SD: 0.34) Final: Mean 0.61 (SD: 0.35)	Baseline: Mean 0.53 (SD: 0.32) Final: Mean 0.48 (SD: 0.38)			Arm1: Mean difference: -0.07 (95% CI: -0.21 to 0.08)

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	N, Arm3	N, Arm4	Outcome, Arm1	Outcome, Arm2	Outcome, Arm3	Outcome, Arm4	Treatment Effect
Rocco, 2011[23]	FHN-Nocturnal	RCT	NA	physical health composite	12 months	42	45	NA	NA	Baseline: Mean 38.4 (SD: 8.5) Final: Mean 40.6 (SD: 9.2)	Baseline: Mean 37 (SD: 9.3) Final: Mean 40.3 (SD: 12.3)			Arm1 vs Arm2: Treatment comparison of change: nocturnal vs conventional (95% CI): 0.6 (−3.4, 4.7), p=0.75 Arm1: Mean difference: 2.1 (se: ±1.5) Arm1: Change from baseline to follow-up: 2.1±9.6 Arm2: Mean difference: 2.7 (se: ±1.4) Arm2: Change from baseline to follow-up: 3.3±9.0
Garg, 2017[16]	FHN	RCT	Nocturnal	Time to recovery (min)	12 months	162	170	NA	NA	Baseline: Median 180 (Range: to) Final: Median: 120 (10, 90 percentile: 0, 1440)	Baseline: Median 180 (Range: to) Final: Median: 30 (10, 90 percentile: 0, 180)			Arm1: Mean difference: -63 (95% CI: -71 to -54), p=0.0004

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	N, Arm3	N, Arm4	Outcome, Arm1	Outcome, Arm2	Outcome, Arm3	Outcome, Arm4	Treatment Effect
Unruh, 2016[18]	FHN	RCT	NA	SPI-II in nocturnal group	12 months	120	125	42	45	Baseline: Mean 32 (SD: 18.4) Final: Mean 33 (SD: 23.1)	Baseline: Mean 33.8 (SD: 17.4) Final: Mean 29.8 (SD: 17.7)			Arm1 vs Arm2: 12 mo Treatment comparison at 6x vs 3x dialysis: -4.5(−12.2–3.2) Arm1: change from baseline to 12 months (SE): +1.2 ± 2.8 Arm1: change from baseline to 12 months (SE): +1.2 ± 2.8 Arm2: change from baseline to 12 months (SE): −3.3 ± 2.8

3x=3 times; 6x=6 times; BDI=Beck's Depression Inventory; CI=confidence interval; FHN=Frequent Hemodialysis Network; HUI=Health Utilities Index; mo=months; N=sample size; NA=not applicable; NR=not reported; p=p-value; RCT=randomized controlled trial; SD=standard deviation; SE=standard error; SPI-II=Medical Outcomes Study Sleep Problems Index-II

Evidence Table 65. Categorical cardiovascular mortality outcomes of studies comparing hemodialysis frequency and duration in non-institutionalized patients

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	n / N (%), Arm1	n / N (%), Arm2	Treatment Effect
Johansen, 2009[32]	NR	Retrospecitve cohort	NA	Composite mortality risk or major copmorbid event	2 years or greater than 2 years	940	94	NR	NR	HR: 0.56; 95% CI: 0.35 to 0.89; p=0.01
Rocco, 2015[24]	FHN-Nocturnal	RCT	NA	CVD mortality rate	>12 months	42	45	Baseline: NR 6 months: 0/42 Final: 2/39	Baseline: NR 6 months: 0/45 Final: 7/35	NR

3x=3 times; 6x=times; BDI=Beck's Depression Inventory; CI=confidence interval; CVD=cardiovascular disease; FHN=Frequent Hemodialysis Network trials; HUI-3=Health Utilities Index-3; min=minutes; N=number of total patients; n=number of sample patients; NA=not applicable; NR=not reported; RCT=randomized controlled trial; SD=standard deviation; SE=standard error; SPI-II=Medical Outcomes Study Sleep Problems Index-II

Evidence Table 66. Categorical infection mortality outcomes of studies comparing hemodialysis frequency and duration in non-institutionalized patients

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	n / N (%), Arm1	n / N (%), Arm2	Treatment Effect
Rocco, 2015[24]	FHN-Nocturnal	RCT	NA	Infection mortality rate	>12 months	42	45	Baseline: NR 6 months: 0/42 Final: 0/39	Baseline: NR 6 months: 0/45 Final: 2/37	NR

FHN=Frequent Hemodialysis Network trials; N=number of total patients; n=number of sample patients; NA=not applicable; NR=not reported; RCT=randomized controlled trial

Evidence Table 67. Categorical mortality composite outcomes of studies comparing hemodialysis frequency and duration in non-institutionalized patients

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	n / N (%), Arm1	n / N (%), Arm2	Treatment Effect	Comments
Rocco, 2011[23]	FHN-Nocturnal	RCT	NA	death/LV mass composite	12 months	42	45	Baseline: NR Final: NR	Baseline: NR Final: NR	Arm1 vs Arm2: HR 0.68 (95% CI: 0.44 to 1.07), p=0.095	
Rocco, 2011[23]	FHN-Nocturnal	RCT	NA	death/PHC composite.	12 months	42	45	Baseline: NR Final: NR	Baseline: NR Final: NR	Arm1 vs Arm2: HR 0.91 (95% CI: 0.58 to 1.43), p=0.68	In the frequent nocturnal arm, three patients had no 12-month LV mass data and three patients had incomplete data for the baseline to 12-month physical health composite (PHC) score comparisons; the respective numbers in the conventional arm were 0 and 1, respectively
Rocco, 2011[23]	FHN-Nocturnal	RCT	NA	Non-access hospitalization and death	12 months	42	45	Baseline: NR Final: 15/42 (38.1)	Baseline: NR Final: 18/45 (40)	Arm1 vs Arm2: RR 1.33 (95% CI: 0.67 to 2.65), p=0.42	Number of randomized patients for the non-access hospitalization/death outcome, and number of patients providing both baseline and follow-up measurements for the remaining outcomes

CI=confidence interval; FHN=Frequent Hemodialysis Network trials; LV=left ventricular; N=number of total patients; n=number of sample patients; NA=not applicable; NR=not reported; PHC=physical health composite; RCT=randomized controlled trial; RR=relative risk

Evidence Table 68. Categorical all cause mortality outcomes of studies comparing hemodialysis frequency and duration in non-institutionalized patients

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	n / N (%), Arm1	n / N (%), Arm2	Treatment Effect
Nesrallah, 2012[36]	NR	Observational: retrospective	US data	Overall mortality rate	NR	1388	338	Final: event rate per 100 person years: 13.9	Final: event rate per 100 person year: 5.5	Arm1 vs Arm2: HR 0.226
Lockridge, 2011[33]	NR	Observational: retrospective	NA	Overall mortality rate	120 months	NR	87			Standardized Mortality Ratio 0.30 (0.16-0.51)
Rocco, 2015[24]	FHN-Nocturnal	RCT	NA	Overall mortality rate	>12 after trial months	42	45	Final: 5/38	Final: 14/32	Arm1 vs Arm2: HR 5.98 (95% CI: 1.71 to 20.92), p=0.002
Rocco, 2015[24]	FHN-Nocturnal	RCT	Age ≤ 50 years	Overall mortality rate	>12 months	42	45	Final: 2/15 Deaths Per Patient Year: 0.037	Final: 4/19 Deaths Per Patient Year: 0.060	NR
Rocco, 2015[24]	FHN-Nocturnal	RCT	Age > 50 years	Overall mortality rate	>12 months	42	45	Final: 3/27 Deaths Per Patient Year: 0.030	Final: 10/26 Deaths Per Patient Year: 0.134	NR
Rocco, 2015[24]	FHN-Nocturnal	RCT	Male	Overall mortality rate	>12 months	42	45	Final: 4/28 Deaths Per Patient Year: 0.042	Final: 9/29 Deaths Per Patient Year: 0.097	NR
Rocco, 2015[24]	FHN-Nocturnal	RCT	Female	Overall mortality rate	>12 months	42	45	Final: 1/14 Deaths Per Patient Year: 0.017	Final: 5/16 Deaths Per Patient Year: 0.104	NR
Rocco, 2015[24]	FHN-Nocturnal	RCT	Non-Black	Overall mortality rate	>12 months	42	45	Final: 5/30 Deaths Per Patient Year: 0.047	Final: 11/33 Deaths Per Patient Year: 0.108	NR
Rocco, 2015[24]	FHN-Nocturnal	RCT	Black	Overall mortality rate	>12 months	42	45	Final: 0/11 Deaths Per Patient Year: 0.000	Final: 3/12 Deaths Per Patient Year: 0.078	NR
Rocco, 2015[24]	FHN-Nocturnal	RCT	LV Mass ≤ 132 (g)	Overall mortality rate	>12 months	42	45	Final: 2/18 Deaths Per Patient Year: 0.028	Final: 7/24 Deaths Per Patient Year: 0.098	NR
Rocco, 2015[24]	FHN-Nocturnal	RCT	LV Mass > 132 (g)	Overall mortality rate	>12 months	42	45	Final: 7/24 Deaths Per Patient Year: 0.036	Final: 3/21 Deaths Per Patient Year: 0.101	NR
Rocco, 2015[24]	FHN-Nocturnal	RCT	< 4 Years vintage	Overall mortality rate	>12 months	42	45	Final: 4/30 Deaths Per Patient Year: 0.037	Final: 7/28 Deaths Per Patient Year: 0.075	NR
Rocco, 2015[24]	FHN-Nocturnal	RCT	≥ 4 Years vintage	Overall mortality rate	>12 months	42	45	Final: 1/12 Deaths Per Patient Year: 0.022	Final: 7/17 Deaths Per Patient Year: 0.148	NR
Rocco, 2011[23]	FHN-Nocturnal	RCT	NA	Overall mortality rate	12 months	42	45	Final: 1/42	Final: 2/45	NR

CI=confidence interval; FHN=Frequent Hemodialysis Network trials; g=grams; HR=hazard ratio; LV=left ventricular; N=number of total patients; n=number of sample patients; NA=not applicable; NR=not reported; RCT=randomized controlled trial; US=United States

Evidence Table 69. Continuous all cause mortality outcomes of studies comparing hemodialysis frequency and duration in non-institutionalized patients

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	Outcome, Arm1	Outcome, Arm2	Treatment effect
Rocco, 2015[24]	FHN-Nocturnal	RCT	NA	Overall mortality rate	>12 past trial months	42	45	Baseline: (Death Rate/Patient-Year: 0.023) Final: (Death Rate/Patient-Year: 0.099)	Baseline: (Death Rate/Patient-Year: r 0.043) Final: (Death Rate/Patient-Year: 0.032)	NR

FHN=Frequent Hemodialysis Network trials; g=grams; HR=hazard ratio; N=number of patients; NA=not applicable; NR=not reported; RCT=randomized controlled trial

Evidence Table 70. Categorical hypotension outcomes of studies comparing hemodialysis frequency and duration in non-institutionalized patients

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	n (%), Arm1	n (%), Arm2	Treatment Effect
Rocco, 2011[23]	FHN-Nocturnal	RCT	NA	Hypotension	12 months	42	45	Final, counts: 28 (total numbers of events: 136)	Final, Counts: 25 (total numbers of events: 71)	NR
Rocco, 2011[23]	FHN-Nocturnal	RCT	NA	Percent of dialysis treatments with a hypotensive episode	12 months	42	45	Final, : (9.5)	Final, : (3.1)	Arm1 vs Arm2: p<0.001

FHN=Frequent Hemodialysis Network trials; g=grams; N=number of total patients; n=number of sample patients; NA=not applicable; NR=not reported; RCT=randomized controlled trial

Evidence Table 71. Categorical vascular access complication outcomes of studies comparing hemodialysis frequency and duration in non-institutionalized patients

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	n (%), Arm1	n (%), Arm2	Treatment Effect
Rocco, 2011[23]	FHN-Nocturnal	RCT	NA	Access hospitalizations	NR months	42	45	Final, counts: 3 (Number of events: 4)	Final, Counts: 5 (Number of Events: 8)	Arm1 vs Arm2: HR 2.15 (95% CI: 0.67 to 6.89), p=0.20

CI=confidence interval; FHN=Frequent Hemodialysis Network trials; g=grams; HR=hazard ratio; N=number of total patients; n=number of sample patients; NA=not applicable; NR=not reported; RCT=randomized controlled trial

Evidence Table 72. Continuous weight outcomes of studies comparing hemodialysis frequency and duration in non-institutionalized patients

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	N, Arm3	N, Arm4	Outcome, Arm1	Outcome, Arm2	Outcome, Arm3	Outcome, Arm4	Treatment Effect
Kaysen, 2012[13]	FHN	RCT	NA	Adiposity (%)	12 months	42	45	120	125	Baseline: Mean 37.9 (SD: 14.6) Final: Mean 37.5 (SD: 15.1)	Baseline: Mean 40.9 (SD: 17.7) Final: Mean 44.4 (SD: 18.5)	Baseline: Mean 37.6 (SD: 13.7) Final: Mean 37.3 (SD: 12.8)		Arm1 vs Arm2: 4.17: Treatment Comparison (6x vs. 3x), baseline to 12 months, Nocturnal (95% CI: to -0.36), p=1.90 Arm3 vs Arm4: 1.85: Treatment Comparison (6x vs. 3x), baseline to 12 months, Daily (95% CI: to -0.34), p=0.76
Kaysen, 2012[13]	FHN	RCT	NA	Adiposity (%)	12 months	42	45	120	125	Baseline: Mean 37.6 (SD: 13.7) Final: Mean 37.3 (SD: 12.8)	Baseline: Mean 40.9 (SD: 17.7) Final: Mean 44.4 (SD: 18.5)	Baseline: Mean 37.6 (SD: 13.7) Final: Mean 37.3 (SD: 12.8)		Arm1 vs Arm2: 4.17: Treatment Comparison (6x vs. 3x), baseline to 12 months, Nocturnal (95% CI: to -0.36), p=1.90 Arm3 vs Arm4: 1.85: Treatment Comparison (6x vs. 3x), baseline to 12 months, Daily (95% CI: to -0.34), p=0.76

Evidence Table 72. Continuous weight outcomes of studies comparing hemodialysis frequency and duration in non-institutionalized patients (continued)

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	N, Arm3	N, Arm4	Outcome, Arm1	Outcome, Arm2	Outcome, Arm3	Outcome, Arm4	Treatment Effect
Kaysen, 2012[13]	FHN	RCT	NA	Lean body mass (kg)	12 months	42	45	120	125	Baseline: Mean 46.3 (SD: 11.7) Final: Mean 44.8 (SD: 11.4)	Baseline: Mean 47.4 (SD: 12.5) Final: Mean 48.2 (SD: 12.0)	Baseline: Mean 44.0 (SD: 10.2) Final: Mean 45.0 (SD: 9.6)	Baseline: Mean 44.6 (SD: 9.8) Final: Mean 43.2 (SD: 10.3)	Arm1 vs Arm2: Treatment Comparison (6x vs. 3x), baseline to 12 months, Nocturnal: −0.45 (95% CI: -2.18 to 1.28), p=0.61 Arm3 vs Arm4: Treatment Comparison (6x vs. 3x), baseline to 12 months, Daily: −1.26 (95% CI: −2.12 to −0.41), p=0.004
Kaysen, 2012[13]	FHN	RCT	NA	Postdialysis weight	12 months	42	45	120	125	Baseline: Mean 83.45 (SD: 24.08) Final: Mean 84.05 (SD: 25.64)	Baseline: Mean 88.55 (SD: 28.19) Final: Mean 89.07 (SD: 28.56)	Baseline: Mean 78.9 (SD: 19.76) Final: Mean 79.19 (SD: 19.86)	?	Arm1 vs Arm2: Treatment comparison baseline to 12 months, Nocturnal: 0.51 (95% CI: −1.66 to 2.69), p=0.64 Arm3 vs Arm4: Treatment comparison baseline to 12 months, Daily: 0.62 (95% CI: −0.59 to 1.83), p=0.32
Kaysen, 2012[13]	FHN	RCT	NA	Predialysis weight	12 months	42	45	120	125	Baseline: Mean 85.83 (SD: 25.05) Final: Mean 86.57 (SD: 26.25)	Baseline: Mean 90.83 (SD: 28.95) Final: Mean 91.11 (SD: 28.87)	Baseline: Mean 81.75 (SD: 20.26) Final: Mean 81.97 (SD: 20.37)	Baseline: Mean 80.17 (SD: 21.26) Final: Mean 80.28 (SD: 21.51)	Arm1 vs Arm2: Treatment effect (6x vs 3x) in 12 months, Nocturnal: 0.17 (95% CI: −2.2 to 2.55), p=0.89 Arm3 vs Arm4: Treatment effect (6x vs 3x) in 12 months, Daily: −0.21 (95% CI: −1.24 to 0.82), p=0.69
Raimann, 2016[6]	FHN	RCT	NA	interdialytic weight gain (IDWG)	12 months	120	125	42	45	Baseline: Mean 3.14 (SD: 0.96) Final: Mean 3.1 (SD: 1.04)	Baseline: Mean 3.16 (SD: 0.99) Final: Mean 2.11 (SD: 0.86)	Baseline: Mean 2.37 (SD: 1.49) Final: Mean 2.55 (SD: 1.02)	Baseline: Mean 2.27 (SD: 1.42) Final: Mean 2.04 (SD: 0.87)	Arm1 vs Arm2: Mean difference: -0.95 (95% CI: -1.12 to -0.78, p<0.001 Arm1: Mean difference: -0.07 (95% CI: -0.2 to 0.06) Arm2: Mean difference: -1.03 (95% CI:-1.2 to -0.9) Arm3: Mean difference: 0.21 (95% CI:-0.03 to 0.44) Arm4: Mean difference: -0.25 (95% CI:-0.49 to -0.02)

3x=3 times; 6x=6 times; CI=confidence interval; FHN=Frequent Hemodialysis Network; kg=kilogram; N=sample size; NA=not applicable; NR=not reported; p=p-value; RCT=randomized controlled trial; SD=standard deviation; SE=standard error

Evidence Table 73. Continuous vascular access outcomes in studies comparing hemodialysis frequency and duration in non-institutionalized patients

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	N, Arm3	N, Arm4	Outcome, Arm1	Outcome, Arm2	Outcome, Arm3	Outcome, Arm4	Treatment Effect
Achinger, 2013[2]	NR	Nonrandomized	NA	Frequency distribution of dialysis access	48 months	51	26	NA	NA	No thrombectomies (58%) One thrombectomy (20%) 2-4 thrombectomies (12%) 5 or more thrombectomies (10%)	No thrombectomies (50%) One thrombectomy (31%) 2-4 thrombectomies (19%) 5 or more thrombectomies (0%)			NR
Achinger, 2013[2]	NR	Nonrandomized	NA	Rate of fistulagram, or thrombectomy	48 months	51	26	NA	NA	543.2 per 1000 person years (95% CI: 432.9 to 673.0)	400.8 per 1000 person years (95% CI: 270.2 to 499.7)			IR: 0.74; 95%CI: 0.4 to 1.36; p=0.33
Achinger, 2013[2]	NR	Nonrandomized	NA	Access revision	48 months	51	26	NA	NA	7	1			P=0.25
Achinger, 2013[2]	NR	Nonrandomized	NA	Thrombectomies per 1000 person years	48 months	51	26	NA	NA	388 (95%CI, 296.0 to 499.7)	307.3 (95%CI: 194.5 to 461.3)			incidence rate ratio=0.79 with 95%CI: from 0.39 to 1.60, P = 0.51
Achinger, 2013[2]	NR	Nonrandomized	NA	Incidence of Fistulagram	48 months	51	26	NA	NA					incidence rate ratio=0.73 with 95%CI: from 0.15 to 3.53, P=0.69
Achinger, 2013[2]	NR	Nonrandomized	Univariate analysis	Time to first access procedure	48 months	51	26	NA	NA					log rank P=0.85

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	N, Arm3	N, Arm4	Outcome, Arm1	Outcome, Arm2	Outcome, Arm3	Outcome, Arm4	Treatment Effect
Achinger, 2013[2]	NR	Nonrandomized	Multivariable adjusted analysis	Time to first access procedure	48 months	51	26	NA	NA					Hazard ratio=0.99; 95% CI, 0.42–2.36, P=0.96

CI=confidence interval; IR=incidence rate; N=population; NA=not available; NR=not reported; p=p-value

Evidence Table 74. Continuous birth weight outcomes of studies comparing hemodialysis frequency and duration in non-institutionalized patients

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	N, Arm3	N, Arm4	Outcome, Arm1	Outcome, Arm2	Outcome, Arm3	Outcome, Arm4	Treatment Effect
Hladunewich, 2014[31]	Toronto PreKid	Observational: retrospective	NA	Birth weight (grams)	36 weeks	22 pregnancies	70 pregnancies	NA	NA	Final: Mean 1767 (IQR: 558, 2348)	Final: Mean 2257 (IQR: 1505, 2812)	Final: Mean 2529 (IQR: 1577, 2990)		NR

3x=3 times; 6x=6 times; %=percentage; CI=confidence interval; FHN=Frequent Hemodialysis Network trials; IDWG=interdialytic weight gain; IQR=interquartile range; kg=kilograms; N=number of patients; NA=not applicable; NR=not reported; SD=standard deviation; Toronto PreKid=Toronto Pregnancy and Kidney Disease Clinic; RCT=randomized controlled trial

Evidence Table 75. Continuous body cell mass outcomes of studies comparing hemodialysis frequency and duration in non-institutionalized patients

