

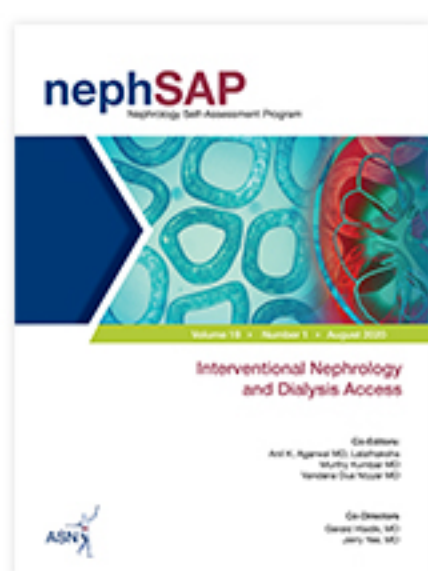
Nephrology Self-Assessment Program (NephSAP)

Latest Issue: November 2018

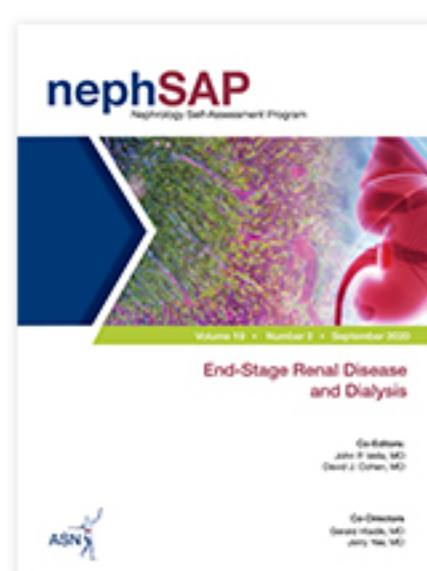
The Nephrology Self-Assessment Program (NephSAP) provides a learning vehicle for clinical nephrologists to renew and refresh their clinical knowledge, diagnostic, and therapeutic skills.

LATEST ISSUE

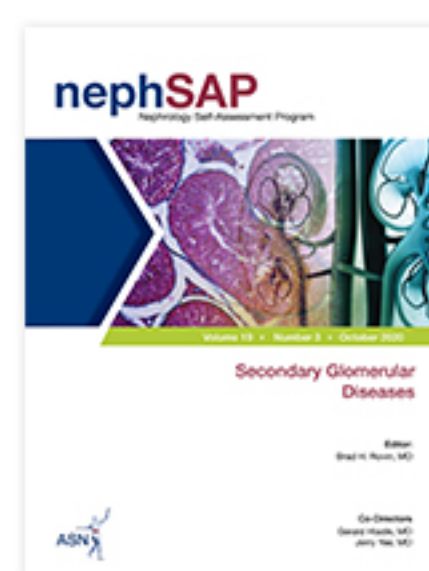
Active Issues



Interventional Nephrology and Dialysis Access



End-Stage Renal Disease and Dialysis



Secondary Glomerular Diseases



Acute Kidney Injury and Critical Care Nephrology

VIEW MORE

Core Knowledge

NephSAP also features core knowledge questions as a supplement to issues, to help prepare for board certification and recertification.

CORE QUESTIONS

[Issue Archives]

All archived issues are available online to ASN members and NephSAP subscribers, as well as the evaluation answers and explanations.

ISSUE ARCHIVES

Q&A and Interviews [Media]

This service is available to all users and is a convenient way to obtain à la carte offline study materials.

Q&A AND INTERVIEWS

- Kidney Donation
- Kidney Transplant
- Bone Disease

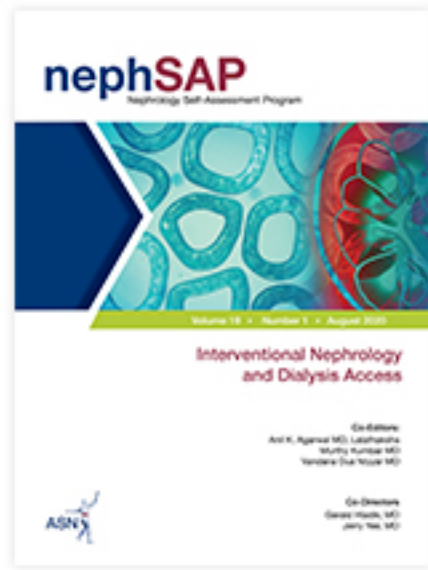
Nephrology Self-Assessment Program (NephSAP)