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	N, Arm3	N, Arm4	Outcome, Arm1	Outcome, Arm2	Outcome, Arm3	Outcome, Arm4	Treatment Effect
Kaysen, 2012[13]	FHN	RCT	NA	Body cell mass (kg)	12 months	42	45	120	125	Baseline: Mean 28.9 (SD: 9.2) Final: Mean 28.4 (SD: 9.5)	Baseline: Mean 29.5 (SD: 9.6) Final: Mean 30.2 (SD: 9.5)	Baseline: Mean 26.6 (SD: 8.2) Final: Mean 27.3 (SD: 7.7)	Baseline: Mean 27.7 (SD: 8.8) Final: Mean 27.3 (SD: 9.3)	Arm1 vs Arm2: Treatment Comparison (6x vs. 3x), baseline to 12 months, Nocturnal: -0.28 (95% CI: -1.84 to 1.28), p=0.73 Arm3 vs Arm4: Treatment Comparison (6x vs. 3x), baseline to 12 months, Daily: -0.23 (95% CI: -1.03 to 0.56), p=0.56

3x=3 times; 6x=6 times; CI=confidence interval; FHN=Frequent Hemodialysis Network trials; kg=kilograms; N=number of patients; NA=not applicable; SD=standard deviation; RCT=randomized controlled trial

Evidence Table 76. Categorical other outcomes of studies comparing hemodialysis frequency and duration in non-institutionalized patients

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	N, Arm3	N, Arm4	n (%), Arm1	n (%), Arm2	n (%), Arm3	n (%), Arm4	Treatment Effect
Hladunewich, 2014[31]	Toronto PreKid	Observational: retrospective	NA	Live birth rates	36 weeks	22 pregnancies	70 pregnancies	NA	NA	Final, Proportion: 38	Final, Proportion: 75	Final, Proportion: 85		
Rocco, 2011[23]	FHN-Nocturnal	RCT	NA	Other vascular procedures	12 months	42	45	NA	NA	Final, counts: 6 (Number of events: 8)	Final, Counts: 12 (Number of events: 17)			Arm1 vs Arm2: HR 2.25 (95% CI: 0.87 to 5.83), p=0.095

%=percentage; CI=confidence interval; FHN=Frequent Hemodialysis Network trials; HR=hazard ratio; N=number of total patients; n=number of sample patients; NA=not applicable; Toronto PreKid=Toronto Pregnancy and Kidney Disease Clinic; RCT=randomized controlled trial

Evidence Table 77. Continuous other outcomes of studies comparing hemodialysis frequency and duration in non-institutionalized patients

Author, year	Study name	Study design	Subgroup	Outcome definition	Follow up	N, Arm1	N, Arm2	N, Arm 3	N, Arm 4	Outcome, Arm1	Outcome, Arm2	Outcome, Arm3	Outcome, Arm4	Treatment Effect
Achinger, 2013[2]	NA	Non-randomized control	NA	Total access procedures	48 months	51	26	NA	NA	543.2 procedures per 1000 person years	400.8 procedures per 1000 person years	NA	NA	IR =0.74, 95%CI 0.40 to 1.36; p=0.33
Hladunewich, 2014[31]	Toronto PreKid	Observational: retrospective	NA	Gestational age (weeks)	36 weeks	22 pregnancies	70 pregnancies	NA	NA	Final: Mean 27 (IQR: 20.3, 33.5)	Final: Mean 34.3 (IQR: 26.8, 36.3)	Final: Mean 36.3 (IQR: 31, 37.5)		Arm1 vs Arm2 vs Arm3: p=0.002
Kaysen, 2012[13]	FHN	RCT	NA	Extra-cellular water (L)	12 months	42	45	120	125	Baseline: Mean 23.8 (SD: 5.6) Final: Mean 22.3 (SD: 5.4)	Baseline: Mean 24.6 (SD: 6.2) Final: Mean 24.3 (SD: 5.9)	Baseline: Mean 22.9 (SD: 4.7) Final: Mean 23.4 (SD: 4.9)	Baseline: Mean 22.7 (SD: 4.4) Final: Mean 21.6 (SD: 4.4)	Arm1 vs Arm2: Treatment comparison from 6x to 3x, baseline to 12 months, Nocturnal: 0.02 (95% CI: −1.23 to 1.27), p=0.98 Arm3 vs Arm4: Treatment comparison from 6x to 3x, baseline to 12 months, Daily: −1.12 (95% CI: −1.83 to −0.41), p=0.002
Kaysen, 2012[13]	FHN	RCT	NA	Intracellular water (L)	12 months	42	45	120	125	Baseline: Mean 22.8 (SD: 7.3) Final: Mean 22.4 (SD: 7.5)	Baseline: Mean 23.3 (SD: 7.5) Final: Mean 23.8 (SD: 7.5)	Baseline: Mean 21.0 (SD: 6.5) Final: Mean 21.6 (SD: 6.1)	Baseline: Mean 21.9 (SD: 6.9) Final: Mean 21.5 (SD: 7.4)	Arm1 vs Arm2: Treatment comparison, 6x to 3x, baseline to 12 months, Nocturnal Trial: -0.22 (95% CI: -1.45 to 1.01), p=0.73 Arm3 vs Arm4: Treatment comparison, 6x to 3x, baseline to 12 months, Daily Trial: −0.19 (95% CI: −0.81 to 0.44), p=0.562

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	N, Arm 3	N, Arm 4	Outcome, Arm1	Outcome, Arm2	Outcome, Arm3	Outcome, Arm4	Treatment Effect
Kaysen, 2012[13]	FHN	RCT	NA	Kinetic Volume	12 months	42	45	120	125	Baseline: Mean 38.2 (SD: 12.1) Final: Mean 38.7 (SD: 13.5)	Baseline: Mean 37.6 (SD: 9..3) Final: Mean 41.2 (SD: 20.5)	Baseline: Mean 36.2 (SD: 8.6) Final: Mean 37.1 (SD: 8.5)	Baseline: Mean 36.8 (SD: 9.5) Final: Mean 35.6 (SD: 9.1)	Arm1 vs Arm2: Treatment comparison, baseline to 12 months, 6x to 3x, Nocturnal: -0.56 (95% CI: -4.38 to 3.26), p=0.77 Arm3 vs Arm4: Treatment comparison, baseline to 12 months, 6x to 3x, Daily: -1.55 (95% CI: -2.8 to -0.29), p=0.02
Kaysen, 2012[13]	FHN	RCT	NA	Phase angle (degrees)	12 months	42	45	120	125	Baseline: Mean 5.54 (SD: 1.48) Final: Mean 5.98 (SD: 1.66)	Baseline: Mean 5.49 (SD: 1.51) Final: Mean 5.79 (SD: 1.67)	Baseline: Mean 5.21 (SD: 1.21) Final: Mean 5.34 (SD: 1.58)	Baseline: Mean 5.65 (SD: 1.74) Final: Mean 5.78 (SD: 1.96)	Arm1 vs Arm2: Treatment comparison, baseline to 12 months, Daily: 0.28 (95% CI: −0.11 to 0.67), p=0.16 Arm3 vs Arm4: Treatment comparison, baseline to 12 months, Nocturnal: −0.05 (95% CI: −0.66 to 0.56), p=0.87
Kaysen, 2012[13]	FHN	RCT	NA	Reactance (ohms)	12 months	42	45	120	125	Baseline: Mean 48.7 (SD: 13.3) Final: Mean 53.9 (SD: 13.9)	Baseline: Mean 47.5 (SD: 13.8) Final: Mean 53.9 (SD: 16.2)	Baseline: Mean 48.2 (SD: 12.6) Final: Mean 47.4 (SD: 15.2)	Baseline: Mean 48.9 (SD: 14.1) Final: Mean 53.3 (SD: 15.3)	Arm1 vs Arm2: Treatment comparison baseline to 12 months, Nocturnal: 1.4 (95% CI: -5.1 to 7.9), p=0.67 Arm3 vs Arm4: Treatment comparison baseline to 12 months, Daily: 5.2 (95% CI: 1.3 to 9.2), p=0.010

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	N, Arm 3	N, Arm 4	Outcome, Arm1	Outcome, Arm2	Outcome, Arm3	Outcome, Arm4	Treatment Effect
Kaysen, 2012[13]	FHN	RCT	NA	Resistance (ohms)	12 months	42	45	120	125	Baseline: Mean 470 (SD: 90) Final: Mean 483 (SD: 108)	Baseline: Mean 467 (SD: 111) Final: Mean 481 (SD: 94)	Baseline: Mean 488 (SD: 99) Final: Mean 466 (SD: 91)	Baseline: Mean 460 (SD: 89) Final: Mean 492 (SD: 93)	Arm1 vs Arm2: Treatment comparison 6x to 3x, 12 months to baseline, Nocturnal: 17.9 (95% CI: 11.1 to 49.6), p=0.30 Arm3 vs Arm4: Treatment comparison 6x to 3x, 12 months to baseline, Daily: 30.4 (95% CI: 11.1 to 49.6), p=0.002
Kaysen, 2012[13]	FHN	RCT	NA	Total body water	12 months	42	45	120	125	Baseline: Mean 46.7 (SD: 11.4) Final: Mean 44.7 (SD: 11.3)	Baseline: Mean 47.9 (SD: 12.2) Final: Mean 48.1 (SD: 11.9)	Baseline: Mean 43.9 (SD: 10.2) Final: Mean 44.9 (SD: 9.6)	Baseline: Mean 44.5 (SD: 9.7) Final: Mean 43.1 (SD: 10.2)	Arm1 vs Arm2: Treatment comparison from baseline to 12 months, 6x to 3x, Nocturnal: −0.4 (95% CI: −2.2 to 1.3), p=0.63 Arm3 vs Arm4: Treatment comparison from baseline to 12 months, 6x to 3x, Daily: -1.3 (95% CI: -2.1 to -0.4), p=0.004

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	N, Arm 3	N, Arm 4	Outcome, Arm1	Outcome, Arm2	Outcome, Arm3	Outcome, Arm4	Treatment Effect
Kaysen, 2012[13]	FHN	RCT	NA	Vector Length	12 months	42	45	120	125	Baseline: Mean 274.5 (SD: 57.3) Final: Mean 289.4 (SD: 75.1)	Baseline: Mean 460.5 (SD: 95.4) Final: Mean 484.2 (SD: 96.5)	Baseline: Mean 291.8 (SD: 64.2) Final: Mean 278.1 (SD: 58.2)	Baseline: Mean 278.0 (SD: 61.1) Final: Mean 297.4 (SD: 65.2)	Arm1 vs Arm2: Treatment comparison, baseline to 12 months, 6x to 3x, Nocturnal: 9.4 (95% CI: −11.6 to 30.5), p=0.38 Arm3 vs Arm4: Treatment comparison, baseline to 12 months, 6x to 3x, Daily: 19.6 (95% CI: 7.6 to 31.6), p=0.0015
Troidle, 2007[29]	NR	Observational: prospective	NA	Time to recovery (minutes)		NR	NR	NA	NA	Baseline: Mean 198 (SD: 240) Final: NR	Baseline: NR Final: Mean 126 (SD: 120)			NR
Raimann, 2016[6]	FHN	RCT	NA	time-integrated estimate of ECF load (TIFL)	12 months	120	125	42	45	Baseline: Mean 10.57 (SD: 3.68) Final: Mean 9.34 (SD: 3.57)	Baseline: Mean 10.28 (SD: 4.13) Final: Mean 6.01 (SD: 3.2)	Baseline: Mean 7.53 (SD: 4.95) Final: Mean 7.14 (SD: 4.3)	Baseline: Mean 5.34 (SD: 3.57) Final: Mean 5.3 (SD: 3.21)	Arm1 vs Arm2: Mean difference: -2.97 (95% CI: -3.79 to -2.15, p<0.001 Arm1: Mean difference: -1.01 (95% CI: -1.66 to -0.36) Arm2: Mean difference: -3.99 (95% CI:-4.60 to -3.38) Arm3: Mean difference: 0.24 (95% CI:-0.92 to 1.40) Arm4: Mean difference: -1.15 (95% CI:-2.28 to -0.02)

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	N, Arm 3	N, Arm 4	Outcome, Arm1	Outcome, Arm2	Outcome, Arm3	Outcome, Arm4	Treatment Effect
Chan, 2012[15]	FHN	RCT	NA	Predialysis Heart rate, /min	12 months	120	125	42	45	Baseline: NR Final: Mean -0.4 (SD: 1.4)	Baseline: NR Final: Mean 2.9 (SD: 1.3)	Baseline: NR Final: Mean 0.5 (SD: 2.4)	Baseline: NR Final: Mean 4.0 (SD: 2.4)	Arm1 vs Arm2: p=0.06 Arm3 vs Arm4: p=0.27 Arm1: Mean difference: -0.4 (SD: 1.4) Arm2: Mean difference: 2.9 (SD: 1.3) Arm3: Mean difference: 0.5 (SD: 2.4) Arm4: Mean difference: 4.0 (SD: 2.4)
Ayus, 2005[1]	NR	NRCT	NA	Erythropoietin dose (U/d)	12 months	51	26	NA	NA	Baseline: Mean 8,450 (IQR: 5,025 to 14,183) 6 months: Mean 10,825 (IQR: 4,704 to 15,979) Final: Mean 11,167 (IQR: 6,300 tp 16,938)	Baseline: Mean 15,000 (IQR: 6,250 to 24,500) 6 months: Mean 9,960 (IQR: 5,972 to 17,950) Final: Mean 9,443 (IQR: 6,313 to 14,795)			Arm1 vs Arm2: p=NS Arm2: p<0.01
Ayus, 2005[1]	NR	NRCT	NA	Erythropoietin resistance index (weekly EPO U/kg per g/dl Hgb)	12 months	51	26	NA	NA	Baseline: Mean 9.0 (IQR: 5.5 to 15.9) 6 months: Mean 12.3 (IQR: 6.6 to 17.6) Final: Mean 11.0 (IQR: 7.5 to 19.1)	Baseline: Mean 19.5 (IQR: 8.6 to 37.6) 6 months: Mean 11.9 (IQR: 8.2 to 17.1) Final: Mean 10.5 (IQR: 5.5 to 14.6)			Arm2: p<0.0001

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	N, Arm 3	N, Arm 4	Outcome, Arm1	Outcome, Arm2	Outcome, Arm3	Outcome, Arm4	Treatment Effect
Lo, 2017[17]	FHN	RCT	NA	prolactin, ng/ml	12 months	91	86	29	31	Baseline: Median 64.3 (IQR: 34.9 to 108.7) Final: Median 45.8 (IQR: 29.0 to 90.4)	Baseline: Median 59.7 (IQR: 40.5 to 99.1) Final: Median 58.4 (IQR: 36.0 to 110.1)	Baseline: Median 66.2 (IQR: 42.2 to 100.9) Final: Median 65.4 (IQR: 46.1, to 97.8)	Baseline: Median 72.6 (IQR: 33.4 to 151.0) Final: Median 58.1 (IQR: 25.8 to 206.1)	Arm1 vs Arm2: treatment effect: -1% (95% CI: -26.7% to 33.5%, p=0.95 Arm3 vs Arm4: treatment effect: -17.4% (95% CI: -50.4% to 37.4%, p=0.46 Arm1: Mean difference: -14.6% adjusted mean change from baseline (95% CI: -33.1% to 8.9%) Arm2: Mean difference: -15.5% adjusted mean change from baseline (95% CI:-34.6% to 9.1%) Arm3: Mean difference: 11.4% adjusted mean change from baseline (95% CI:-21.4% to 57.8%) Arm 4: 6x weekly nocturnal trial -8.1% (95% CI: -37.1 to 34.4) adjusted mean change from baseline

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	N, Arm 3	N, Arm 4	Outcome, Arm1	Outcome, Arm2	Outcome, Arm3	Outcome, Arm4	Treatment Effect
Unruh, 2016[18]	FHN	RCT	NA	hours of sleep in Daily Trial	12 months	120	125	42	45	Baseline: Mean 5.98 (SD: 1.44) Final: Mean 5.89 (SD: 1.77)	Baseline: Mean 5.94 (SD: 1.82) Final: Mean 6.04 (SD: 1.77)			Arm1 vs Arm2: Mean difference: +0.02 (95% CI: -0.35 to 0.39) Arm1: change from baseline to 4 months (SE): −0.00 ± 0.14 Arm1: change from baselin 12 months (SE): −0.05 ± 0.16 Arm2: change from baselin 4 months (SE): 0.02 ± 0.14 Arm2: change from baselin 12 months (SE): −0.02 ± 0.15 12 mo Treatment comparison (6× versus 3×) :0.02(−0.39–0.43)
Unruh, 2016[18]	FHN	RCT	NA	hours of sleep in Nocturnal group	12 months	120	125	42	45	Baseline: Mean 6.37 (SD: 1.45) Final: Mean 6.24 (SD: 1.55)	Baseline: Mean 6.51 (SD: 1.43) Final: Mean 6.80 (SD: 1.71)			Arm1 vs Arm2: 3x vs 6x dialysis comparison in 12 months: 0.43 (−0.09–0.96) Arm1: change from baseline to 12 months (SE): −0.16 ± 0.19 Arm1: change from baseline to 12 months (SE): −0.16 ± 0.19 Arm2: change from baseline to 12 months (SE): +0.27 ± 0.19
Troidle, 2007[29]	NR	Observational: prospective	NA	Kt/V urea	6 months	NR	NR	NA	NA	Baseline: Mean 1.2 (SD: 0.16) Final: NR	Baseline: NR Final: Mean 2.6 (SD: 0.65)			Arm1 vs Arm2: p=0.003
Troidle, 2007[29]	NR	Observational: prospective	NA	Total ultrafiltration (L/Rx)	6 months	NR	NR	NA	NA	Baseline: Mean 3.9 (SD: 1.4) Final: NR	Baseline: NR Final: Mean 5.0 (SD: 1.9)			Arm1 vs Arm2: p=NR

Author, year	Study name	Study design	Subgroup	Outcome definition	Followup	N, Arm1	N, Arm2	N, Arm 3	N, Arm 4	Outcome, Arm1	Outcome, Arm2	Outcome, Arm3	Outcome, Arm4	Treatment Effect
Troidle, 2007[29]	NR	Observational: prospective	NA	Ultrafiltration rate (mL/h/kg)	6 months	NR	NR	NA	NA	Baseline: Mean 10.3 (SD: 4.5) Final: NR	Baseline: NR Final: Mean 5.9 (SD: 1.7)			Arm1 vs Arm2: p=NR

3x=3 times; 6x=6 times; /min=per minute; CI=confidence interval; ECF=extracellular fluid; EPO=erythropoietin; g/dl=grams per deciliter; Hgb=hemoglobin; IQR=interquartile range; Kt/V=urea clearance; L=liters; L/Rx=Total ultrafiltration in liters per dialysis session; mL/h/kg=milliliters per hour per kilogram; N=number of patients; NA=not applicable; NR=not reported; ng/ml=nanograms per milliliter; NR=not reported; RCT=randomized controlled trial; SD=standard deviation; SE=standard error; TIFL=Time-integrated estimate of extracellular fluid load; U/d=units per dose; U/kg=units per kilogram

Evidence Table 78. Risk of bias assessment of randomized clinical trial studies comparing hemodialysis frequency and duration in non-institutionalized patients

Author, year	Domain 1: Risk of bias arising from the randomization process	Domain 2: Risk of bias due to deviations from the intended interventions	Domain 2: Risk of bias due to deviations from the intended interventions	Domain 3: Missing outcome data	Domain 4: Risk of bias in measurement of the outcome	Domain 5: Risk of bias in selection of the reported result	Overall risk of bias judgement
Chertow, 2010[3] FHN-Daily	Low	Low	Some Concerns	Low	Low	Some concerns	Some concerns
Dember, 2019[26]	Low	Some Concerns	High	Low	Low	High	High
Rocco, 2011[23] FHN-Nocturnal	Low	Low	Some concerns	Low	Low	Low	Some concerns

FHN=Frequent Hemodialysis Network; High=high risk of bias; Low=low risk of bias; Some concerns=some concerns regarding risk of bias

Evidence Table 79. Risk of bias assessment of observational studies comparing hemodialysis frequency and duration in non-institutionalized patients

Author, year	Domain 1: Confounding	Domain 2: Selection	Domain 3: Classification of interventions	Domain 4: Deviations from intended interventions	Domain 5: Missing data	Domain 6: Measurement of outcomes	Domain 7: Selection of reported result	Overall risk of bias judgement
Achinger, 2013[2]	Low	Low	Low	Low	Moderate	Moderat	Low	Moderate
Ayus, 2005[1]	Low	Low	Low	Low	Low	Moderate	Low	Moderate
Brunelli, 2010[27]	Moderate	Moderate	Moderate	Moderate	Moderate	Low	Serious	Serious
Brunelli, 2016[30]	Serious	Serious	Moderate	Moderate	Moderate	Moderate	Moderate	Serious
Hladunewich, 2014[31]	Serious	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Serious
Johansen, 2009[32]	Critical	Moderate	Low	Low	Moderate	Moderate	Low	Critical
Lacson, 2012[28]	Serious	Low	Moderate	Moderate	Moderate	Moderate	No information	Serious
Lockridge, 2011[33]	Critical	Low	Low	Serious	Low	Low	Low	Critical
Mathew, 2016[34]	Critical	Critical	Moderate	Critical	Critical	No Information	Low	Critical
Miller, 2010[35]	Moderate	Low	Moderate	Serious	Low	Low	Moderate	Serious
Nesrallah, 2012[36]	Moderate	Moderate	Moderate	Moderate	Low	Low	Moderate	Moderate
Rivara, 2016[37]	Serious	Moderate	Moderate	Low	Low	Low	Low	Moderate
Troidle, 2007[29]	Serious	Serious	Low	Low	Low	Low	Moderate	Serious
Weinhandl, 2012[38]	Serious	Serious	Moderate	Low	No information	Low	Low	Serious
Weinhandl, 2015[39]	Critical	Serious	Low	Low	Moderate	Moderate	Low	Serious

Critical=critical risk of bias; Low=low risk of bias; Moderate=moderate risk of bias; Serious=serious risk of bias

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Appendix F. Evidence Tables: Quality of Life and Symptom Measure

Evidence Table F.1. Study characteristics of randomized controlled trial studies utilizing instruments used to measure quality of life of people with ESRD treated by dialysis

Author, year	Study name	Study period	Location	Inclusion criteria
Chertow, 2010[1] Chertow, 2016[2] Garg, 2017[3] Hall, 2012[4] Lo, 2017[5] Lo, 2017[6] Unruh, 2013[7]	FHN, Daily*	2006 to 2009	In-center Multi-center	Age: >13 Language: English or Spanish Prevalent dialysis Achieved mean eKt/V > 1.0 for last two baseline hemodialysis sessions Weight > 30 kg Must be able and willing to follow the study protocol for any reason (including mental incompetence) Must be able and willing to provide informed consent or sign the Institutional Review Board-approved consent form Does not require HD >3 times per week due to medical comorbidity Not Currently pregnant, or actively planning to become pregnant in the next 12 months No History of poor adherence thrice weekly HD Ability to come for in-center HD 6 days per week, including ability to arrange adequate transportation No Expected geographic unavailability at a participating HD unit for >2 consecutive weeks or >4 weeks total during the next 14 months (excluding unavailability due to hospitalizations) Not currently in an acute or chronic care hospital No contraindication to heparin, including allergy or heparin induced thrombocytopenia No Expectation that native kidneys will recover Residual renal clearance <3ml/min per 35 L Not currently on daily or nocturnal HD or less than 3 months since the subject discontinued daily or nocturnal HD Not less than 3 months since patient returned to HD after acute rejection resulting in allograft failure No current use of investigational drugs or participation in another clinical trial that contradicts or interferes with the therapies or measured outcomes in this trial Not scheduled for living donor kidney transplant, change to peritoneal dialysis, or plans to relocate to a non-study center within the next 14 months Life expectancy greater than 6 months No medical history that might limit the patient's ability to take the trial treatments and complete the 12 month duration of the study

Author, year	Study name	Study period	Location	Inclusion criteria
Chertow, 2010[1] Chertow, 2016[2] Garg, 2017[3] Hall, 2012[4] Lo, 2017[5] Lo, 2017[6] Unruh, 2013[7] (continued)				No medical conditions that would prevent the subject from performing the cardiac MRI procedure Vascular access being used for HD is not a non-tunneled catheter Additional criteria beyond the main study:[6] The primary analytic cohort included individuals with TSH values between 0.2 and 8.0 millilunits per mL classified as having endogenous thyroid function, including 14 individuals with TSH levels of 5.0–7.9 millilunits per mL (6.2% of the source cohort) Not receiving thyroid hormone supplementation (all with TSH <5 IIU/mL except 3 with TSH of 7.0–7.9 millilunits per mL and 2 with TSH >10 millilunits per mL) and 3 with TSH level >8 millilunits per mL in the absence of thyroid hormone supplementation from primary analysis. No missing TSH at baseline, TSH<= 0.01 IIU/mL, treatment with propylthiouracil, or lack of both FT3 and FT4 measures.
Rocco, 2011[8] Rocco, 2015[9] Rocco, 2011[10] Unruh, 2016[11]	FHN, Nocturnal *	2006 to 2009	Home or in-center Not stated	Age: >18 Language: English or Spanish Prevalent Patients with end-stage renal disease requiring chronic renal replacement therapy Age > 18 years Achieved mean eKt/V > 1.0 for last two baseline hemodialysis sessions Willing to perform hemodialysis at home Must be able and willing to follow the study protocol Must be able and willing to provide informed consent or sign the Institutional Review Board-approved consent form Current requirement for hemodialysis less than or equal to three times per week due to medical comorbidity. (Ultrafiltration session on a fourth day per week not an exclusion criterion) Not pregnant, or planning to become pregnant within the next 12 months Compliance with hemodialysis or peritoneal dialysis treatments in the past Able to follow the nocturnal home hemodialysis training protocol for any reason, including inability to train the patient or the patient's caregiver Availability at a participating HD unit or at home for >2 consecutive weeks or >5 weeks total during the next 12 months (excluding unavailability due to hospitalizations) Not in an acute or chronic care hospital No contraindication to heparin, including allergy or heparin induced thrombocytopenia No expectation that native kidneys will recover kidney function glomerular filtration rate (GFR) </=10 ml/min per 1.73m^2 No current use of investigational drugs or participation in another clinical trial that contradicts or interferes with the therapies or measured outcomes in this trial

Author, year	Study name	Study period	Location	Inclusion criteria
Rocco, 2011[8] Rocco, 2015[9] Rocco, 2011[10] Unruh, 2016[11] (continued)				Not scheduled for living donor kidney transplant, change to peritoneal dialysis, or plans to relocate to a non-study center within the next 12 months Life expectancy greater than 6 months No medical history that might limit the individual's ability to take the trial treatments for the 12 month duration of the study No medical conditions that would prevent the patient from performing the cardiac MRI procedure No temporary non-tunneled catheter
Kaysen, 2011[12] Unruh, 2013[7]	FHN, both	2006 to 2009	Home or in-center Multi-center	See above inclusion and exclusion criteria
Burrowes, 2005[13] Jhamb, 2011[14] Liang, 2011[15] Unruh, 2003[16] Unruh, 2003[17]	HEMO	1995 to 2000	In-center Multi-center	Age: 18 to 80† Duration of prior dialysis: >=3 months Urea clearance <1.5 ml/min/35 L of urea Albumin>2.6 g per dL Equilibrated Kt/V>1.30 was achieved within 4.5 hours during 2 of 3 consecutive monitored dialysis sessions during which high-dose goal was targeted No severe comorbid conditions such as severe cardiac disease, active malignancies requiring chemotherapy or radiation therapy, known acquired immunodeficiency syndrome (AIDS); or were unable or unwilling to follow study procedures.
Crews, 2019[18]	SOCIABLE	2016 to 2017	In-center	Age: >60 Duration of prior dialysis: at least 6 moths English speaking At least on limitation in physical function Low SES
Aramwit, 2012[19]		NR	NS	Age>18 HD patients for at least 3 months Having mild to severe pruritus as measured by the VAS during the previous 6 weeks
Begum, 2004[20]		NR	In-center Multi-center	Age: >20 With symptoms of dry or itchy skin
Belayev, 2015[21]		NR	NS	Language: English Cognitively intact Adults Not undergoing work up for a living donor kidney transplant or considering PD Receiving HD 3x.wk
Berman, 2016[22]		NR	In-center Multi-center	Language: English Included if deemed medically non-transplantable

Author, year	Study name	Study period	Location	Inclusion criteria
Birdee, 2015[23]		2012 to 2013	In-center Single-center (clinic)	Age: >18 Maintenance HD for at least 3 month, expected to stay on hemodialysis for at least 6 months no unstable cardiac disease, no chronic lung disease requiring oxygen, no active cerebrovascular disease, no major depression, no cognitive impairment Not participating in another mind-body program or class
Brass, 2001[24]		NR	In-center Multi-center	Age: >18 Prevalent Medically suitable to undergo graded ergometer exercise testing, plasma acetylcarnitine/carnitine ratio >0.4 required for randomization, effectively dialyzed, unlikely to require changes in dialysis prescription No claudication, if screening identified a medical condition that precluded safe performance of maximal exercise testing, Ability to cooperate with exercise testing, or the use of immunosuppressives, growth hormones, androgens, or anabolic steroids within the 3 months before study entry.
Burrowes, 2012[25]		1995 to 2000	In-center Multi-center	Age: 18 to 80 none, although eligibility criteria listed in referenced protocol manuscript
Chan, 2019[26]		NR	In-center Multi-center	Age: 55-80 Impaired exercise ability Maintenance HR for at least 3 months No temporary vascular access, uncontrolled diabetes mellitus, active autoimmune disease, malignancy, severe obesity, alcoholism or other recreational drug use, unstable cardiac disease, peripheral vascular disease, medically unstable Must not do mor than 2 hours of moderate physical activity per week No anabolic, catabolic, or cytotoxic medication in the past 3 months.
Dember, 2019[27]	TIME	2013 to 2015	In-center Multi-center	Age: >18 Prevalent/Duration of prior dialysis: at least 120 days No health care proxy used to provide consent for dialysis treatment Willing to have clinical data included in dataset
Deniston, 1990[28]		1984 to 1987	In-center Multi-center	Age: >18 Prevalent baseline hemoglobin <8.5 Postmenopausal women or women receiving oral contraceptives hypertensive patients stable on anti-hypertensive drugs for 3 months
Duggal, 2019[29]		2017 to 2018	In-center Multi-center	Age: 18 to 89 Recovery time: 6+ hours at baseline. Kt/V >/=1.3 for those dialyzing three times per week, or standardized Kt/V greater than 2.1 for those dialyzing four times per week Not pregnant, breastfeeding, considering pregnancy No planned change in dialysis rate or timing, or if primary nephrologist had a medical objection to patients involvement.

Author, year	Study name	Study period	Location	Inclusion criteria
Mehrotra, 2019[30]		2015 to 2017	In-center Multi-center	Age: >21 Prevalent Major depressive disorder or dysthymia
Natarajan, 2014[31]		2011 to	In-center Single-center (clinic)	Age: 18 to 80 Currently receiving hemodialysis treatment Not pregnant or nursing women No HIV/AIDs or liver disease diagnoses No active dependency on controlled substances and alcohol Not on anticoagulant therapy regimen Must sign consent form, No social conditions or medical debilitating disease/disorder that would interfere with or serve as a contraindication to adherence to the study protocol
Pai, 2009[32]		2003 to 2005	In-center Multi-center network	Age: >18 Language: English Stable HD regimen for at least 3 months
Rodrigue, 2011[33]		2007 to 2009	In-center NS	Age: 18 to 70 Language: English ESRD or CKD Approved for transplant Living within 60 miles of the transplant center Not already receiving psychological treatment No prior transplant Not listed for liver/kidney transplantation, known No cognitive impairment (Mini Mental Status Exam score <23).
Sloan, 1998[34]		NR	In-center Multi-center	no clinical contraindication to L-carnitine Had not previously received L-carnitine
Sloand, 2004[35]		NR	In-center Single-center (clinic)	No child bearing potential, severe liver disease, polycythemia, evidence of hemochromatosis, 10 or more blood transfusions 2 years prior to the study, hypersensitivity to IV iron, receipt of IV iron 1 month prior to the study, weight less than 50Kg
Song, 2015[36]		2010 to 2012	In-center Multi-center	Age: >18 Language: English Ethnicity: White, non-Hispanic; Black, non-Hispanic Prevalent Creatinine clearance of 6 or higher Not hearing impaired

Author, year	Study name	Study period	Location	Inclusion criteria
Steiber, 2006[37]		2001 to 2002	In-center NS	Age: >18 Prevalent Minimum 3 hours HD 3x/week On dialysis for at least 1 year Must meet 2 of the following risk factors: >/= 65yo; 1 year treatment; female; use of aspirin or mannitol; Type 2 Diabetes Mellitus; left atrial dilation, left ventricular hypertrophy No pervious transplant (within the last 2 months) of L-carnitine; severe blood loss; disease affecting skeletal muscle function; severe liver disease; pregnancy; free carnitine >40
Tawney, 2000[38]		NR	NS	Sufficient mobility to transfer independently around the room No: excessive fluid gain; severe valval disease; uncontrolled angina; severe joint pain; dizziness; dyspnea; uncompensated heart failure; inadequately managed diabetes; uncontrolled hypertension or hyperkalemia

† inclusion criteria gathered from the original study: Eknoyan G, Beck GJ, Cheung AK et al. Effect of dialysis dose and membrane flux in maintenance hemodialysis. N Engl J Med 2002; 347: 2010–2019 [39]

AIDS=Acquired Immunodeficiency Syndrome; CKD=chronic kidney disease; dl=deciliters; eKt/V=equilibrated Kt/V (urea clearance); ESRD=end stage renal disease; FHN=Frequent Hemodialysis Network trials; FT3=Free triiodothyronine (T3); FT4=Free thyroxine (T4); g=grams; GFR=glomerular filtration rate; HD=hemodialysis; HIV=Human Immunodeficiency Virus; IV=intravenous; kg=kilograms; Kt/V=urea clearance; L=liters; m^2=meters squared; ml=milliliter; MRI=magnetic resonance imaging; SOCIABLE = Seniors optimizing community integration to advance better living with ESRD; TSH=thyroid-stimulating hormone; VAS=Visual Analogue Scale

Evidence Table F.2. Study characteristics of cohort studies utilizing instruments used to measure quality of life of people with ESRD treated by dialysis

Author, year	Study	Study period	Location	Study design	Inclusion Criteria	COMMENTS about Study Characteristics
Abdel-Kader, 2009[40]		2004 to 2006	Home or in-center Multi-center network	Prospective	Age: 18 to 90 No active malignancy Living at home No active infection (pneumonia) No active coronary artery disease (e.g., unstable angina, myocardial infarction) within the last 6 months No advanced cirrhosis No advanced dementia No active alcohol abuse No active treatment for sleep apnea No refractory psychiatric disease Safe home environment	CKD patients compared to dialysis patients
Abdel-Kader, 2009[41]		2004 to 2007	NRCKD, PD and HD patients in western PA	Cross-sectional	Age: 18 to 90 No severe comorbid illness No unsafe home environment	
Abreo, 2017[42]		2009 to 2011	Not stated	Retrospective	Age: >18 Language: English or Spanish HD for at least 3 months	
Agarwal, 2011[43]		Not stated	Not stated	Prospective	All groups: not obese Control group: no hypertension, CKD, or diabetes CKD group: eGFR>15; no hospitalization in the last 2 months; no hypertension or arrhythmia Hemodialysis group: no atrial fibrillation	
Agganis, 2010[44]		Not stated	In-center Multi-center network	Prospective	Language: English Sufficient visual and hearing acuity to complete the survey No pre-existing advanced dementia or confusion Medically stable without access-related hospitalization within 1 month Maintenance HD for at least 1 month	

Author, year	Study	Study period	Location	Study design	Inclusion Criteria	COMMENTS about Study Characteristics
Allen, 2002[45]	HEMO	1995 to 2000	In-center	Cross-sectional analysis of main study participants[39]	Dialyzed 3 times per week for ≥3 months Not scheduled for a living related renal transplant Did not return to dialysis <6 months after renal transplantation Able to achieve equilibrated Kt/V of 1.3 in 4.5 hours or less due to large body size or access problems Residual renal urea clearance<1.5 mL/min per 35L volume distribution for urea No pregnancy, malignancy, ongoing chemotherapy/radiation, unstable or new onset ischemic heart disease within past 3 months, severe congestive heart failure despite maximal medical therapy, AIDS, active systemic infection, chronic pulmonary disease requiring supplemental oxygen, severe liver disease, or severe malnutrition	
Anand, 2011[46]		2005 to 2007	In-center Multi-center	Prospective	Language: English or Spanish No: speech, hearing, or cognitive impairment; prior or imminent transplant	
Atcherson, 1978[47]		1977 to 1977	Single-center (clinic)	qualitative interviews	Individuals who did home hemodialysis from 1970-1976 then transitioned to in-center hemodialysis	Of note: this is a qualitative study, no comparison group
Barakzoy, 2006[48]		2005 to 2005	In-center Single-center network	Prospective	Age: >18 Possess decision-making capacity No history of drug abuse Not receiving continuous treatment for chronic pain	HD patients SF-MPQ pain score compared before and after pain treatment using WHO pain ladder
Barrett, 1990[49]		1985 to 1986	Home or in-center	Prospective	Minimal care in center HD, home HD or chronic ambulatory PD	
Bleyer, 2019[50]		NR	NR	Survey	Individuals (or families) with autosomal dominant tubulointerstitial kidney disease	

Author, year	Study	Study period	Location	Study design	Inclusion Criteria	COMMENTS about Study Characteristics
Bremer, 1989[51]		Not stated	Home or in-center Multi-center network	Cross-sectional study	Age: >18 Prevalent HD Current treatment for at least 90 days Medically stable All patients in the smaller treatment groups were selected (70 self-care center hemodialysis and 87 home hemodialysis patients) Random sample of 200 patients in each of the larger treatment modalities (center staff-assisted hemodialysis; CAPD; functioning cadaver transplant; and functioning living-related transplant)	Study looked at responders and non-responders by modality. Some groups (self-care center, home hemodialysis, and CAPD) were oversampled to ensure large enough groups for analyses.
Bremer, 1997[52]		Not stated	In-center Single-center (clinic)	Prospective	Age: 18 to 65 HD patients on the wait list for transplant Normal vision	
Broers, 2015[53]		2008 to 2011	Multi-center network	Retrospective	Patients with >=2 surveys 12 months apart	Unable to tell from the article if the Fresenius Medical Care North America database includes just Americans or dialysis patients in Canada/Mexico.
Bullen, 2018[54]		Not stated	In-center Single-center (clinic)	pre-post test	Age: >18 Were fully conscious during HD treatments Received HD three times a week Able to provide consent	
Cardone, 2011[55]		Not stated	In-center Single-center (clinic)	Retrospective	Nocturnal home hemodialysis	

Author, year	Study	Study period	Location	Study design	Inclusion Criteria	COMMENTS about Study Characteristics
Chiu, 2009[56]		Not stated	In-center Multi-center	Cross-sectional	Duration >=3 months	
Christensen, 1989[57]		1984 to 1987	In-center	Prospective	Dialysis patients post-transplant	
Christensen, 1991[58]		1987 to 1989	In-center Single-center (clinic)	Prospective	Undergoing chronic dialysis	
Cohen, 2019[59]		2014 to 2016	Home or in-center Multi-center	Retrospective	Age: >18 No veterans affairs beneficiaries	
Cukor, 2007[60]		Not stated	In-center Single-center (clinic)	not specified	Adults	
Cukor, 2008[61]		Not stated	In-center Single-center (clinic)	Prospective	Adults	
Cukor, 2008[62]		Not stated	In-center Single-center (clinic)	Prospective	On HD	
Cukor, 2014[63]		Not stated	In-center Multi-center	Prospective	Age: >18 Language: English Duration: >=6 months Elevated depressed affect No current hospitalization No altered mental status (Mini-Mental Status Examination score must be ≥23), psychosis, current substance abuse, current ongoing psychotherapy, a change in psychotropic medication in the last 6 months.	
Curtin, 2002[64]		Not stated	In-center Multi-center	Prospective	Age: >18 Language: English	

Author, year	Study	Study period	Location	Study design	Inclusion Criteria	COMMENTS about Study Characteristics
Debnath, 2018[65]		Not stated	In-center Single-center (clinic)	Cross-sectional	Race/Ethnicity: Mexican American Duration: 6 months Diagnosis of type 2 diabetes On in-center hemodialysis 3x/week No cardiovascular event within past 30 days No refractory psychiatric disease	
Delano, 1989[66]		Not stated	In-center NS	pre-post treatment with epogen	On maintenance hemodialysis Patients receiving treatment with recombinant human erythropoietin	
Deniston, 1989[67]		1984 to 1986	Home or in-center Multi-center	Cross-sectional	Age: >18 Duration: 6 months Residing in Michigan ESRD onset between 1981 and 1985	
Domenic Sridharan, 2018[68]		2016 to 2016	In-center Multi-center	Cross-sectional	Language: English Duration: >=3 months Willing to participate	
Drayer, 2006[69]		2002 to 2003	In-center Single-center (clinic)	Prospective	Language: English Prevalent Not demented Receiving chronic thrice-weekly dialysis	
Duque, 2006[70]		Not stated	In-center Single-center (clinic)	Prospective	Age: <63 No inflammatory skin disease	
Dwyer, 2002[71] Liu, 2012[72]	HEMO	1995 to 1999	In-center Multi-center	Cross-sectional	Age: 18 to 80 Duration on dialysis: ≥3 months In-center hemodialysis 3x/week with residual renal clearance <1.5 ml/min. No severe malnutrition indicated, current active malignancies requiring radiation or chemotherapy, symptomatic acquired immunodeficiency syndrome (AIDS), cirrhosis with encephalopathy, severe congestive heart failure, unstable or new onset angina pectoris, chronic pulmonary disease, and current hospitalization	

Evidence Table F.2. Study characteristics of cohort studies utilizing instruments used to measure quality of life of people with ESRD treated by dialysis (continued)

Author, year	Study	Study period	Location	Study design	Inclusion Criteria	COMMENTS about Study Characteristics
Evans, 1990[73]		Not stated	In-center Multi-center	Compared recipients of EPO in clinical trials to patients in the National Kidney Dialysis and Kidney Transplantation Study	Age: >18 Duration: 3 months Have a known history and monitored status of at least 1 month's duration at participating dialysis centers Clinically stable condition based on documented patient history Life expectancy greater than 6 months If female, using approved contraceptives or judged unable to become pregnant Ambulatory Hematocrit ≤ 0.30 Serum ferritin level > 100 micrograms per L and transferrin saturation greater than 20% No evidence of gastrointestinal blood loss or hemolysis Aspartate aminotransferase level stable for the past month and not more than twice normal No systemic hematologic disease or chronic inflammatory disease that would interfere with data analysis No changes in general health within the past month, No current drug addiction Controlled supine diastolic blood pressure of <100 mm Hg No thrombocytopenia (defined as platelet count, <100x 10^9 per L) No neutropenia (defined as leukocyte count, <2.0 x 10^9 per L), No hematologic evidence of toxic reactions to aluminum (acquired, non-iron-deficient microcytosis) No deferoxamine mesylate (Desferal) therapy No positive Coombs test Not on immunosuppressant therapy (including corticosteroids) within the past month No changes in medication (other than dose) within the prior month No participation in any other clinical investigational drug or biologic study No androgen therapy in the preceding month No history of seizures.	