Latest Issue: November 2018

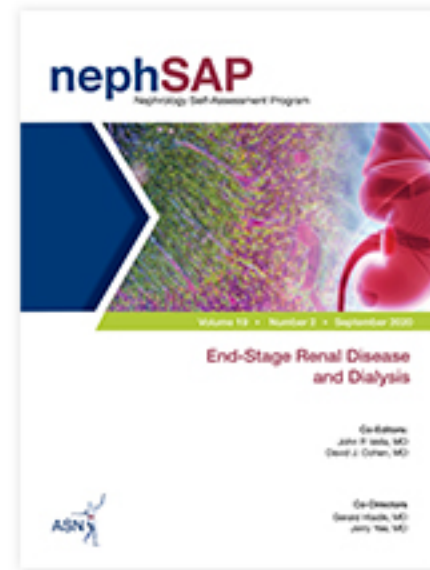
The Nephrology Self-Assessment Program (NephSAP) provides a learning vehicle for clinical nephrologists to renew and refresh their clinical knowledge, diagnostic, and therapeutic skills.

LATEST ISSUE

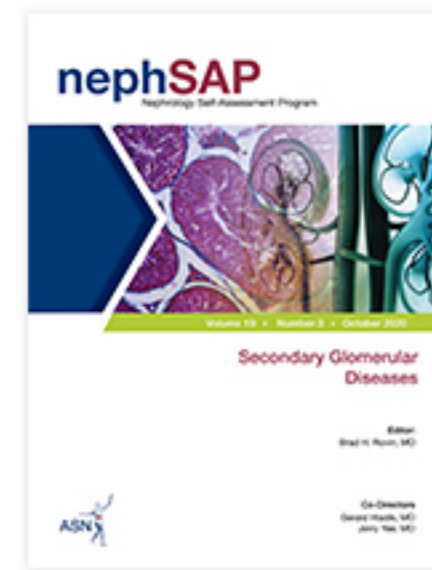
Active Issues



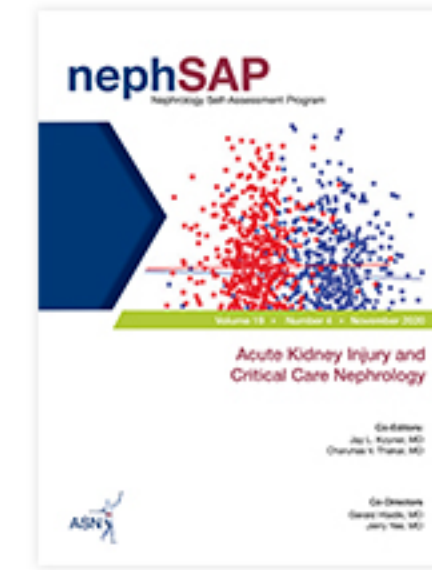
Interventional Nephrology and Dialysis Access



End-Stage Renal Disease and Dialysis



Secondary Glomerular Diseases



Acute Kidney Injury and Critical Care Nephrology

VIEW MORE ▾

Core Knowledge

NephSAP also features core knowledge questions as a supplement to issues, to help prepare for board certification and recertification.

CORE QUESTIONS >

[Issue Archives]

All archived issues are available online to ASN members and NephSAP subscribers, as well as the evaluation answers and explanations.

ISSUE ARCHIVES >

Q&A and Interviews [Media]

This service is available to all users and is a convenient way to obtain à la carte offline study materials.

Q&A AND INTERVIEWS >

End-Stage Renal Disease and Dialysis

Restricted Access

Authors: Ruediger W. Lehrich, MD  John P. Middleton, MD 

VIEW MORE +

CITATION ALERTS

Correspondence should be addressed to P Luke: peter.luke@nuth.nhs.uk

DOI: <https://doi.org/10.1530/ERP-18-0024>

Online Publication Date: Nov 2018

Page(s): 139–147

Copyright: © 2018 The authors 2018

Volume / Number: Volume 17: Number 5

DOWNLOAD PDF

ABSTRACT / EXCERPT

FULL TEXT

PDF

SUPPLEMENTAL DATA

Abstract

This issue of NephSAP on end-stage renal disease (ESRD) and dialysis discusses the most recent survival data and, importantly, examines other traditional and nontraditional clinical outcomes, including quality of life (QoL), cognition, cardiovascular disease, depression, and frailty. Some of the most relevant and promising new data will be highlighted below.