Evidence Table F.2. Study characteristics of cohort studies utilizing instruments used to measure quality of life of people with ESRD treated by dialysis (continued)

Author, year	Study	Study period	Location	Study design	Inclusion Criteria	COMMENTS about Study Characteristics
Evans, 1991[74]		Not stated	Multi-center	Prospective	Enrollment in the National Kidney Dialysis and Kidney Transplantation Study, the Kidney Transplant Immunosuppressive Protocol Study, or the AmGen, Inc. phase 3 clinical trial of EPO	Data obtained from the National Kidney Dialysis and Kidney Transplantation Study (NKDKTS), the Kidney Transplant Immunosuppressive Protocol Study (KTIPS), and the AMGen, Inc phase 3 clinical trial of EPO.
Feroze, 2011[75]		2001 to 2007	In-center Multi-center	Prospective	Age: >18 Duration: >= 8 weeks Signed IRB consent form	
Feroze, 2012[76]		Not stated	Home or in-center	Cross-sectional	Age: 18 to 95 Duration: 6 months	
Finkelstein, 2009[77]		2003 to 2006	In-center Multi-center	Cohort	Age: >18 Language: English or French GFR <60 ml/min/1.73 m^2 on the basis of estimated GFR using the Modification of Diet in Renal Disease formula	NOTE: this study includes sites in the US AND Canada

Evidence Table F.2. Study characteristics of cohort studies utilizing instruments used to measure quality of life of people with ESRD treated by dialysis (continued)

Author, year	Study	Study period	Location	Study design	Inclusion Criteria	COMMENTS about Study Characteristics
Finkelstein, 2012[78] Jaber, 2010[79]	FREEDOM	2006 to 2009	Home Multi-center	Prospective	Age: >18 End-stage renal disease requiring dialysis Candidate for starting short daily HD (prescribed six times per week) at home and who had Medicare as their primary insurance payer. Not currently using device, nor prior enrollment in the study Not currently enrolled in an investigational drug or device trial that might impact the outcome measures, and not those with low likelihood of surviving the first 4–6 weeks encompassing the training period. Medicare as primary payer (but not Medicare HMO) Ability to understand HIPAA compliant authorization statement	
Fowler, 2006[80]		Not stated	In-center Single-center (clinic)	Prospective	Receiving dialysis at one of two facilities	
Fukuhara, 2003[81]		Not stated	In-center Multi-center	Cross-sectional	HD patients	
Gabbay,2010[82]		1997 to 2006	In-center Multi-center	Retrospective	Age: >18 Duration: 6 months All participants received hemodialysis at a DCI outpatient facility. No treatment by PD, death, kidney transplantation or loss to follow up within 6 months after starting dialysis	
Gerson, 2004[83]		1998 to 2003	Nephrology practices	Prospective	Age: 11 to 18 Language: English or Spanish Attended 1 of the participating outpatient nephrology practices or dialysis clinics (hemodialysis or peritoneal dialysis), had CKD, or kidney transplant recipients,	Note: parents or guardians of the study completed the questionnaires, not the children.
Goldstein, 2006[84]		Not stated	In-center: renal transplant care Multi-center	not specified	Age: 2 to 18	

Evidence Table F.2. Study characteristics of cohort studies utilizing instruments used to measure quality of life of people with ESRD treated by dialysis (continued)

Author, year	Study	Study period	Location	Study design	Inclusion Criteria	COMMENTS about Study Characteristics
Goldstein, 2008[85]		2004 to 2006	Home or in-center Multi-center	Cross-sectional and case control	Age: children 5-18 and parents of children age 2-18 On prevalent HD at least 2 months	
Goldstein, 2009[86]		Not stated	Home or in-center: renal transplant care Multi-center	Cross-sectional	Age: 2 to 18 Written parental informed consent and child assent	
Gorodetskaya, 2005[87]		2002 to 2004	Not stated	Cross-sectional and longitudinal	Language: English Signed written informed consent	
Harris, 2012[88]		2001 to 2003	In-center Single-center network	Prospective	All patients on chronic HD at the 2 study sites	
Hedayati, 2006[89]		Not stated	Not stated	Retrospective	Language: English Had health care power of attorney Able to sign consent	
Hernandez, 2018[90]		Not stated	In-center Single-center (clinic)	pre-post	Age: >18 Language: English On chronic HD for ≥ 3 months Elevated symptoms of depression Had serious comorbid conditions as reported by staff	
Hicks, 2004[91]		1996 to 1997	Not stated	survey	Age: >18 On dialysis	
Hornberger, 1992[92]		1990 to 1991	In-center Single-center (clinic)	Prospective	Language: English or Spanish On HD for at least 3 months No acute illness requiring hospitalization	

Evidence Table F.2. Study characteristics of cohort studies utilizing instruments used to measure quality of life of people with ESRD treated by dialysis (continued)

Author, year	Study	Study period	Location	Study design	Inclusion Criteria	COMMENTS about Study Characteristics
Hynes, 2019[93]		Not stated	In-center Multi-center	Pre-post	Age: ≥ 18 Fluent in English or Spanish On maintenance dialysis Able to provide informed consent	
Jhamb, 2009[94]		1995 to 1998	In-center Multi-center	Prospective	Age: >18 Language: English or Spanish Incident HD: >45 days Gave informed consent. BMI<>50 No missing information on vitality items or CHOICE Health Experience Questionnaire	
Johansen, 2007[95]		1996 to 1997	Not stated	Prospective	Patients on incident dialysis in the US in 1996 and ESRD program in 1997 who were included in the Dialysis Morbidity and Mortality Study Wave 2 Standard Analytic File of the USRDS	
Johnson, 1982[96]		Not stated	In-center Single-center (clinic)	Cross-sectional	Age: 18 to 55 End-stage renal disease of sufficient severity to require treatment with either hemodialysis or transplantation If subject had a transplant, patient must have been transplanted with a cadaveric graft or living-related transplant If patient has failed transplantation and is currently on hemodialysis, the most recent transplantation must have been cadaveric Clinically stable; Must not have been hospitalized within the past 3 months for intercurrent problem or problems related either to hemodialysis or transplantation is not eligible.	
Julius, 1989[97]		1981 to 1984	Home or in-center Multi-center	Cross-sectional	Age: >18 Duration: 6 months	Interview took place in 1985, patients diagnosed with ESRD between 1981 and 1984
Kimmel, 1995[98]		1992 to 1994	In-center Multi-center	Prospective	HD for at least 6 months No: HIV, psychiatric diagnosis of psychosis Did not fail Mini-Mental Status exam	

Evidence Table F.2. Study characteristics of cohort studies utilizing instruments used to measure quality of life of people with ESRD treated by dialysis (continued)

Author, year	Study	Study period	Location	Study design	Inclusion Criteria	COMMENTS about Study Characteristics
Kimmel, 1998[99]		1992 to 1996	In-center Single-center (clinic)	Prospective	ESRD HD patients No: HIV; psychiatric diagnosis; mini-mental status score of less than 23	
Kimmel, 2003[100]		2001 to 2001	Multi-center network	Cross-sectional	Language: English Had decision-making capacity Not too sick to participate	
Ko, 2007[101]		2004 to 2005	In-center Single-center (clinic)	Cross-sectional	Mentally competent to complete two surveys	
Kring, 2009[102]		Not reported	In-center Single-center	Cross-sectional	Age: >18 Language: English Duration: >=3 months Actively undergoing in-center hemodialysis No dementia or other condition that impaired ability to answer questions, cognitive or medical changes occurring during hemodialysis that prevented answering questions	
Kurella, 2004[103]		Not stated	In-center: nephrology practices affiliated with University of California San Francisco Multi-center	not specified	Language: English ESRD patients were on in-center hemodialysis CKD patients had eGFR < 60 on 2 occasions within the past 12 months No significant hearing impairment	

Evidence Table F.2. Study characteristics of cohort studies utilizing instruments used to measure quality of life of people with ESRD treated by dialysis (continued)

Author, year	Study	Study period	Location	Study design	Inclusion Criteria	COMMENTS about Study Characteristics
Kurella, 2005[104]		Not stated	In-center Multi-center	Cross-sectional	Language: English In-center hemodialysis or eGFR <60 on at least 2 occasions within the preceding 12 months	
Kutner, 1998[105]		1987 to	In-center Multi-center	Prospective	Age: >60 Chronic dialysis Participated in follow-up interview	
Kutner, 2000[106]		1996 to 1997	Home or in-center Multi-center	Cross-sectional	Age: >20 Language: English or Spanish Incident HD No cognitive impairment	
Kutner, 2005[107]		1996 to 1997	In-center Multi-center	Prospective	Age: >18 No intermittent dialysis treatment due to fluid overload or HF No home HD No previous treatment	
Kutner, 2007[108]		1996 to 1997	Home or in-center Multi-center network	Prospective	Age: >18 Incident HD or PD on day 60 of dialysis Not receiving intermittent dialysis because of fluid overload or heart failure Not on home HD No past transplant	
Kutner, 2010[109]		2005 to 2007	In-center	Prospective	Age: >18 ESRD Initiated dialysis between 2005-2007	
Lacson, 2009[110]		2006 to 2006	In-center Multi-center network	survey	On dialysis	
Lacson, 2014[111]		2006 to 2006	In-center Multi-center network	Retrospective	Incident dialysis	

Evidence Table F.2. Study characteristics of cohort studies utilizing instruments used to measure quality of life of people with ESRD treated by dialysis (continued)

Author, year	Study	Study period	Location	Study design	Inclusion Criteria	COMMENTS about Study Characteristics
Laskin, 2017[112]		2011 to 2014	In-center Multi-center	Cross over	Age: 3 to 21 Duration: >2 months No kidney transplant No switch from peritoneal dialysis w/in subsequent 6 months Not received >3 days or >12 hr per week of HD No use of temporary or femoral dialysis catheter Included children listed for a deceased donor transplant	
Li, 2016[113]		Not stated	NR Single-center (clinic)	Cross-sectional non interventional	Age: >18 No hospitalization in the last 3 months except for vascular access repair No amputation or prostheses of the lower extremities Ability to ambulate and to complete all study tests Likelihood of good compliance No acute infection or other inflammatory illness No current heart failure, lung failure, severe liver disease, or active cancer (except for basal cell carcinoma) No MI or angina pectoris within the last 12 months	
Liebman, 2016[114]		2006 to 2006	In-center Multi-center	Retrospective	Age: >18 Not dialyzing on the unit on a temporary basis	This study includes MCID data
Mapes, 2004[115]		Not stated	Not stated	not specified	Treated in a DOPPS study dialysis center	A stratified sample of KDQOL scores in the DOPPS study, US, Japan, Europe
Maung, 2017[116]		2015 to 2015	In-center Single-center (clinic)	Cross-sectional	Age: >18 Language: English Had the specified weekly frequency of hemodialysis treatment for at least 6 months	

Evidence Table F.2. Study characteristics of cohort studies utilizing instruments used to measure quality of life of people with ESRD treated by dialysis (continued)

Author, year	Study	Study period	Location	Study design	Inclusion Criteria	COMMENTS about Study Characteristics
McAdams-DeMarco, 2016[117]		2009 to 2013	In-center	Prospective	Patients on dialysis	
McClellan, 1991[118]		1986 to	Not stated	Prospective	Incident dialysis less than 6 weeks prior to the study	
McDade-Montez, 2006[119]		Not stated	In-center Single-center network	not specified	Age: >18 Language: English No severe cognitive impairment	Reports that patient data was drawn from several earlier studies conducted at University of Iowa over a 9 year period, but doesn't specify the years
Mehdi, 2009[120]		Not stated	In-center Multi-center	Retrospective	Age: >18 HD 3 months or longer Signed consent	
Mittal, 2001[121]		1996 to 1998	In-center Single-center (clinic)	Prospective	Did not die or receive a kidney transplant between 1996 and 1998	
Mittal, 2001[122]		1996 to 1998	In-center Single-center (clinic)	Prospective	Receiving HD or PD for a minimum of 3 months prior to the study	
Neri, 2009[123]		Not stated	In-center Single-center network	cross-sectional	Age: 18 to 67 Employed	

Evidence Table F.2. Study characteristics of cohort studies utilizing instruments used to measure quality of life of people with ESRD treated by dialysis (continued)

Author, year	Study	Study period	Location	Study design	Inclusion Criteria	COMMENTS about Study Characteristics
Neul, 2013[124]		2009 to 2011	Home or in-center	Retrospective	Age: <18 No significant cognitive delays Must be able to complete the survey alone of with assistance of medical staff	
Neul, 2015[125]		Not stated	Not stated	pilot study	Age: ≥8 years and caregivers of both eligible and ineligible children (ineligible=<8 age, cognitive delays, evidence that patient could not comprehend QoL item content, and who completed recent semiannual QoL pair assessment surveys	Description of a pilot study
Novak, 2008[126]		2003 to 2006	In-center Single-center (clinic)	Retrospective	Incident dialysis On PD for 6 months or more Must not have received HD for 6 months or more prior to PD initiation	
Painter, 2012[127]		Not stated	In-center Single-center (clinic)	Prospective	Age: >18 Language: English ESRD requiring kidney replacement therapy Stable on conventional HD for at least 3 months or scheduled for a kidney transplant from a living donor No orthopedic or musculoskeletal factors that could be exacerbated by the disease Hematocrit >33% No cardiovascular event No pulmonary disease No peripheral vascular disease No progressive degenerative muscular disease in the last year No diabetes	

Evidence Table F.2. Study characteristics of cohort studies utilizing instruments used to measure quality of life of people with ESRD treated by dialysis (continued)

Author, year	Study	Study period	Location	Study design	Inclusion Criteria	COMMENTS about Study Characteristics
Painter, 2017[128]		Not stated	Home	Quasi-experimental	Language: English Ambulatory Able to provide informed consent No cognitive dysfunction No progressive neurologic disease No severe rheumatologic or orthopedic conditions No angina upon exertion No MI or cardiac surgery within the last year	
Parker, 2003[129]		Not stated	In-center	Prospective	CKD on intermittent HD	
Parkerson, 2000[130]		Not stated	In-center Multi-center	Prospective	All patients receiving dialysis at 3 centers in North Carolina	
Patel, 2002[131]		2001 to 2001	In-center Single-center (clinic)	Prospective	Receiving HD for at least 6 months No: HIV infection or psychiatric diagnosis	
Pifer, 2003[132]		Not stated	In-center	Prospective	Patients at one of the demonstration centers	
Pisoni, 2006[133]		1996 to 2004	In-center Multi-center	Prospective	Treated in a DOPPS study dialysis center	NOTE: DOPPS cohort contains data from 300 randomly selected dialysis facilities in 12 countries.
Plantinga, 2007[134]		1995 to 1998	In-center Multi-center	Prospective	Incident dialysis Had 1-year QOL measurement Had 6 month hemoglobin measurement	

Evidence Table F.2. Study characteristics of cohort studies utilizing instruments used to measure quality of life of people with ESRD treated by dialysis (continued)

Author, year	Study	Study period	Location	Study design	Inclusion Criteria	COMMENTS about Study Characteristics
Pruchno, 2009[135]		2001 to 2006	Not stated	Prospective	Age: >55 Language: English On HD for at least 6 months No cognitive, hearing, and speech impairments that would preclude their ability to answer questions on the telephone	
Ramakrishnan, 2013[136]		2009 to 2012	In-center	Retrospective	On HD or PD Received treatment at a large dialysis organization between January 2009-May 2012 and had responded to the KDQOL-36 survey	Large dialysis organization
Rao, 2000[137]		Not stated	Not stated	not specified	Subsection of parent study of patients with ESRD	
Raspovic, 2017[138]		2009 to 2016	Not stated	Retrospective	Patients with diabetic foot disease.	
Rosas, 2001[139]		Not stated	In-center Multi-center	Prospective	Age: >18 Language: English On chronic HD for at least 6 months No cognitive impairment	
Roumelioti, 2011[140]		2004 to 2008	In-center Multi-center	Prospective	Age: >18 Advanced CKD No CPAP No active medical or psychiatric disease	
Saad, 2015[141]		2013 to 2013	In-center Single-center (clinic)	Retrospective	Patients on Hemodialysis	

Evidence Table F.2. Study characteristics of cohort studies utilizing instruments used to measure quality of life of people with ESRD treated by dialysis (continued)

Author, year	Study	Study period	Location	Study design	Inclusion Criteria	COMMENTS about Study Characteristics
Saban, 2008[142]		Not stated	VA dialysis	Prospective	Language: English Any HD patient receiving care at a Veteran's Affairs facility in the past 3 years No live kidney donor identified No skilled nursing care Life expectancy>1 year No cognitive impairment No severe hearing or speech impairment Access to a phone	
Saban, 2010[143]		2001 to 2003	In-center Multi-center	Comparison of 2 prospective studies	Receiving HD	
Schneider, 2003[144]		Not stated	In-center Multi-center	Cross-sectional	Primary caregivers of hemodialysis or transplant patients Alert and oriented Not actively using drugs/alcohol Living with the HD patient No relatives/friends of HD patients in long-term care facilities	
Schneider, 2004[145]		Not stated	Multi-center	Prospective	Primary caregiver of ESRD patients and living with the patient No active drug or alcohol use	
Seethala, 2010[146]		2008 to 2008	In-center Single-center (clinic)	Prospective	Language: English No evidence of significant cognitive impairment based on Mini-Cog scores <3 On dialysis for >3 months No vision problems that limited their ability to read the study surveys.	
Shafi, 2010[147]		1995 to 1998	Not stated	Prospective	Age: >18 Language: English or Spanish Incident dialysis Able to provide informed consent	See main study for characteristics

Evidence Table F.2. Study characteristics of cohort studies utilizing instruments used to measure quality of life of people with ESRD treated by dialysis (continued)

Author, year	Study	Study period	Location	Study design	Inclusion Criteria	COMMENTS about Study Characteristics
Simmons, 1984[148]		1983 to 1984	Home or in-center Multi-center	Cross-sectional	Age: 19 to 55 Duration: 1 year Nondiabetic On their respective therapy (HD, PD or transplant) for at least 1 year	
Simmons, 1990[149]		1970 to 1984	Home or in-center Multi-center	Cross-sectional	Age: 19 to 56 Nondiabetic On present therapy for at least 1 year	
Siskind, 1993[150]		Not stated	In-center	Prospective	Met the Medicare eligibility requirements for IDPN	
Song, 2009[151]		2007 to 2008	In-center Multi-center	Baseline interview data from an RCT	Age: >18 Race/Ethnicity: Self-identified Black/African American, non-Hispanic HD for at least 3 months	
Song, 2011[152]		Not stated	In-center Multi-center	Cross-sectional descriptive	Age: >18 Language: English Receiving in-center HD or PD for at least 6 months prior to dialysis Normal cognitive function	Stated: 3 dialysis centers
Song, 2018[153]		2012 to 2015	In-center Multi-center	longitudinal cohort	Age: >19 Language: English Duration: >=1 month No uncompensated hearing impairment Not a kidney transplantation candidate Not too ill to participate in an hour-long data collection session No more than 3 errors on a gross cognitive screening test (the 10-item Short Portable Mental Status Questionnaire [SPMSQ]) No documented advanced dementia	
Sorensen, 2012[154]		Not stated	In-center Single-center (clinic)	Prospective	Language: English Sufficient vision and hearing to complete cognitive tests No advanced dementia; confusion; non-access acute hospitalization in the last month On maintenance HD >1 month	

Evidence Table F.2. Study characteristics of cohort studies utilizing instruments used to measure quality of life of people with ESRD treated by dialysis (continued)

Author, year	Study	Study period	Location	Study design	Inclusion Criteria	COMMENTS about Study Characteristics
Spinowitz, 1990[155]		1994 to 1997	Multi-center	Retrospective	On HD	
Steele, 1996[156]		Not stated	In-center	Prospective	Age: 21 to 80 Continuous ambulatory PD (CAPD) for at least 3 months Ability to fill out self-rating forms No acute psychiatric or medical illness 2 months prior to the study	
Steele, 1996[157]		Not stated	In-center Single-center (clinic)	Prospective	Age: 21 to 80 On chronic peritoneal dialysis (CPD) for at least 3 months No psychiatric or medical illness 2 months prior to the study No prior HD or transplantation	
Suri, 2011[158]		Not stated	Home or in-center Multi-center	cross-sectional	Prevalent HD Patients enrolled in the FHN trials	
Tell, 1995[159]		Not stated	In-center Single-center (clinic)	Cross-sectional	Age: >18 Considered competent	
Thomas, 2011[160]	FREEDOM	2002 to 2002	In-center	Cross-sectional	Race/ethnicity: Black, non-Hispanic Mentally stable enough to participate No physical limitation to compromise participation	
Thomas, 2012[161]		Not stated	In-center	Prospective	Race/ethnicity: Black, non-Hispanic No acute illness Mentally stable	
Thomas-Hawkins, 2000[162]		Not stated	Multi-center	Prospective	Age: >18 Language: English On dialysis for 6 months or more Attended regularly scheduled dialysis visits Able to give consent	

Evidence Table F.2. Study characteristics of cohort studies utilizing instruments used to measure quality of life of people with ESRD treated by dialysis (continued)

Author, year	Study	Study period	Location	Study design	Inclusion Criteria	COMMENTS about Study Characteristics
Ting, 2003[163]		1996 to 2002	Home or in-center Single-center (clinic)	Prospective	Age: >18 Prevalent HD or PD for at least 3 months for 3- or 4-times weekly before starting short daily HD treatments Adequate vascular access Compliance with fluid management and treatment protocols Ability to understand and sign informed consent For in-center patients, willingness to reuse dialyzers and ability to transport to and from the clinic 6 times a week Willing to commit at least 3 months in study and provide consent Initially, patient selection was based on medical indications to justify the additional expenses; nonmedical reasons were added within 3 months of starting the study for patients who volunteered for the study	
Troidle, 2003[164]		2000 to 2002	In-center Single-center (clinic)	Prospective	Either on continuous PD or daily HD	
Troidle, 2007[165]		Not stated	In-center Multi-center network	Prospective	Prevalent dialysis Able to provide their own consent Preference was given to patients who had difficulty achieving an adequate Kt/V urea, had large intradialytic weight gains with hemodynamic instability, or difficulty in achieving ideal dry weight	
Unruh, 2004[166]		1995 to 2001	In-center Multi-center	Retrospective	Age: 18 to 80 Race/ethnicity: Black, non-Hispanic Receiving HD for 3 or more months	
Unruh, 2004[167]		1995 to 1998	In-center Single-center network	Prospective	Age: >17 Language: English or Spanish Incident HD	

Evidence Table F.2. Study characteristics of cohort studies utilizing instruments used to measure quality of life of people with ESRD treated by dialysis (continued)

Author, year	Study	Study period	Location	Study design	Inclusion Criteria	COMMENTS about Study Characteristics
Unruh, 2006[168]		1995 to 1998	Home or in-center Multi-center	Prospective	Age: >18 Language: English or Spanish Incident HD Responded to CHOICE Health Experience Questionnaire (CHEQ) and completed at least the items regarding sleep quality No home HD	
Unruh, 2008[169]		2004 to 2005	In-center	Prospective	Age: 45 to 90 No craniofacial abnormalities No use of home oxygen No history of uvulopalatopharyngoplasty No active malignancy No acute infection No active coronary artery disease No advanced cirrhosis No advanced dementia No active alcohol abuse No refractory psychiatric disease	
Unruh, 2008[170]	HEMO	1995 to 2000	In-center Multi-center	Prospective	Dialyzed 3 times per week for ≥3 months Not scheduled for a living related renal transplant Did not return to dialysis <6 months after renal transplantation Able to achieve equilibrated Kt/V of 1.3 in 4.5 hours or less due to large body size or access problems Residual renal urea clearance<1.5 mL/min per 35L volume distribution for urea No pregnancy, malignancy, ongoing chemotherapy/radiation, unstable or new onset ischemic heart disease within past 3 months, severe congestive heart failure despite maximal medical therapy, AIDS, active systemic infection, chronic pulmonary disease requiring supplemental oxygen, severe liver disease, or severe malnutrition	

Evidence Table F.2. Study characteristics of cohort studies utilizing instruments used to measure quality of life of people with ESRD treated by dialysis (continued)

Author, year	Study	Study period	Location	Study design	Inclusion Criteria	COMMENTS about Study Characteristics
Unruh, 2011[171]		Not stated	Home or in-center Multi-center	Other (enter information as described in the article)	Age: >21 Language: English or Spanish Prevalent HD FHN major criteria: no anticipated kidney transplantation or relocation within the next 14 months, no medical need for HD >3 x per week, no history of poor adherence to HD, no medical condition preventing cardiac magnetic resonance imaging, ability to achieve a mean eKt/V urea ≥1.0 Enrolled in either FHN trial and completed baseline sleep questionnaires with baseline sleep scores, whether or not they were randomized	
Vu, 1999[172]		Not stated	Not stated	Prospective	Patients with lupus nephritis	
Walters, 2002[173]		1996 to 2000	In-center Multi-center	Prospective	Age: >18 No concomitant life-threatening conditions Life expectancy >12 months	
Ware, 2019[174]		Not stated	In-center: non-dialysis patients Single-center network	survey	CKD stages 3-5	
Wasse, 2007[175]		Not stated	Not stated	Prospective	Age: >18 Race/ethnicity: White, non-Hispanic; Black, non-Hispanic Incident dialysis No intermittent dialysis Not on home HD Attended dialysis units in the in the US though 1994	
Weisbord, 2003[176]		Not stated	In-center Single-center network	Prospective	All patients receiving 3x weekly ambulatory HD for at least 3 months prior to the study Charlson Comorbidity index of >/=8	

Evidence Table F.2. Study characteristics of cohort studies utilizing instruments used to measure quality of life of people with ESRD treated by dialysis (continued)

Author, year	Study	Study period	Location	Study design	Inclusion Criteria	COMMENTS about Study Characteristics
Weisbord, 2004[177]		Not stated	Not stated	DSI development study	Dialysis patients and renal providers	
Weisbord, 2005[178]		2003 to 2003	In-center Multi-center	Prospective	Receiving HD 3x/wk	
Weisbord, 2007[179]		2003 to 2003	In-center Multi-center	Prospective	Race/ethnicity: White, non-Hispanic; Black, non-Hispanic On HD for at least 3 months	
Welch, 1999[180]		Not stated	In-center Multi-center	Prospective	Adults Race/Ethnicity: Black, non-Hispanic No psychiatric disorders	
Williams, 2004[181]		Not stated	In-center Multi-center	pre-post	Prevalent HD No bacteremia, psychosis, senility, or other conditions prejudicing short-term survival No history of malignancy within the previous 3 years No history of noncompliance Not pregnant	
Wolcott, 1988[182]		Not stated	Multi-center	Prospective	Age: 20 to 65 Language: English On dialysis (same modality) for at least 6 months No: stroke; dementia; acute or chronic psychosis; temporary modality change, major visual impairment; major hearing impairment; no major medical or surgical event int eh previous 3 months Independently ambulatory	
Wolcott, 1989[183]		Not stated	NR University of California Los Angeles	not reported	Language: English No acute psychiatric disorder No visual or hearing impairment	

Evidence Table F.2. Study characteristics of cohort studies utilizing instruments used to measure quality of life of people with ESRD treated by dialysis (continued)

Author, year	Study	Study period	Location	Study design	Inclusion Criteria	COMMENTS about Study Characteristics
Wuerth, 1997[184]		Not stated	In-center Single-center network	Prospective	On chronic PD	
Young, 2010[185]		2001 to 2007	Not stated	Prospective	Included diabetic patients with CKD 5	Investigator from the University of Washington and the Group Health Research institute.

AIDS=Acquired Immunodeficiency Syndrome; BMI=body mass index; CKD=chronic kidney disease; CAPD=continuous ambulatory peritoneal dialysis; CHEQ=CHOICE Health Experience Questionnaire; CHOICE=Choices for Healthy Outcomes in Caring for End-Stage Renal Disease Cohort Study; CPD=chronic peritoneal dialysis; DOPPS= The Dialysis Outcomes and Practice Patterns Study; DSI=Dialysis Symptom Index; eGFR=estimated glomerular filtration rate; eKt/V=equilibrated Kt/V (urea clearance); EPO=erythropoietin; ESRD=end stage renal disease; FHN=Frequent Hemodialysis Network trials; FREEDOM= Following Rehabilitation, Economics and Everyday-Dialysis Outcome Measurements Study; GFR=glomerular filtration rate; HD=hemodialysis; HEMO= The Hemodialysis Study; HIPAA=Health Insurance Portability and Accountability Act; HIV=Human Immunodeficiency Virus; HMO=Health Maintenance Organization; IDPN=intradialytic parenteral nutrition; KDQOL=Kidney Disease Quality of Life; KDQOL-36= Kidney Disease Quality of Life-36; Kt/V=urea clearance; KTIPS=Kidney Transplant Immunosuppressive Protocol Study; L=liters; m^2=meters squared; MCID=minimal clinically important difference; ml/min=milliliters per minute; mm Hg=millimeters of mercury; NKDKTS=National Kidney Dialysis and Kidney Transplantation Study; PD=peritoneal dialysis; QOL=quality of life; SF-MPQ= Short-Form McGill Pain Questionnaire; SPMSQ=Short Portable Mental Status Questionnaire; US=United States; USRDS= United States Renal Data System; WHO=World Health Organization

Evidence Table F3. Interventions and outcomes of randomized controlled trial studies utilizing instruments used to measure quality of life of people with ESRD treated by dialysis

Author, year; Study Subgroup	Interventions	Outcomes
Chertow, 2010[1], FHN	HD 3x week (conventional) HD 6x week	Metabolic/inflammatory control Phosphorus level, ESA use Hypertension/pressure control Clinic SBP, LV mass, Morbidity Hospitalization rate, Hospitalization rate Quality of life and symptom measures Mortality Overall mortality rate Harms Hypotension, Vascular access complications/thrombosis, Hospitalizations, Other Dialysis recovery time
Chertow, 2016[2], FHN Extended followup of study pop	HD 3x week (conventional) HD 6x week	Metabolic/inflammatory control Phosphorus level, ESA use Hypertension/pressure control Clinic SBP, LV mass, Morbidity Hospitalization rate, Hospitalization rate Quality of life and symptom measures Mortality Overall mortality rate Harms Hypotension, Vascular access complications/thrombosis, Hospitalizations, Other Dialysis recovery time

Author, year; Study Subgroup	Interventions	Outcomes
Garg, 2017[3], FHN	HD 3x week (conventional) HD 6x week	Metabolic/inflammatory control Phosphorus level, ESA use Hypertension/pressure control Clinic SBP, LV mass, Morbidity Hospitalization rate, Hospitalization rate Quality of life and symptom measures Mortality Overall mortality rate Harms Hypotension, Vascular access complications/thrombosis, Hospitalizations, Other Dialysis recovery time
Hall, 2012[4], FHN	HD 3x week (conventional) HD 6x week	Metabolic/inflammatory control Phosphorus level, ESA use Hypertension/pressure control Clinic SBP, LV mass, Morbidity Hospitalization rate, Hospitalization rate Quality of life and symptom measures Mortality Overall mortality rate Harms Hypotension, Vascular access complications/thrombosis, Hospitalizations, Other Dialysis recovery time
Lo, 2017[5], FHN	HD 3x week (conventional) HD 6x week	Metabolic/inflammatory control Phosphorus level, ESA use Hypertension/pressure control Clinic SBP, LV mass, Morbidity Hospitalization rate, Hospitalization rate Quality of life and symptom measures Mortality Overall mortality rate Harms Hypotension, Vascular access complications/thrombosis, Hospitalizations, Other Dialysis recovery time

Author, year; Study Subgroup	Interventions	Outcomes
Lo, 2017[6], FHN	HD 3x week (conventional) HD 6x week	Metabolic/inflammatory control Phosphorus level, ESA use Hypertension/pressure control Clinic SBP, LV mass, Morbidity Hospitalization rate, Hospitalization rate Quality of life and symptom measures Mortality Overall mortality rate Harms Hypotension, Vascular access complications/thrombosis, Hospitalizations, Other Dialysis recovery time
Rocco, 2011[8], FHN	Conventional Frequent nocturnal HD	Metabolic/inflammatory control Albumin level, serum phosphate, serum creatinine Hypertension control/pressure control LV mas, blood pressure Morbidity Hospitalization rate Quality of life and symptom measures Mortality Overall mortality, Other Target dry weight
Rocco, 2015[9], FHN	Conventional Frequent nocturnal HD	Metabolic/inflammatory control Albumin level, serum phosphate, serum creatinine Hypertension control/pressure control LV mas, blood pressure Morbidity Hospitalization rate Quality of life and symptom measures Mortality Overall mortality, Other Target dry weight

Author, year; Study Subgroup	Interventions	Outcomes
Rocco, 2011[10], FHN	Conventional Frequent nocturnal HD	Metabolic/inflammatory control Albumin level, serum phosphate, serum creatinine Hypertension control/pressure control LV mas, blood pressure Morbidity Hospitalization rate Quality of life and symptom measures Mortality Overall mortality, Other Target dry weight
Unruh, 2016[11], FHN Age; Depression; Race/ethnicity; Sex	Conventional Frequent nocturnal HD	Metabolic/inflammatory control Albumin level, serum phosphate, serum creatinine Hypertension control/pressure control LV mas, blood pressure Morbidity Hospitalization rate Quality of life and symptom measures Mortality Overall mortality, Other Target dry weight
Unruh, 2013[7], FHN	HD 3x week (conventional) HD 6x week Frequent nocturnal HD	Quality of life and symptom measures
Kaysen, 2011[12], FHN	HD 3x week (conventional) HD 6x week Frequent nocturnal HD	Quality of life and symptom measures
Unruh, 2003[17], HEMO	Self-administered KDQOL-LF Interviewer administered KDQOL-LF	Metabolic/inflammatory control Albumin level, creatinine, cholesterol Hypertension/pressure control post dialysis weight, BMI, knee height, upper arm circumference Morbidity Hospitalization rate, hospitalization duration not related to vascular access, cardiac hospitalization Quality of life and symptom measures Mortality Overall mortality rate, cardiovascular mortality rate, cause specific mortality, peripheral vascular mortality, all-cause mortality

Author, year; Study Subgroup	Interventions	Outcomes
Burrowes, 2005[13], HEMO	Appetite rating very good appetite rating good appetite rating fair appetite rating poor/very poor	Quality of life and symptom measures
Jhamb, 2011[14], HEMO	Quartile 1 Vitality Score Quartile 2 Vitality Score Quartile 3 Vitality Score Quartile 4 Vitality Score	Quality of life and symptom measures
Liang, 2011[15], HEMO	HD patients with CHF	Metabolic/inflammatory control Albumin level, creatinine, cholesterol Hypertension/pressure control post dialysis weight, BMI, knee height, upper arm circumference Morbidity Hospitalization rate, hospitalization duration not related to vascular access, cardiac hospitalization Quality of life and symptom measures Mortality Overall mortality rate, cardiovascular mortality rate, cause specific mortality, peripheral vascular mortality, all-cause mortality
Unruh, 2004[16], HEMO	standard Kt/V High Kt/V Low flux High flux	Quality of life and symptom measures
Dember, 2019[27], TIME Primary Analysis and Full Analysis population	3 times per week, usual care (<4.25 hours/ session) 3 times per week, >=4.25 hours per week	Hypertension/pressure control pre-dialysis BP Morbidity Hospitalization rate Quality of life Mortality death Other weight gain, fluid removal rate, missed sessions
Crews, 2019[18], SOCIABLE	SOCIABLE intervention—intervening on more than one socioecologic domain to increase resilience	Patient acceptance of intervention Quality of life (Physical and social functioning (through ADLs))
Aramwit, 2012[19]	Seracin treatment cream-base treatment	Quality of life Other Skin hydration, irritation, and pigmentation

Author, year; Study Subgroup	Interventions	Outcomes
Begum, 2004[20]	fish oil safflower oil	Quality of life and symptom measures Other Red blood cell fatty acids
Belayev, 2015[21]	Receiving HD 3x/week	Quality of life and symptom measures
Berman, 2016[22]	Usual care dialysis (determined by clinic) Dialysis altered to meet a blood pressure goal	Metabolic/inflammatory control Phosphorus level, Phosphorus binders, demonstration of feasibility of recruitment randomization and application of the protocol; difference in PTH level; difference in vitamin D level Hypertension/pressure control Number of BP meds, Difference in blood pressure Morbidity dry weight increase Symptom measures
Birdee, 2015[23]	Intra-dialysis yoga Education	Quality of life Harms BP, heart rate, respirations, temperature Other Feasibility of the intra-dialysis yoga program
Brass, 2001[24]	Study A- placebo Study A- 20mg/kg L-carnitine Study B- placebo Study B - 10 mg/kg, 20 mg/kg or 40 mg/kg L-carnitine	Metabolic/inflammatory control VO2 max Quality of life
Chan, 2019[26]	Exercise training	Exercise capacity Muscle mass Quality of life (function)
Cukor, 2014[63]	Wait list 3 months of cognitive behavioral therapy	Metabolic/inflammatory control weight gain Symptom measures
Deniston, 1990[28]	Michigan population (conventional care) EPO population	Symptom measures
Duggal, 2019[29]	Usual care blood flow rate reduced by 100 mL/min or to a minimum blood flow rate of 300 mL/min,	Morbidity Time to recovery from hemodialysis Quality of life

Author, year; Study Subgroup	Interventions	Outcomes
Laskin, 2017[112] children	conventional HD treatment of 3 days per week for 4 h (12 h per week 5 days per week shorter, more frequent HD for 2 h 25 min (12 h total per week; intervention)	Metabolic/inflammatory control Phosphorus level, Phosphorus binders, Hemoglobin level, ESA use, PTH Hypertension/pressure control LV mass, pre-systolic BP Quality of life Other dry weight changes, Interdialytic weight gains., Vitamin D, number of dialysis treatments
Mehrotra, 2019[30]	CBT Sertraline	Symptom measure
Natarajan, 2014[31]	Placebo Renadyl	Metabolic/inflammatory control urea, creatinine, CBC, liver function, indoxyl metabolites, p-cresyl sulfate, serum pentosidine, beta-2 microglobulin, NF-kappaB, sCD30 Quality of life
Pai, 2009[32]	Standard of Care Pharmaceutical care	Quality of life
Rodrigue, 2011[33]	standard care (prior to treatment) QOL therapy (prior to treatment) supportive therapy (prior to treatment)	Quality of life and symptom measures
Sloan, 1998[34]	placebo x 6 months 1000 mg L carnitine x 6 months 3 months placebo then 3 months L carnitine (or vice versa)	Metabolic/inflammatory control Normalized protein catabolic rate, Albumin level, Kt/V urea Quality of life
Sloand, 2004[35]	Placebo IV saline infusion 1000mg iron in 5ooml saline	Symptom measures
Song, 2015[36]	Usual Care SPIRIT intervention	Symptom measures
Steiber, 2006[37]	Placebo Carnitine	Quality of life Other Carnitine levels; EPO use
Tawney, 2000[38]	Dialysis patients	Quality of life
Unruh, 2008[170], HEMO	Entire populations received HD	Quality of life

ADL = activities of daily living; BMI=body mass index; BP=blood pressure; CHF=congestive heart failure; EPO=erythropoietin; ESA=erythropoietin-stimulating agent; h=hours; FHN=Frequent Hemodialysis Network trials; HD=hemodialysis; HEMO=The Hemodialysis Study; IV=intravenous; ml=milliliters; KDQOL-LF=Kidney Disease Quality of Life-

Long Form; Kt/V=urea clearance; L=liters; LV=left ventricular; min=minutes; mg/kg=milligrams per kilogram; NF-kappaB=nuclear factor Kappa B; PTH=parathyroid-stimulating hormone; SBP=systolic blood pressure; SOCIABLE = Seniors optimizing community integration to advance better living with ESRD; SPIRIT=Sharing Patient's Illness Representationsto Increase Trust; TiME= Time to Reduce Mortality in ESRD; VO2 max=maximum rate of Oxygen consumption

Evidence table F4. Interventions and outcomes of cohort studies utilizing instruments used to measure quality of life of people with ESRD treated by dialysis

Author, year	Study population/intervention details	Outcomes
Abdel-Kader, 2009[40]	CKD stage 4 or 5 ESRD on maintenance HD	Quality of life Symptom measure
Abdel-Kader, 2009[41]	HD patients PD patients CKD stages 4/5	Quality of life Symptom measure
Abreo, 2017[42]	Prevalent patients on HD	Symptom measure Other Bioimpedence spectroscopy; hydration status (fluid overload)
Agarwal, 2011[43]	Control (no CKD, no hemodialysis) CKD (no hemodialysis) Hemodialysis	Symptom measure Other: Sleep actigraphy; Activity classification; CVD; missed dialysis
Agganis, 2010[44]	HD patients	Symptom measure
Allen, 2002[45]	HEMO: Low dose, high dose; low flux; high flux HD	Quality of life
Anand, 2011[46]	Patients on dialysis	Quality of life Other Vitamin D levels
Atcherson, 1978[47]	HD patients	Quality of life
Barakzoy, 2006[48]	ESRD patients	Symptom measure
Barrett, 1990[49]	HD patients Continuous peritoneal dialysis	Quality of life Symptom measure
Bleyer, 2019[50]	People (and their families) with ADTKD	Quality of life
Bremer, 1989[51]	Center hemodialysis Home hemodialysis Continuous peritoneal dialysis first transplant	Quality of life Other income, education, sleep, activities, pain, sexual activity, tiredness, employment
Bremer, 1997[52]	Matched control, on dialysis awaiting treatment	Quality of life Symptom measure Other Physiologic adjustment; neurophysical functioning
Broers, 2015[53]	Dialysis patients	Morbidity: Hospitalization rate, Hospitalization Quality of life Mortality Overall mortality
Bullen, 2018[54]	Acupuncture/massage	Quality of life Symptom measure