Managing the Endocrine and Metabolic Consequences of ESRD

Determination of Hemodialysis Adequacy, Uremic Toxins, Frequency, and Residual Renal Function

Since the 1980s, measuring the adequacy of a hemodialysis (HD) treatment has relied on assessment of urea kinetics with determination of Kt/V. Results of the Hemodialysis (HEMO) study informed the current Kidney Disease: Improving Global Outcomes (KDIGO) guidelines for adequate delivery of HD treatments. **To achieve adequate clearance of uremic toxins, a single-pool Kt/Vurea of 1.4 is recommended, while attaining a minimum Kt/V of 1.2 for patients undergoing conventional thrice-weekly HD.** Concerns have been raised about the clearance of solutes other than urea, often referred to as **Sign in to annotate**, and small solutes. Using the HEMO study cohort, Meyer and colleagues (1) studied whether high-dose dialysis could lower uremic solutes other than urea. As reviewed in prior NephSAP issues, the HEMO study randomized patients to high-dose versus standard-dose HD, and the effective single-pool Kt/Vurea doses achieved were, respectively, 1.72 versus 1.31. A HEMO subgroup of 1281 patients with similar baseline characteristics had measurements made for trimethylamine N-oxide, indoxyl sulfate, methylguanidine, hippurate, phenylacetylglutamine, symmetric dimethylarginine, p-cresol sulfate, and asymmetric dimethylarginine. There were some differences between the high-dose group and the standard-dose group, but nondialytic clearance and likely increased solute production caused the variable reduction in solute levels. As Figure 12 illustrates, the prescribed Kt/Vurea accounted for little of the variation in solute concentrations (Figure 12).