Author, year	Study population/intervention details	Outcomes
Burrowes, 2012[25]	No intervention: exposure is nutritional status	Metabolic/inflammatory control Serum albumin, serum creatinine Quality of life and symptom measures
Cardone, 2011[55]	Nocturnal hemodialysis	Morbidity Pill burden Quality of life
Chiu, 2009[56]	Maintenance dialysis patients	Metabolic/inflammatory control Phosphorus level adherence to phosphorus binders Quality of life
Christensen, 1989[57]	Successful transplant Unsuccessful transplant Chronic HD	Quality of life
Christensen, 1991[58]	All groups on maintenance HD to transplant or no transplant	Quality of life
Cohen, 2019[59]	Dialysis patients	Quality of life
Cukor, 2007[60]	No psychopathology Depression Anxiety Other pathology	Symptom measure
Cukor, 2008[61]	Non-depressed Intermittently depressed Persistently depressed	Metabolic/inflammatory control Albumin level, URR, calcium phosphate product Quality of life Symptom measure
Cukor, 2008[62]	HD patients	Quality of life Symptom measure
Curtin, 2002[64]	HD patients	Symptom measure
Debnath, 2018[65]	Depressed Not depressed	Quality of life Symptom measure
Delano, 1989[66]	Anemic HD patients, received EPO	Metabolic/inflammatory control hematocrit, VO2max Quality of life
Deniston, 1989[67]	ESRD patients	Quality of life
Domenic Sridharan, 2018[68]	Compared satisfaction with vascular access site in dialysis patients	Quality of life
Drayer, 2006[69]	HD patients	Symptom measure Mortality Overall mortality rate
Duque, 2006[70]	Compared dialysis patients with and without pruritus	Quality of life Symptom measure
Dwyer, 2002[71]		Quality of life
Evans, 1990[73]	Conventional care - NKDKTS population Population receiving recombinant EPO	Quality of life Symptom measure

Author, year	Study population/intervention details	Outcomes
Evans, 1991[74]	Compared treatment modality in dialysis patients	Quality of life
Feroze, 2011[75]	Compared by SF-36 Mental Health dimension	Quality of life Mortality Overall mortality
Feroze, 2012[76]	Maintenance dialysis patients	Symptom measure
Finkelstein, 2009[77]	Compared by level of hemoglobin	Quality of life
Finkelstein, 2012[78]	FREEDOM: Shorter duration hemodialysis	Quality of life
Fowler, 2006[80]	Dialysis patients	Quality of life
Fukuhara, 2003[81]	DOPPS participants	Quality of life
Gabbay,2010[82]	HD patients	Quality of life
Gerson, 2004[83]	Compared by hematocrit level	Quality of life
Goldstein, 2006[84]	ESRD sample Healthy sample	Quality of life
Goldstein, 2008[85]	Children with ESRD	Quality of life
Goldstein, 2009[86]	HD patients PD patients Transplant patients	Quality of life
Gorodetskaya, 2005[87]	GFR >=60 GFR 30-60 GFR 15-30 GFR <15 GFR<15 + dialysis	Quality of life
Harris, 2012[88]	HD patients	Morbidity Transplantation Symptom measure Mortality Overall mortality
Hedayati, 2006[89]	Entire cohort on dialysis	Symptom measure
Hernandez, 2018[90]	HD patients	Symptom measure
Hicks, 2004[91]	ESRD patients	Quality of life Other patient preference for transplantation
Hornberger, 1992[92]	HD patients	Quality of life
Hynes, 2019[93]	HD patients	Quality of life
Jaber, 2010[79]		Symptom measure
Jhamb, 2009[94]	Incident HD and PD patients	Quality of life Mortality Overall mortality rate
Johansen, 2007[95]	Patients on dialysis	Quality of life

Author, year	Study population/intervention details	Outcomes
Johnson, 1982[96]	HD not waiting for transplant HD waiting for transplant Status post-transplant HD failed transplant	Quality of life
Julius, 1989[97]	In-center hemodialysis patients PD patients Cadaveric transplant Transplant from relative	Quality of life
Kimmel, 1995[98]	Patients on HD for at least 6 months	Quality of life Symptom measure
Kimmel, 1998[99]	All ESRD patients on HD	Quality of life Symptom measure
Kimmel, 2003[100]	Compared 3 HD units	Quality of life
Ko, 2007[101]	ESRD patients	Quality of life
Kring, 2009[102]	ESRD patients	Quality of life Symptom measure
Kurella, 2004[103]	CKD patients ESRD patients	Symptom measure
Kurella, 2005[104]	CKD patients ESRD patients	Symptom measure
Kutner, 1998[105]	Elderly Black and White patients	Morbidity Time to recovery from hemodialysis, Number of days in bed during the past 3 months (0 vs 1+), number of nights hospitalized during the past 6 months (0 vs 1+)Quality of life Symptom measure
Kutner, 2000[106]	HD patients PD patients	Quality of life
Kutner, 2005[107]	HD patients PD patients Stratified by race	Morbidity cardiovascular Quality of life
Kutner, 2007[108]	Incident dialysis patients, compared individuals with and without sleep difficulty	Quality of life Symptom measure
Kutner, 2010[109]	Comprehensive Dialysis Study population USRDS incident dialysis patients	Symptom measure
Lacson, 2009[110]	Patients on dialysis	Quality of life
Lacson, 2014[111]	Incident HD patients	Morbidity Hospitalization rate, Hospitalization rate Symptom measure
Levy, 2019[186]	Patients with secondary hyperparathyroism on maintenance HD	Symptom measures

Author, year	Study population/intervention details	Outcomes
Li, 2016[113]	Normal controls Maintenance HD	Quality of life
Liebman, 2016[114]	Patients on dialysis	Quality of life Mortality Overall mortality rate
Liu, 2012[72]		Quality of Life
Mapes, 2004[115]	DOPPS population	Quality of life
Maung, 2017[116]	Patients on HD thrice weekly for at least 6 months	Symptom measure
McAdams-DeMarco, 2016[117]	Patients on dialysis waiting for transplant	Quality of life
McClellan, 1991[118]	Incident dialysis patients	Quality of life
McDade-Montez, 2006[119]	ESRD hemodialysis patients	Symptom measure
Mehdi, 2009[120]	Patients on HD for greater than 3 months	Quality of life
Mittal, 2001[121]	Patients on HD	Quality of life
Mittal, 2001[122]	PD patients HD patients	Quality of life
Neri, 2009[123]	Employed HD patients	Quality of life
Neul, 2013[124]	Thrice weekly dialysis in-center Home nightly PD Home HD	Quality of life
Neul, 2015[125]	Children on chronic dialysis	Quality of life
Novak, 2008[126]	Incident PD patients	Symptom measure
Painter, 2012[127]	Control Conventional HD (thrice weekly) Conventional to Daily HD Conventional to Transplant	Quality of life
Painter, 2017[128]	Peritoneal dialysis Maintenance HD	Quality of life
Parker, 2003[129]	HD patients	Quality of life Symptom measure
Parkerson, 2000[130]	Patients on dialysis	Quality of life Mortality 1 year survival prediction
Patel, 2002[131]	Patients on dialysis	Symptom measure
Pifer, 2003[132]	Managed care patients at Kaiser; Health Options, Inc; Xantus Health Care Corporation	Quality of life
Pisoni, 2006[133]	DOPPS population	Symptom measure Mortality Overall mortality rate

Author, year	Study population/intervention details	Outcomes
Plantinga, 2007[134]	HD patients, compared by hemoglobin level	Metabolic/inflammatory control Hemoglobin level Quality of life
Pruchno, 2009[135]	ESRD patients	Symptom measure
Ramakrishnan, 2013[136]	Patients on PD or HD	Morbidity Itchiness Quality of life
Rao, 2000[137]	ESRD patients	Quality of life
Raspovic, 2017[138]	Patients: diabetic foot disease without ESRD Patients: diabetic foot disease and ESRD	Quality of life Symptom measure
Rocco, 2011[10]	Conventional nocturnal dialysis Frequent nocturnal dialysis	Quality of life
Rosas, 2001[139]	Patients on HD	Symptom measure
Roumelioti, 2011[140]	CKD 4-5 Hemodialysis	Symptom measure
Saad, 2015[141]	Patients on Hemodialysis	Quality of life
Saban, 2008[142]	Veterans Affairs patients on HD	Quality of life
Saban, 2010[143]	VETERANS study participants (male only) DOPPS study participants (male only, US cohort)	Quality of life
Schneider, 2003[144]	Caregivers of ESRD patients	Symptom measure
Schneider, 2004[145]	Caregivers of ESRD patients	Symptom measure
Seethala, 2010[146]	Women on maintenance HD	Symptom measure
Shafi, 2010[147]	CHOICE study population	Quality of life
Simmons, 1984[148]	HD patients PD patients Transplant patients	Quality of life
Simmons, 1990[149]	In-center hemodialysis Continuous ambulatory peritoneal dialysis Current transplant Past transplant	Quality of life
Siskind, 1993[150]	ESRD patients	Quality of life
Song, 2009[151]	Patients on dialysis	Quality of life Symptom measure
Song, 2011[152]	In-center PD and HD patients	Quality of life Other Activities and experiences of the previous day
Song, 2018[153]	Patients on dialysis	Quality of life Symptom measure
Sorensen, 2012[154]	Patients on maintenance HD	Symptom subscale Other Neurocognitive deficits

Author, year	Study population/intervention details	Outcomes
Spinowitz, 1990[155]	Patients on maintenance HD	Quality of life
Steele, 1996[156]	Patients on PD	Quality of life Symptom measure
Steele, 1996[157]	Patients on PD	Quality of life Symptom measure
Suri, 2011[158]	FHN trial participants regarding caregivers	Quality of life
Tell, 1995[159]	White patients on HD Black patients on HD	Quality of life
Thomas, 2011[160]	FREEDOM interventions in African-Americans on HD for at least 1 month	Quality of life Other: Religostiy, Social Support
Thomas, 2012[161]	African American patients on HD	Quality of life
Thomas-Hawkins, 2000[162]	On dialysis for at least 6 months	Quality of life
Ting, 2003[163]	Short daily HD	Metabolic/inflammatory control Phosphorus binders, Albumin level, ESA use, calcium, alkaline phosphatase, serum bicarbonate, or PTH Hypertension/pressure control Clinic SBP (and report how it was measured), Clinic DBP (and report how it was measured), number of hypertensive meds Morbidity Hospitalization rate, Hospitalization rate, admissions Quality of life Mortality Survival Harms Vascular access complications/thrombosis Other mean dry weights
Troidle, 2003[164]	PD patients Daily HD patients	Quality of life Symptom measure
Troidle, 2007[165]	Nocturnal HD patients	Quality of life Symptom measure
Unruh, 2004[166]	African Americans and non-African Americans on HD	Quality of life
Unruh, 2004[167]	Incident HD patients in CHOICE study	Quality of life Symptom measure
Unruh, 2006[168]	CHOICE study population	Quality of life Symptom measure

Author, year	Study population/intervention details	Outcomes
Unruh, 2008[169]	Matched control (no HD) Hemodialysis	Morbidity CVD, lung disease, diabetes Symptom measure
Unruh, 2008[170]		Quality of life Symptom measure
Unruh, 2011[171]	FHN study population	Symptom measure
Vu, 1999[172]	ESRD patients with lupus ESRD patients without lupus	Quality of life Symptom measure
Walters, 2002[173]	Gambro Healthcare dialysis patients	Quality of life Symptom measure
Ware, 2019[174]	CKD 3-5 Dialysis Transplant	Quality of life
Wasse, 2007[175]	ESRD patients on dialysis, compared by vascular access	Quality of life
Weisbord, 2003[176]	Patients on HD for at least 3 months	Quality of life Symptom measure
Weisbord, 2004[177]	ESRD patients and renal care providers	Symptom measure
Weisbord, 2005[178]	Patients receiving thrice weekly HD	Quality of life Symptom measure
Weisbord, 2007[179]	African Americans patients on dialysis Whites patients on dialysis	Symptom measure
Welch, 1999[180]	Patients on HD	Quality of life
Williams, 2004[181]	Three-times weekly HD Six-times weekly HD	Quality of life
Wolcott, 1988[182]	Patients on dialysis	Metabolic/inflammatory control most recent chemical values Morbidity recent kidney disease diagnosis Quality of life Symptom measure
Wolcott, 1989[183]	University of California Los Angeles dialysis patients	Quality of life Symptom measure
Wuerth, 1997[184]	Chronic PD patients	Quality of life
Young, 2010[185]	Patients with stage 5 diabetic chronic kidney disease	Symptom measure Mortality Overall mortality rate

ADTKD = Autosomal dominant tubulointerstitial kidney disease; CHOICE=Choices for Healthy Outcomes in Caring for End-Stage Renal Disease Cohort Study; CKD=chronic kidney disease; CVD=cardiovascular disease; DBP=diastolic blood pressure; DOPPS=The Dialysis Outcomes and Practice Patterns Study; EPO=erythropoietin; ESA=erythropoietin-stimulating agent; ESRD=end stage renal disease; FHN=Frequent Hemodialysis Network trials; FREEDOM=Following Rehabilitation, Economics and Everyday-Dialysis Outcome Measurements Study; GFR=glomerular filtration rate; HD=hemodialysis; KQ4=key question 4; NKDKTS=National Kidney Dialysis and Kidney

Transplantation Study; PD=peritoneal dialysis; PTH=parathyroid-stimulating ; SBP=systolic blood pressure; SF-36: Short Form-36; VETERAN=Veteran End-Stage Renal Disease Study; VO2max=Maximum rate of Oxygen consumption

Evidence table F5. Population characteristics of studies utilizing instruments used to measure quality of life of people with ESRD treated by dialysis

Study design, Study Name, n	Study size, n	Followup period	Sex, % female range	Age	Race/ethnicity, range of mean %	Education
RCT, FHN, 12*	Daily, 245 Nocturnal, 87	1 to 3.7 years (range of means)	38 to 62	49.1 to 65 (range of means)	WNH: 34 to 60 BNH: 26 to 50 LH: 69 API: 13 to 22 AI/AN: 0 to 3 Other: 0 to 40	Less than High School: 12 to 21 Completed HS: 21 to 27 College degree: 17 to 38 Post grad: 4 to 6 Completed HS or less: 33 to 45 Greater than HS: 55 (1 study)
RCT, HEMO, 6*	1798-3632	2.84+/-1.84 years (mean)	55 to 56.2	56.4 to 63.3 (range of means)	WNH: 34 to 36 BNH: 43.7 to 65 LH: 13.1 to 14.5 API: NR AI/AN: NR Other, non-black: 35.6	Less than High School: 37.2 to 38.7 At least HS: 61 to 63.5
RCT,TIME, 1*	4470	1.1 years (median)	58.8	66.6 (mean)	WNH: 55.7 to 56.4 BNH: 23.7 to 24.7 LH: NR API: 4.5 to 4.8 AI/AN: NR Other: 1.5 to 1.6	NR
RCT,SOCIABLE, 1	12	5 months	41.6	68.6 to 69.5 (range of means)	BNH: 100	NR
All other RCTs, 19	Range: 6-1846	2 weeks to 20 months	38 to 70.9	42.7 to 74.4	WNH: 15 to 55 BNH: 7 to 100 LH: 6 to 51 API: to 33 AI/AN: 5 to 15 Other: 0 to 30	Less than High School: 14 to 27 Completed HS: 13 to 33 Years of education: 10.2 to 12.4 Greater than HS: 54 to 100 Some college: 70 to 20 College degree: 17 to 38 Post grad: 4 to 6 Completed HS or Less: 33 to 45
Cohort, 142 studies in 145 articles FREEDOM, 3 HEMO, 2	9 to 71012	49 studies: 1 month to 3 years	136 studies: 20 to 83.3	Child: 12.1 (mean, 1 study) Adult; 47.2 to 74.4 (mean, 136 studies)	2 studies 100 WNH 9 studies 100 BNH	Less than High School: 10 to 72.5 Completed HS: 15 to 66 College degree: 3.8 to 40.9 Post grad: 4 to 6 Completed HS or Less: 33 to 45 Greater than HS: 55

%=percentage; AI/AN=American Indian/Native American; API=Asian/Pacific Islander; BNH=Black non-Hispanic; FHN=Frequent Hemodialysis Network trials; FREEDOM=Following Rehabilitation, Economics and Everyday-Dialysis Outcome Measurements Study; HEMO=The Hemodialysis Study; HS=high school; KQ4=key question

4; LH=Latino/Hispanic; n=number of patients; NR=not reported; post grad=postgraduate degree; RCT=randomized controlled trial; TiME=Time to Reduce Mortality in ESRD; WNH=White non-Hispanic

* summary of the overall study

Evidence Table F6.1. List of instruments used to measure quality of life of people with ESRD treated by dialysis (ESRD specific)

Tool	Tool subscale	Author. Year	Domain
KDQOL		Birdee, 2015[23] Bremer, 1989[51] Chan, 2019[26] Hernandez, 2018[90] Ko, 2007[101] Li, 2016[113] Liu, 2012[72] Mapes, 2004[115] McAdams-DeMarco, 2016[117] Painter, 2012[127] Ramakrishnan, 2013[136] Rao, 2000[137] Saban, 2010[143] Shafi, 2010[147] Tawney, 2000[38] Ting, 2003[163] Unruh, 2003[17] Unruh, 2004[166] Unruh, 2004[16]	Overall quality of life
KDQOL	Adapted by authors	Hicks, 2004[91]	Overall health Emotional health Energy level Physical activity Social activity Effect of ESRD on daily life
KDQOL	Burden/effects	Ware, 2019[174]	Burden/effects
KDQOL	Cardiopulmonary symptoms	Rao, 2000[137]	Cardiopulmonary symptoms
KDQOL	Cognitive function	Kurella, 2004[103] Kutner, 2007[108] Sorensen, 2012[154] Rao, 2000[137]	Cognitive function
KDQOL	Cramps	Rao, 2000[137]	Cramps
KDQOL	Dialysis related symptoms	Rao, 2000[137]	Dialysis related symptoms
KDQOL	dialysis staff encouragement	Kutner, 2000[106]	dialysis staff encouragement
KDQOL	Effects of kidney disease	Kutner, 2000[106]	Effects of kidney disease
KDQOL	Energy	Rao, 2000[137]	Energy
KDQOL	Kidney disease component subscale	Saban, 2008[142]	Kidney disease component subscale

Tool	Tool subscale	Author. Year	Domain
KDQOL	Mental composite summary	Dember, 2019[27] Jhamb, 2011[14] Johansen, 2007[95] Saad, 2015[141] Unruh, 2008[170]	Mental composite summary
KDQOL	Mood questions	Kutner, 2007[108]	Mood questions
KDQOL	Physical composite summary	Dember, 2019[27] Jhamb, 2011[14] Johansen, 2007[95] Saad, 2015[141] Unruh, 2008[170]	Physical composite summary
KDQOL	Psychological dependency	Rao, 2000[137]	Psychological dependency
KDQOL	sleep	Agarwal, 2011[43] Burrowes, 2012[25] Jhamb, 2011[14] Kurella, 2005[104] Rao, 2000[137]	sleep
KDQOL	Social functioning	Rao, 2000[137]	Social functioning
KDQOL	Symptoms-problems	Ware, 2019[174]	symptoms-problems
KDQOL-36		Aramwit, 2012[19] Chertow, 2010[1] Cohen, 2019[59] Cukor, 2007[60] Cukor, 2008[61] Cukor, 2008[62] Cukor, 2014[63] Debnath, 2018[65] Domenic Sridharan, 2018[68] Drayer, 2006[69] Finkelstein, 2009[77] Fukuhara, 2003[81] Ko, 2007[101] Kutner, 2005[107] Neri, 2009[123] Neul, 2015[125] Parkerson, 2000[130] Steiber, 2006[37] Thomas-Hawkins, 2000[162] Unruh, 2004[167] Unruh, 2004[16] Walters, 2002[173] Wasse, 2007[175]	Overall quality of life

Tool	Tool subscale	Author. Year	Domain
KDQOL-36	acute form of SF-12	Gorodetskaya, 2005[87]	acute form of SF-12
KDQOL-36	burden/effects	Dember, 2019[27] Hynes, 2019[93]	burden/effects
KDQOL-36	Effect of kidney disease scale	Dember, 2019[27]	Effect of kidney disease scale
KDQOL-36	Mental composite Summary	Anand, 2011[46] Broers, 2015[53] Burrowes, 2005[13] Hynes, 2019[93] Lacson, 2009[110] Liang, 2011[15] Mittal, 2001[122]	Mental composite Summary
KDQOL-36	Pain	Kutner, 2007[108] Rao, 2000[137]	Pain
KDQOL-36	Physical composite summary	Anand, 2011[46] Broers, 2015[53] Burrowes, 2005[13] Hynes, 2019[93] Lacson, 2009[110] Liang, 2011[15] Mittal, 2001[122]	Physical composite summary
KDQOL-36	symptoms-problems	Dember, 2019[27] Hynes, 2019[93]	symptoms-problems
PedsQL	3.0 End-Stage Renal Disease (ESRD) Module	Goldstein, 2008[85] Laskin, 2017[112] Neul, 2013[124] Goldstein, 2009[86] Neul, 2015[125]	General Fatigue About My Kidney Disease Treatment Problems Family and Peer Interaction Worry Perceived Physical Appearance Communication
PedsQL	4.0 Generic Scale	Goldstein, 2006[84] Goldstein, 2008[85] Laskin, 2017[112] Neul, 2013[124] Neul, 2015[125]	Physical quality of life Emotional quality of life Social quality of life School functioning Summary scores: Psychosocial health and total scores
DSI		Abdel-Kader, 2009[40] Abdel-Kader, 2009[41] Berman, 2016[22] Kring, 2009[102] Song, 2009[151] Weisbord, 2004[177] Weisbord, 2005[178] Weisbord, 2007[179]	Symptoms related to dialysis

Tool	Tool subscale	Author. Year	Domain
CHEQ	Sleep quality domain	Jhamb, 2009[94] Unruh, 2006[168]	Sleep
CHEQ		Plantinga, 2007[134]	Cognitive function Sexual function Sleep Work Recreation Travel Finances General quality of life Diet Freedom Time Body image Dialysis access Symptoms
CHEQ	Sleep domain Vitality domain Bodily pain domain	Unruh, 2004[167]	Sleep Vitality Bodily pain
General Dialysis Treatment Stress Scale		Wolcott, 1989[183]	Illness/treatment stress
Home Dialysis Interview Schedule		Atcherson, 1978[47]	General quality of life in home hemodialysis
Kidney Disease Questionnaire (KDQ)		Brass, 2001[24]	Physical symptoms Fatigue Depression Relationships with others Frustration
Renal Quality of Life Profile (RQLP)		Pai, 2009[32]	Eating/Drinking Physical Activities Leisure Time Psychosocial Activities Impact of Treatment
unnamed validated questionnaire specifically designed for use in ESRD		Barrett, 1990[49]	Physical well-being Psychological Social well-being

Evidence Table F6.2. List of instruments used to measure quality of life of people with ESRD treated by dialysis—ESRD validated but not ESRD specific.

Tool	Tool subscale	Author. Year	Domain
SF-36		Abdel-Kader, 2009[41] Cardone, 2011[55] Curtin, 2002[64] Feroze, 2011[75] Kutner, 2000[106] Painter, 2012[127] Rao, 2000[137] Sloan, 1998[34] Song, 2011[152] Thomas, 2012[161] Troidle, 2003[164] Vu, 1999[172]	Overall quality of life
SF-36	Author modified (no details on modification)	Natarajan, 2014[31]	General quality of life
SF-36	Bodily pain	Jhamb, 2009[94] Unruh, 2011[171]	Pain
SF-36	Depression score	Lacson, 2014[111]	Depression
SF-36	Energy/fatigue	Painter, 2017[128]	Energy/fatigue
SF-36	Mental composite and Physical composite summaries	Allen, 2002[45] Gabbay,2010[82] Mittal, 2001[121] Pifer, 2003[132] Plantinga, 2007[134] Raspovic, 2017[138] Rodrigue, 2011[33] Suri, 2011[158] Troidle, 2007[165] Unruh, 2006[168] Unruh, 2011[171]	Mental and physical composite scores
SF-36	Mental composite summary	Dwyer, 2002[71] Thomas, 2011[160] Abdel-Kader, 2009[40] Chan, 2019[26] Chiu, 2009[56] Drayer, 2006[69] Dwyer, 2002[71] Finkelstein, 2012[78] Liebman, 2016[114] Mittal, 2001[121] Allen, 2002[45]	Mental composite summary

Tool	Tool subscale	Author. Year	Domain
SF-36	Mental health	Jhamb, 2009[94]	Mental health
SF-36	Mental health functions	Bremer, 1997[52]	Mental health functions
SF-36	Mental health composite	Rocco, 2011[8]	Mental health composite
SF-36	Physical composite summary	Abdel-Kader, 2009[40] Chiu, 2009[56] Drayer, 2006[69] Dwyer, 2002[71] Dwyer, 2002[71] Finkelstein, 2012[78] Kaysen, 2011[12] Liebman, 2016[114] Mittal, 2001[121] Rocco, 2011[8] Rocco, 2015[9] Thomas, 2011[160] Rocco, 2011[8]	Physical composite summary
SF-36	Physical health composite	Rocco, 2011[8]	Physical health composite
SF-36	Physical composite summary	Abdel-Kader, 2009[40]	Physical composite summary
SF-36	Physical functioning	Bremer, 1997[52] Jhamb, 2009[94] Kaysen, 2011[12] Painter, 2017[128]	Physical functioning
SF-36	Physical health problems	Rocco, 2011[8]	Physical health problems
SF-36	vitality	Jhamb, 2009[94] Jhamb, 2011[14] Unruh, 2011[171]	vitality
SF-36 (as part of the KDQOL-LF)		Liu, 2012[72]	Physical functioning Bodily pain Mental health General health Vitality Role emotional Role physical Social functioning

Tool	Tool subscale	Author. Year	Domain
BDI		Chertow, 2010[1] Christensen, 1989[57] Cukor, 2007[60] Cukor, 2008[61] Cukor, 2014[63] Debnath, 2018[65] Feroze, 2012[76] Garg, 2017[3] Harris, 2012[88] Hedayati, 2006[89] Jaber, 2010[79] Kimmel, 1998[99] Kimmel, 1998[99] Li, 2016[113] Lo, 2017[5] Lo, 2017[6] Maung, 2017[116] Patel, 2002[131] Rocco, 2011[10] Rocco, 2011[8] Steele, 1996[157] Steele, 1996[156] Suri, 2011[158] Troidle, 2003[164] Troidle, 2007[165] Unruh, 2011[171] Unruh, 2013[7] Weisbord, 2007[179] Weisbord, 2007[179] McDade-Montez, 2006[119] Unruh, 2013[7] Weisbord, 2005[178]	Depression
RAND-36		Chertow, 2010[1] Chertow, 2016[2] Garg, 2017[3] Lacson, 2009[110] Lo, 2017[5] Lo, 2017[6] Rocco, 2011[10] Suri, 2011[158] Unruh, 2013[7]	Overall quality of life
RAND-36	Physical functioning	Hall, 2012[4]	Physical functioning
RAND-36	Physical health composite	Hall, 2012[4]	Physical health composite

Tool	Tool subscale	Author. Year	Domain
SF-12	Mental composite and Physical composite summaries	Belayev, 2015[21] Ware, 2019[174]	Mental and Physical composite summaries
SF-12		Pisoni, 2006[133] Song, 2009[151]	Overall quality of life
Hospital Anxiety and Depression Scale (HADS)		Cukor, 2008[62] Li, 2016[113] Song, 2015[36]	Anxiety and depression
PHQ-9		Belayev, 2015[21] Seethala, 2010[146] Young, 2010[185]	Depression
BDI-II		Mehrotra, 2019[30]	Depression

Evidence Table F6.3. List of instruments used to measure quality of life of people with ESRD treated by dialysis—Not ESRD validated or specific.

Tool	Tool subscale	Author. Year	Domain
3-item tool on restless leg syndrome		Sloand, 2004[35]	Restless leg syndrome
Appetite and Diet Assessment Tool (ADAT)		Dwyer, 2002[71]	Appetite and diet
Activities of Daly Living (ADL)		Julius, 1989[97] Song, 2018[153]	Activities of daily living: Mobility Self-care Instrumental
Affect Balance Scale		Deniston, 1989[67]	Psychosocial: Positive affect Negative affect
Alberta Quality of Life	Combined 7 scales: Campbell Life Satisfaction Scale, Bradburn Affect Scale, Mental Health Scale, Perceived Health Scale, Karnofsky Scale, a physical symptoms scale, and an activity scale	Williams, 2004[181]	Psychological well-being Physical well-being
Appetite and Diet Assessment Tool		Burrowes, 2005[13]	Appetite
BAI		Feroze, 2012[76] Li, 2016[113]	Anxiety
Beeson Cognitive Test		Chan, 2019 [26]	Cognition
Bradburn Affect Balance Scale		Kutner, 1998[105]	Positive Mood Negative Mood
Brief nocturnal and daytime sleep questionnaires		Parker, 2003[129]	Sleep
Campbell Index of Wellbeing		Hornberger, 1992[92] Simmons, 1984[148]	Overall well-being
Beck's Depression Inventory	Cognitive Depression Index (CDI; 15 of 21 BDI items)	Kimmel, 1998[99] Patel, 2002[131] Unruh, 2013[7] Weisbord, 2007[179]	Depression

Tool	Tool subscale	Author. Year	Domain
Center for Epidemiologic Studies Depression scale (CES-D)		Agganis, 2010[44] Hedayati, 2006[89] Hernandez, 2018[90] Kutner, 1998[105] Pruchno, 2009[135] Schneider, 2004[145] Vu, 1999[172]	Depression
Child Health Questionnaire Parent Form (CHQPF50)		Gerson, 2004[83]	Physical functioning Limitations in school work and activities with friends General health Bodily pain and discomfort Limitations in family activities Emotional/time impact on the parent Impact of emotional or behavior problems on school work and other daily activities Self-esteem Mental health Behavior Family cohesion Change in health
CKD-QOL		Ware, 2019[174]	Role and social functioning Fatigue Psychologic distress Cognitive functioning) Overall quality of life
Cousineau Scale of Perceived Burden		Suri, 2011[158]	Self-perceived burden of HD patients on unpaid caregivers
Current health and activities questionnaire		Wolcott, 1989[183]	Overall health Current activity of daily living abilities Pain Health-related activity of daily living restrictions Health-related vocational function restrictions Health-related household task restriction Current vocational function ability
Custom QOL Survey		Bleyer, 2019 [50]	Quality of life

Tool	Tool subscale	Author. Year	Domain
Duke Severity of Illness Checklist		Parkerson, 2000[130]	Physical health Mental health Social health Perceived health Disability General health Self-esteem Anxiety Depression Anxiety-depression Pain
Duke Social Support and Stress Scale		Parkerson, 2000[130]	Family support Family stress Non-family support Non-family stress Social support Social stress
Duo subjective questionnaire for assessment of uremic pruritus (adapted)		Begum, 2004[20]	Symptoms and severity of uremic pruritus
Community Healthy Activities Model Program for Seniors (CHAMPS)		Painter, 2017[128]	
Edmonton Symptom Assessment System (ESAS)		Song, 2018[153]	Overall symptoms
Effort-Reward Imbalance Questionnaire (ERI)		Neri, 2009[123]	Occupational stress
Epworth Sleepiness Scale (ESS)		Maung, 2017[116] Parker, 2003[129] Roumelioti, 2011[140]	Sleep
Fatigue assessment scale		Troidle, 2007[165]	Fatigue
Fatigue Severity Scale (FSS)		Schneider, 2003[144] Schneider, 2004[145]	Fatigue
Female Sexual Function Index (FSFI)		Seethala, 2010[146]	Sexual function
Foot and Ankle Ability Measure (FAAM)		Raspovic, 2017[138]	Activities of daily living and sports-related activities in relation to lower-extremity function

Tool	Tool subscale	Author. Year	Domain
Functional Assessment of Chronic Illness Therapy—Spirituality Scale (FACIT-Sp)		Weisbord, 2003[176]	Physical well-being Social/family well-being Emotional well-being Functional well-being Spiritual well-being
Functional Assessment of Chronic Illness-fatigue		Birdee, 2015[23]	Fatigue
Generalized Anxiety Disorder 7-item Scale (GAD-7)		Bullen, 2018[54] Mehrotra, 2019[30]	Anxiety
Global Illness Stress		Wolcott, 1988[182]	Illness-related stress on self, souse, children, other family members, and closest friend
Global Quality of Life Scale		Mehrotra, 2019[30]	Overall quality of life
Hamilton Depression Rating Scale (HAM-D)		Cukor, 2014[63]	Depression
Health Utilities Index (HUI-3)		Garg, 2017[3] Gorodetskaya, 2005[87] Lo, 2017[5] Lo, 2017[6]	Vision Hearing Speech Ambulation Dexterity Emotion Cognition Pain
Hopkins symptom checklist (HSCL)		Rodrigue, 2011[33]	Anxiety Depression
Human Activity Profile (HAP)		Anand, 2011[46]	Physical activity
Illness Effects Questionnaire (IEQ)		Harris, 2012[88] Kimmel, 1995[98] Kimmel, 1998[99] Patel, 2002[131] Weisbord, 2005[178]	Burden of illness
Index of Activities of Daily Living		Crews, 2019 [18]	Activities of daily living

Tool	Tool subscale	Author. Year	Domain
Inventory of Functional Status-Dialysis (IFS-Dialysis)		Thomas-Hawkins, 2000[162]	Functional status: Personal care activities Household activities Social and community activities
Index of General Affect (IGA)		Bremer, 1989[51] Deniston, 1989[67] Deniston, 1990[28] Spinowitz, 1990[155]	Cognitive evaluation of life circumstances
International Index of Erectile Function, short form (IIEF-5)		Rosas, 2001[139]	Erectile dysfunction
Insomnia Severity Index		Abreo, 2017[42]	Sleep
Instrumental Activities and Daily Living Scales		Song, 2018[153]	Physical function
Interpersonal Support Evaluation List		Tell, 1995[159]	Social support
Investigator generated 47 question list of symptoms		Curtin, 2002[64]	Common hemodialysis symptoms
Index of Psychological Affect (IPA)		Siskind, 1993[150]	Overall quality of life, psychological affect
Index of Well Being (IWB)		Bremer, 1989[51] Christensen, 1989[57] Deniston, 1989[67] Evans, 1990[73] Evans, 1991[74] Fowler, 2006[80] Johnson, 1982[96] Simmons, 1990[149] Siskind, 1993[150] Unruh, 2004[166] Unruh, 2004[16] Unruh, 2008[170]	Psychological affect Life satisfaction
The Kupfer-Detre System-2 questionnaire (KDS2)		Steele, 1996[157]	Somatic symptoms
Life Events Stress Scale		Cukor, 2008[61]	Stressful life events

Tool	Tool subscale	Author. Year	Domain
London Evaluation of Illness survey (LEVIL)		Duggal, 2019[29]	General well-being Pain Feeling washed out or drained Sleep quality Shortness of breath Appetite
Lubben Social Network Scale		Tell, 1995[159] Crews, 2019[18]	Social contacts Living arrangements
McGill Pain Questionnaire, short form		Belayev, 2015[21]	Pain
McGill Quality of Life Questionnaire		Kimmel, 2003[100]	Physical quality of life Psychological quality of life Existential quality of life Support
McGill Short form		Duque, 2006[70]	Pain
Multidimensional Fatigue Inventory (MFI-20)		Schneider, 2003[144]	General fatigue Reduction in activity Physical fatigue Mental fatigue Reduction in motivation
Modality Specific Stress		Wolcott, 1988[182]	Stress
Modality specific treatment stress scale		Wolcott, 1989[183]	Stress
Medical Outcomes Study, Sleep Problems Index (MOS-SPI)		Unruh, 2011[171]	Sleep
Memorial Symptom Assessment Scale Short Form (MSAS-SF)		Weisbord, 2003[176]	Stresses associated with continuous ambulatory peritoneal dialysis and hemodialysis
Multidimensional Health Assessment Questionnaire		Mehdi, 2009[120]	Functional status Psychologic status Pain Fatigue Global assessment of quality of life Painful joint count
Multidimensional Health Locus of Control scale		Wolcott, 1988[182]	Health-related locus of control

Tool	Tool subscale	Author. Year	Domain
Multidimensional Scale of Perceived Social Support		Patel, 2002[131]	Social support
Patient Assessed Quality of Life (PAQOL)		Steele, 1996[157]	Overall quality of life
Physician's health questionnaire, 2 questions (PHQ-2)		Kutner, 2010[109]	Depression
Physical activity index		Kutner, 2000[106]	
Physical activity questionnaire		Chan, 2019[26]	Physical activity
Physical performance battery		Suri, 2011[158]	
Profile of Mood States-Short Form (POMS)		Birdee, 2015[23] Rodrigue, 2011[33] Wolcott, 1989[183]	Mood
Positive and Negative Affect Scales		Bremer, 1989[51]	Psychological: Positive Affect Negative Affect
Patient Related Anxiety Scale (PRAS)		Steele, 1996[157]	Anxiety
Profile of Mood scale		Wolcott, 1988[182]	Mood
Patient Reported Outcomes Measurement Information System (PROMIS)	Depression short form	Berman, 2016[22] Bullen, 2018[54]	Depression
Pittsburgh Sleep Quality Index (PSQI)		Harris, 2012[88] Maung, 2017[116] Mehrotra, 2019[30]	Sleep
Patient-assessed QOL index (PAQOL)		Steele, 1996[156]	Overall quality of life
Pittsburgh Symptom Score Index (PSS)		Novak, 2008[126]	
Perceived Stress Scale (PSS-4)		Abdel-Kader, 2009[41]	Stress

Tool	Tool subscale	Author. Year	Domain
Post-Traumatic Symptoms Scale 10 (PTSS-10)		Song, 2015[36]	Fatigue Trouble sleeping Difficulty concentrating Restless legs Change in taste Loss of appetite Nausea or vomiting Pruritus Bone pain Muscle pain Weakness
Quality of Life Index (QLI)		Kring, 2009[102] Welch, 1999[180]	Health care Physical health and functioning Occupation Education Leisure Future Peace of mind Personal faith Life goals Personal appearance Self-acceptance General happiness General satisfaction

Tool	Tool subscale	Author. Year	Domain
Quality of Life Questionnaire (investigator developed)		Wuerth, 1997[184]	Family Social supports Structured activity/responsibility Physical condition Hobbies/recreation Energy Spirituality/Religion Exercise/Physical recreation Travel Autonomy/independence Appetite Life circumstances Dialysis regime Mental status Cooking Driving Sleep Sex Vision: ability to see Pets Relationship with dialysis medical team Physical pain
Quality of Life Inventory (QOLI)		Rodrigue, 2011[33]	Health Self-esteem Goals and values Money Work Play Learning Creativity Helping Love relationship Relationships with children, relatives, and friends Home Neighborhood Community
Quality of Life Scale		Wolcott, 1988[182]	Overall quality of life

Tool	Tool subscale	Author. Year	Domain
Quality of life "questionnaire"		Delano, 1989[66]	Well-being Better appetite Socialization Sleep habits Symptoms Exercise capacity Sexual life
Quality of life questionnaire		Johnson, 1982[96]	Sleep Hospitalizations Fatigue Sexual performance Employment Overall well-being Emotional health Impact of renal failure on income Impact of renal failure on daily life Social relationships Life satisfaction
Quality of well-being scale-self-administered		Saban, 2008[142]	Mobility Physical activity Social activity
Investigator-developed questionnaires		Simmons, 1984[148]	Uremic symptoms
Revised Illness Perception Questionnaire (IPQ-R)		Fowler, 2006[80]	Cognitive illness representation Emotional representation in response to illness
Rosenberg happiness scale		Simmons, 1990[149]	Emotional well-being
Rosenberg self-esteem scale		Simmons, 1990[149]	Emotional well-being
Structured Clinical Interview for Depression (SCID)		Hedayati, 2006[89]	Depression
The Schedule of Evaluation of Individual Quality of Life–Direct Weighting (SEIQOL-DW)		Abdel-Kader, 2009[41]	Overall quality of life
SF-6D		Saban, 2008[142]	Physical functioning Role limitation Social pain functioning Mental health Vitality

Tool	Tool subscale	Author. Year	Domain
Short-Form McGill Pain Questionnaire (SF-MPQ)		Barakzoy, 2006[48]	Pain
Sheehan Disability scale		Mehrotra, 2019[30]	Functional impairment in 3 domains: Work/school Social life Family life
Simmons self-esteem scale		Wolcott, 1988[182]	Self-esteem
Sickness Impact Profile (SIP)	physical dysfunction dimension	Julius, 1989[97] Christensen, 1991[58]	Sickness-related physical dysfunction: Ambulation Body care and movement Mobility
Sickness Impact Profile (SIP)		Deniston, 1990[28] Evans, 1990[73] Hornberger, 1992[92] Siskind, 1993[150] Spinowitz, 1990[155]	Psychological well-being Energy Appetite Activity Work Sex Overall quality of life
Skindex-16		Duque, 2006[70]	Skin-related quality of life: Physical symptoms Emotional well-being Function
Sleep Habits Questionnaire		Unruh, 2008[169]	Sleep
Sleep Problems Index II (SPI-II)		Unruh, 2016[11]	Sleep
Spitzer Quality of Life Index (SQLI)		McClellan, 1991[118]	Overall quality of life Activity Daily living Health Social support Outlook
State-Trait Anxiety Inventory		Christensen, 1989[57]	Anxiety
Symptom Assessment Questionnaire		Levy, 2019[186]	Symptoms
Satisfaction With Life Scale		Harris, 2012[88] Kimmel, 1998[99] Kimmel, 2003[100] Mehrotra, 2019[30] Patel, 2002[131]	Overall quality of life

Tool	Tool subscale	Author. Year	Domain
Profile of Mood States	Total Mood Disturbance	Wolcott, 1988[182]	Emotional distress
Trail making B		Rocco, 2011[10]	

ADAT=Appetite and Diet Assessment Tool; ADL=Activities of Daily Living; BDI=Beck's Depression Inventory; BDI-II=Beck's Depression Inventory-2; CDI=Cognitive Depression Index; CES-D=Center for Epidemiologic Studies Depression scale; CHAMPS= Community Healthy Activities Model Program for Seniors; CHEQ=CHOICE Health Experience Questionnaire; CHQPF50=Child Health Questionnaire Parent Form; CKD-QOL=Chronic Kidney Disease Quality of Life Tool; DSI=Dialysis Symptom Index; ERI= Effort-Reward Imbalance Questionnaire; ESAS=Edmonton Symptom Assessment System; ESRD=end stage renal disease; ESS=Epworth Sleepiness Scale; FAAM=Foot and Ankle Ability Measure; FACIT-Sp=Functional Assessment of Chronic Illness Therapy—Spirituality Scale; FSFI=Female Sexual Function Index; FSS=Fatigue Severity Scale; GAD-7=General Anxiety Disorder 7-item scale; HADS=Hospital Anxiety and Depression Scale; HAM-D=Hamilton Depression Rating Scale; HAP= Human Activity Profile; HD=hemodialysis; HSCL=Hopkins Symptom Checklist; HUI-3=Health Utilities Index-3; IEQ=Illness Effects Questionnaire; IFS-Dialysis=Inventory of Functional Status-Dialysis; IGA=Index of General Affect; IIEF-5=International Index of Erectile Function, short form; IPA=Index of Psychological Affect; IPQ-R=Revised Illness Perception Questionnaire; IWB=Index of Wellbeing; KDQ=Kidney Disease Questionnaire; KDQOL=Kidney Disease Quality of Life; KDQOL-36=Kidney Disease Quality of Life-36; KDQOL-LF=Kidney Disease Quality of Life-Long Form; KDS2=Kupfer-Detre System-2 questionnaire; KQ=Key question; LEVIL=London Evaluation of Illness survey; MFI-20=Multidimensional Fatigue Inventory; MOS-SPI=Medical Outcomes Study: Sleep Problem Index; MSAS-S=Memorial Symptom Assessment Scale Short Form; PAQOL=Patient Assessed Quality of Life; PedsQL=Pediatric Quality of Life; PHQ-2=Patient Health Questionnaire-2; PHQ-29=Patient Health Questionnaire-9; POMS=Profile of Mood States; PRAS=Patient Related Anxiety Scale; PROMIS= Patient Reported Outcomes Measurement Information System; PSQI=Pittsburgh Sleep Quality Index; PSS= Pittsburgh Symptom Score Index; PSS-4=Perceived Stress Scale; PTSS-10=Post-Traumatic Symptoms Scale-10; QLI=Quality of Life Index; QOLI=Quality of Life Inventory; RAND-36=RAND-36 Measure of Health-Related Quality of Life; RQLP=Renal Quality of Life Profile; SCID=Structured Clinical Interview for Depression; SEIQOL-DW=The Schedule of Evaluation of Individual Quality of Life–Direct Weighting; SF-12=Short Form-12; SF-36=Short Form 36; SF-6D=Short Form-6D; SF-MPQ=Short-Form McGill Pain Questionnaire; SIP=Sickness impact Profile; SPI-II=Sleep Problems Index II

Evidence table F7.1. Reliability and validity of tools most commonly used across studies utilizing instruments used to measure quality of life of people with ESRD treated by dialysis-ESRD Specific

Tool	Tool subscale	Reliability	Validity	Feasibility	Usability
KDQOL	Overall	Chronbach's alpha: 0.68-0.94[143] Reliable with no data [16, 17, 115, 136, 141, 166]	Valid with no data†[16, 17, 51, 90, 115, 166]	NR	NR
KDQOL	Dialysis staff encouragement	Test-retest:0.82[106]	NR	NR	NR
KDQOL	Effects of kidney disease	Test-retest:0.61[106]	NR	NR	NR
KDQOL	Cognitive function	Chronbach's alpha:: 0.72[108] Reliable with no data [103]	construct: cut off of 60 sensitivitiy = 52%, specificity 82%[103] Valid with no data†[154]	NR	NR
KDQOL	Composite?	Chronbach's alpha: 0.66 to 0.92[137]	construct: relative validity of sub-scales; correlation with SF-36 scales[103]	NR	NR
KDQOL	MCS	Chronbach's alpha: 0.72 to 0.79[170]	Valid with no data†[141, 170]	NR	Used in clinical practice
KDQOL	PCS	Chronbach's alpha: 0.72 to 0.79[170]	Valid with no data†[141, 170]	NR	Used in clinical practice
KDQOL	Burden/effects	Test-retest: 0.79/0.86[174]	Valid with no data†[174]	NR	
KDQOL	Symptoms/problems	Test-retest: 0.85[174]	Valid with no data†[174]	NR	NR
KDQOL	Sleep	Reliable with no data [104]	Valid with no data†[104]	NR	Used in clinical practice
KDQOL	All other subscales	NR	NR	NR	NR
KDQOL SF-36	Overall	Chronbach's alpha: 0.84[123] Reliable with no data [81, 107, 162, 173, 175]	Valid with no data†[61, 65, 68, 77, 107, 173, 175]	NR	NR
KDQOL SF-36	Pain	Chronbach's alpha: 0.83[108]	NR	NR	NR
KDQOL SF-36	MCS	Reliable with no data [122]	Valid with no data†[122]	NR	Used in clinical practice[53]
KDQOL SF-36	PCS	Reliable with no data [122]	Valid with no data†[122]	NR	Used in clinical practice[53]
KDQOL SF-36	Effect of kidney disease	NR	NR	NR	Used in clinical practice[27]
KDQOL SF-36	Burden/effects	NR	NR	NR	Used in clinical practice[27]
KDQOL SF-36	Symptoms/problems	NR	NR	NR	Used in clinical practice[27]
KDQOL SF-36	All other subscales	NR	NR	NR	NR
PedsQL	Overall		Valid with no data†[86]	NR	NR

Tool	Tool subscale	Reliability	Validity	Feasibility	Usability
PedsQL	Child ESRD module	Chronbach's alpha: 0.77[85]	Factor analysis: Confirmatory Factor Analysis (CFA) for child with ESRD self-report: CFI 0.94, RMSEA 0.062, and NNFI 0.93[85]	Patient burden: Minimal missing[85]	NR
PedsQL	Parent ESRD total score	Chronbach's alpha: 0.33[85]	Factor analysis: Confirmatory Factor Analysis for parent: CFI of 0.95, RMSEA 0.077, and NNFI 0.94[85]	Patient burden: Minimal missing[85]	NR
PedsQL	CDI	Reliable with no data [124]	Valid with no data†[124]	NR	NR
PedsQL	Generic scale	Reliable with no data [112, 124]	Valid with no data†[112]	NR	NR
PedsQL	End-stage renal disease scale (3.0)	NR	Valid with no data†[112]	NR	NR
PedsQL	All other subscales	NR	NR	NR	NR
DSI	Overall	Chronbach's alpha: 0.86[40] Chronbach's alpha: 0.87[102] Test-retest: 0.80[102] Test-retest: 0.52[178]	Content: noted good not reported[177] Valid with no data†[40, 102]	NR	NR
CHEQ	Overall	NR			
	Sleep quality	Chronbach's alpha: 0.75[94, 168]			
Home Dialysis Interview Schedule					
KDQ					
RQLP					
unnamed validated questionnaire specifically designed for use in ESRD					
Home Dialysis Interview Schedule					

Evidence table F7.2. Reliability and validity of tools most commonly used across studies utilizing instruments used to measure quality of life of people with ESRD treated by dialysis-ESRD validated

Tool	Tool subscale	Reliability	Validity	Feasibility	Usability
SF-36	Overall	Reliable with no data*[152]	Valid with no data*[152]	NR	NR
SF-36	MCS	Chronbach's alpha: 0.73[52] Test-retest: 0.9 or more[71] Reliable with no data*[40, 78, 160, 171]	Valid with no data†[40, 41, 78, 94, 121, 132, 134, 187]	NR	NR
SF-36	PCS	Chronbach's alpha: 0.78[52] Test-retest: 0.9 or more[71] Reliable with no data[40, 78, 160, 171]	Valid with no data†[12, 40, 41, 78, 94, 121, 132, 134, 187, 188]	NR	NR
SF-36	Social functioning	Test-retest: 0.62[106]	NR	NR	NR
SF-36	Vitality	Reliable with no data [94]	Valid with no data†[94]	NR	NR
SF-36	Bodily pain	Reliable with no data [171]	Valid with no data†[40]	NR	NR
SF-36	All other subscales	NR	NR	NR	NR
BDI	Overall	Chronbach's alpha: 0.85[119] Reliable with no data [5, 63, 131, 171]	Other construct: 62% Sensitivity and 81% specificity for diagnosing depression in HD patients[89] Valid with no data[5, 7, 60, 61, 63, 79, 88, 131]	NR	NR
BDI	Non-somatic scale	Chronbach's alpha: 0.86[119]	Valid with no data[119]	NR	NR
RAND-36	Overall	Reliable with no data [5]	Valid with no data†[5, 7, 110]	NR	NR
RAND-36	Physical functioning	NR	Valid with no data†[4]	Computer-adapted testing[4]	NR
RAND-36	Physical health composite	NR	Valid with no data†[4]	Computer-adapted testing[4]	NR
SF-12	Overall	NR	NR	NR	NR
SF-12	MCS	Chronbach's alpha: 0.87[174] Reliable with no data [21]	Valid with no data[21, 174]	NR	NR
SF-12	PCS	Chronbach's alpha: 0.84[174] Reliable with no data [21]	Valid with no data[21, 174]	NR	NR
HADS‡	Overall	Reliable with no data [62]	Valid with no data [62]	NR	NR
HADS‡	Subscales	NR	NR	NR	NR
PHQ-9	Overall	NR	NR	NR	NR
BDI-II	Overall	NR	NR	NR	NR

***** Explicitly state in the article that the tool was reliable but no data presented.

† Explicitly state in the article that the tool was valid but no data presented

‡ a later study questioned its clinical utility in patients with ESRD because a unified factor structure failed to emerge.

BDI = Beck Depression Inventory; BDI-II = Beck Depression Inventory II; CDI=Cognitive Depression Index; CFA=Confirmatory Factor Analysis; CFI=Comparative Fit Index; CHEQ = CHOICE Health Experience Questionnaire; DSI = Dialysis Symptom Index; ESRD = End-stage Renal Disease; ESRD = End-stage Renal Disease; HADS = Hospital Anxiety and Depression scale; KDQ=Kidney Disease Questionnaire; KDQOL = Kidney Disease Quality of Life; KDQOL; KDQOL-SF-36 = Kidney Disease Quality of Life Short Form 36; NR=not reported; MCS=Mental Composite Score; NNFI= non-normed fit index; PCS=Physical Composite Score; PedsQL = Pediatric Quality of Life Inventory; PHQ-9 = Physician's Health Questionnaire 9; RAND-36= RAND-36; RMSEA=root mean squared error of approximation; RQLP=Renal Quality of Life Profile; Measure of Health-Related Quality of Life; SF-12 = Short Form 12; SF-36 = Short Form 36

Evidence table F8.1. MCID in tools designed specifically for ESRD patients and for tools not specifically designed for ESRD patients but validated in that population—ESRD Specific

Tool	Tool subscale	MCID	Study population
KDQOL -36	MCS	1 point increase in PCS and MCS scores associated with significant HR mortality (0.97 for PCS, 0.99 for MCS) and hospitalization (0.99 for PCS and 1.00 for MCS)[53]	ESRD
KDQOL -36	PCS	1 point increase in PCS and MCS scores associated with significant HR mortality (0.97 for PCS, 0.99 for MCS) and hospitalization (0.99 for PCS and 1.00 for MCS)[53]	ESRD
PedsQL	Child ESRD module	4.36[189]	ESRD
PedsQL	Parent ESRD total score	4.5[189]	ESRD

Evidence table F8.2. MCID in tools designed specifically for ESRD patients and for tools not specifically designed for ESRD patients but validated in that population—ESRD validated

Tool	Tool subscale	MCID	Study population
SF-36	Overall	Each 10 unit decrease in score was associated impacts death HRs[75] "In many populations, SF-36 is regarded sensitive to change, but robust estimations of its minimal clinically important difference (MCID) and interpretability are lacking."[190]	Dialysis CKD stage 5
SF-36	Depression score	2 more likely to be depressed, but unclear where this cut off came from[111]	Hemodialysis patients
SF-36	MCS	change in score from 2-5[114]	Dialysis patients—MCID was derived from other populations: Osteoarthritis[191] Crohn's disease,[192] temporomandibular joint and muscle disorder,[193] and general[194]
SF-36	PCS	change in score from 2-5[114] For the physical component summary, MCID was estimated at 5.7 points"[190]	Dialysis patients—MCID was derived from other populations: Osteoarthritis[195] Crohn's disease,[192] temporomandibular joint and muscle disorder,[193] and general[194] CKD stage 5
RAND-36	Physical functioning	>=3.0 points for PHC and PF clinically meaningful because of their associations with subsequent morbidity and disability[4]	ESRD
RAND-36	Physical health composite	>=3.0 points for PHC and PF clinically meaningful because of their associations with subsequent morbidity and disability[4]	ESRD
BDI-II	Overall	17.5%[30]	Hemodialysis patients

BDI II – Beck Depression inventory II; CKD=chronic kidney disease; ESRD=end stage renal disease; KDQOL-36 = Kidney Disease Quality of Life, Short Form 36; MCID=Minimal clinically important difference; MCS = mental component summary score; PCS = physical component summary score; PedsQL = Pediatric Quality of Life Inventory; PF=Physical functioning; PHC=Physical health composite; RAND-36= RAND-36 Measure of Health-Related Quality of Life

Evidence Table F9.1. Validation methods for tools specifically designed for use in an ESRD population.

Tool	Author, Year	Subscale	General/ not defined	Construct	Content	Relative	Discriminant	Other	Population
KDQOL	Hays, 1994[196]	Overall	NR	Exploratory factor analysis	NR	known group differences	NR	NR	ESRD
KDQOL	Kurella, 2004[103]	Cognitive function	Compared to the gold standard: Modified Mini-Mental State Exam correlation coefficients, Bland-Altman plots, and receiver operating characteristic curves	NR	NR	NR	NR	NR	ESRD and CKD
KDQOL	Rao, 2000[137]	Symptoms/ problems Effects of kidney disease	NR	NR	NR	One-way analysis of variance F ratios	NR	NR	ESRD
KDQOL-36	Gorodetskaya, 2005[87]	Overall	NR	NR	NR	NR	NR	NR	CKD 4 and 5
KDQOL-36	Piepert, 2018[197]	Overall	NR	Correlations between SF-12 and KDQOL-36 scales and “known groups” analyses	NR	NR	NR	NR	Patients on dialysis
KDQOL-36	Ricardo, 2013[198]	Overall and subscales	NR	Correlation between the overall health rating score and each of the subscales score	NR	NR	NR	NR	Mild to moderate CKD

Tool	Author, Year	Subscale	General/ not defined	Construct	Content	Relative	Discriminant	Other	Population
PedsQL	Goldstien, 2008	ESRD module of version 3.0	NR	NR	NR	NR	Range of effect sizes	NR	Pediatric ESRD
PedsQL	Varni, 1999[199]	Overall	NR	Multitrait-multimethod strategy	NR	NR	Clinical: Known-groups methodology	NR	Pediatric cancer patients and their parents
PedsQL	Varni, 2001[200]	Generic, Version 4.0weis	NR	Known groups method: Multitrait-multimethod analysis	NR	NR	Multitrait-multimethod analysis	NR	Children and their parents: well-child visits; hospital specialty visits; hospital inpatient or outpatient in the last 3 months.
PedsQL	Varni, 2003[201]	Generic, Version 4.0	NR	Known groups method	NR	NR	NR	NR	Children and their parents
PedsQL	Varni, 2007[202]	Generic core, total score, physical health summary, emotional functioning	NR	Of patient proxy: Known groups method	NR	NR	NR	NR	Children 2 to 16 years (healthy and with a known chronic condition) old and their parents
DSI	Weisbord, 2004[177]	Overall	NR	NR	Clinical experts judge the clinical relevance and wording of each of the items	NR	NR	NR	Dialysis population
CHEQ	Wu, 2001[203]	Overall	NR	Multitrait-multimethod strategy	NR	NR	NR	Convergent: agreement between measures	ESRD

Evidence Table F9.2. Validation methods for tools validated in an ESRD population.*

Tool	Author, Year	Subscale	General/ not defined	Construct	Content	Relative	Discriminant	Other	Population
SF-36	McHorney, 1993[204]	Overall (8 subscales)	NR	NR	NR	Unadjusted general linear models to estimate mean differences between pairs: resulting F-statistic for each scale	Compared the convergent validity of each subscale to the other subscales,	Factorial validity: common-factor variance Convergent: correlations of each of the subscales with the hypothesized component(s)	General population of clinicians and patients
SF-36	Johansen, 2001[205]	Physical activity	NR	NR	NR	NR	NR	Study to establish validity in ESRD (PAR, PASE, HAP, and SF-36): Method not defined: compared physical tests to measure score.	ESRD
SF-36	Diaz-Buxo, 2000[206]	All scales	ANCOVA correlating SF-36 scores to laboratory variables	NR	NR	NR	NR	PD and HD patients	**SF-36 (cont)**
BDI	Ambrosini, 1991[207]	Overall	Criterion validity	NR	NR	NR	Criterion: Sensitivity, specificity and positive predictive powers comparing to the Kiddie-Schedule for Affective Disorders and Schizophrenia (K-SADS)	Outpatient adolescents	**BDI**

Tool	Author, Year	Subscale	General/ not defined	Construct	Content	Relative	Discriminant	Other	Population
BDI	Beck 1961[208]	Overall	Differences in each depth of depression category The Kruskal-Wallis One-way Analysis of Variance by Ranks, Mann-Whitney U test Correlation	NR	NR	NR		Psychiatric inpatient and outpatients	
BDI	Beck, 1988[209]	Overall	NR	NR	NR	NR	Statistical differences in scores between "normal" patients and those with psychiatric disorder. Statistical differences in scores between patients with different disorders.	Concurrent: Pearson product-moment correlations	Psychiatric and non-psychiatric populations (review article)
BDI	Gatewood-Colwell, 1989[210]	Overall	NR	Factor analysis	NR	NR	NR	Concurrent: Compared to the Geriatric Depression Scale, Pearson product moment coefficient.	Geriatric population

Tool	Author, Year	Subscale	General/ not defined	Construct	Content	Relative	Discriminant	Other	Population
BDI	Watnick, 2005[211]	Overall	Compared to The Structured Clinical Interview for Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (gold standard), calculated PPV, NPV, sensitivity, specificity. Constructed ROC to detect differences	NR	NR	NR	NR	NR	Dialysis patients
RAND-36	Hays, 2005[212]	Overall	NR	Method not reported	NR	NR	NR	NR	General with some comparisons in an ESRD population
SF-12	Peipert, 2018[197]	MCS, PCS, symptoms/problems, effects	The SF-12 was used as a comparative standard in a ESRD population for the KDQOL-36	NR	NR	NR	NR	NR	ESRD
SF-12	Resnick, 2001[213]	Overall	NR	confirmatory factor analysis Hypothesis testing	NR	NR	NR	NR	Independent living older adults in a retirement community

Tool	Author, Year	Subscale	General/ not defined	Construct	Content	Relative	Discriminant	Other	Population
SF-12	Ware, 1996[214]	MCS and PCS	NR	Known groups validity	NR	F-statistics compared	NR	NR	General population with chronic diseases
HADS	Bjelland, 2002[215]	Overall	NR	NR	NR	NR	NR	Concurrent: Correlation with BDI, General Health Questionnaire, The Clinical Anxiety Scale, Spielberger's State-Trait Anxiety Inventory	General Population
PHQ-9	Kroenke, 2001[216]	Overall	NR	Examined functional status, disability days, symptom-relates difficulty, and healthcare utilization	NR	NR	NR	Criterion: ROC analysis	General Population

Tool	Author, Year	Subscale	General/ not defined	Construct	Content	Relative	Discriminant	Other	Population
PHQ-9	Watnick, 2005[211]	Overall	Compared to The Structured Clinical Interview for Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (gold standard), calculated PPV, NPV, sensitivity, specificity. Constructed ROC to detect differences	NR	NR	NR	NR	NR	Dialysis patients
BDI-II	Button, 2015[217]	Overall	Cut-point validity	NR	NR	NR	NR	Cut-point: kappa coefficients to assess the agreement between the dichotomized global ratings and the classifications predicted from the optimal ROC cut-points	General

* Content and face validity were not reported in any of the studies on validation of this set of tools.

ANCOVA=Analysis of Covariance; BDI=Beck's Depression Inventory; BDI-II=Beck's Depression Inventory-II; CHEQ=CHOICE Health Experience Questionnaire; CKD=chronic kidney disease; DSI=Dialysis Symptom Index; ESRD=end stage renal disease; HADS=Hospital Anxiety and Depression Scale; HAP=Human Activity Profile; HD=hemodialysis; K-SADS=Kiddie-Schedule for Affective Disorders and Schizophrenia ; KDQOL=Kidney Disease Quality of Life; KDQOL-36=Kidney Disease Quality of Life-36; MCS=Mental Composite Score; NPV=Negative Predictive Value; PAR=Physical Activity Recall questionnaire; PASE=Physical Activity Scale for the Elderly;

PCS=Physical Composite Score; PD=peritoneal dialysis; PedsQL=Pediatric Quality of Life; PHQ-9=Patient Health Questionnaire-9; PPV=Positive Predictive Value; RAND-36=RAND-36 Measure of Health-Related Quality of Life; ROC=Receiver Operating Characteristic; SF-12=Short Form-12; SF-36=Short Form-36

Evidence Table F10. Placebo effect.

Author, year	RCT	Arm	KDQ, total	KDQ, physical symptoms	KDQ, fatigue	KDQ, depression				
Brass, 2001[24]	RCT	Placebo	5-5.29	4.2-4.88	4.9-5.14	5.38-5.53				
		l-carnitine	4.83-5.27	4.23-5.04	4.65-5.09	5.07-5.36				
Author, year	**RCT**	**Arm**	**RLS**							
Sloand, 2004[35]	RCT	Placebo	9-9							
		Iron infusion	7-5							
Author, year	**RCT**	**Arm**	**SF-36 Physical function**	**SF-36 Role physical**	**SF-36 Bodily pain**	**SF-36 General health**	**SF-36 vitality**	**SF-36 mental health**	**SF-36 PCS**	**SF-36 MCS**
Steiber, 2006[37]	RCT	Placebo	30.3-29.2	40.6-40.1	50.2-47.9	40.3-39.2	46.3-48	49.5-46.2	37.3-35.7	49.6-51.8
		L-carnetine	37-35.9	33.9-43.2	42.9-50.9	42.9-43.2	44.1-46.1	50.2-51.4	36.1-39.7	49.7-54.2

KDQ=Kidney Disease Questionnaire; MCS=Mental Composite Score; PCS=Physical Composite Score; RCT=randomized controlled trial; SF-36=Short Form-36

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