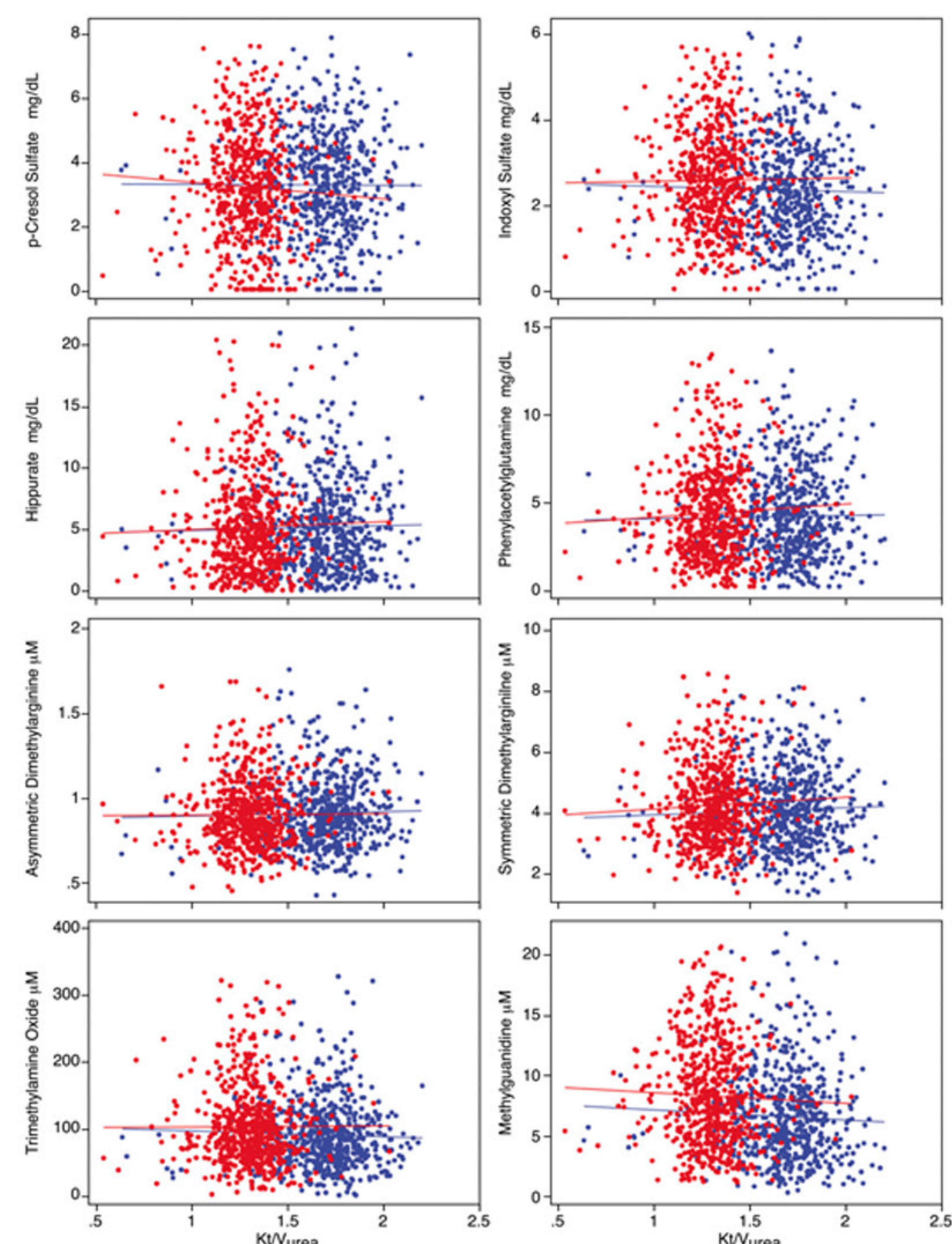

 DOWNLOAD FIGURE

Figure 12. Serum solute levels in high-dose dialysis patient (blue circles) and standard-dose dialysis (red circles). Kt/V urea accounted for very little of the variability of solute levels in this cohort. Reprinted with permission from reference 1 (Meyer TW, Sirich TL, Fong KD, Plummer NS, Shafi T, Hwang S, Banerjee T, Zhu Y, Powe NR, Hai X, Hostetter TH: Kt/Vurea and Nonurea Small Solute Levels in the Hemodialysis Study. *J Am Soc Nephrol* 27: 3469-3478, 2016).

 DOWNLOAD VIDEO

Video 1. Model I represents adjustment for demographics and medical history and model II was adjusted for additional adjustment for modifiable factors (Abbreviation: PY, patients years). In patients who are inflamed, the higher the BMI, the lower the mortality.

All-cause mortality was not significantly associated with any of the measured solutes. The authors argued that the failure to achieve a greater reduction in nonuremic solute levels might explain the failure of the HEMO study to provide a mortality benefit to patients. Using the Frequent Hemodialysis Network (FHN) daily trial data, Sirich and colleagues (2) investigated the effect of frequent dialysis on other small solute concentrations. Urea and other small solute concentrations were measured and compared from baseline to the end of trial in frequent (in-center daily) and conventional (thrice-weekly) HD groups. The frequent group had 18% lower levels of urea than those in the conventional group. Also, the frequent dialysis group had 25% lower phenylacetyl-glutamine, 17% lower hippurate, and 13% lower indoxyl sulfate. However, there was a 4% higher p-cresol sulfate in the frequently treated group. Furthermore, metabolic analysis of 107 solutes showed only a small average reduction. In summary, frequent dialysis in this cohort produced only a very modest decline in measured solutes (2). The FHN daily trial showed an improvement of the two composite outcomes with more frequent HD: death or change in left ventricular mass and death or change in self-reported physical health. Recently, Chertow and colleagues (3) reported long-term outcomes in the FHN cohort. For this study, patients returned to the conventional thrice-weekly HD schedule after the initial 12-month intervention in the FHN protocol. A total of 245 patients were followed over a median of 3.6 years, with 228 patients entering year 2 and 215 patients entering year 3. Over the entire follow-up period, 16% of the frequent patients (20 of 125) died versus 28% (34/120) of conventional patients (hazard ratio [HR], 0.54; 95% confidence interval [95% CI], 0.31 to 0.93), a statistically significant difference even after time-censoring after kidney transplantation (Figure 13). In a reassessment of a subset of patients from both groups, the reduction of left ventricular mass was maintained but was not statistically significant. Self-reported physical health data did not persist. The major limitation of this study was the lack of information regarding frequency of HD beyond a few months after conclusion of the original study. However, the survival difference observed after 1 year of frequent dialysis treatments suggested a durable benefit of the intervention. More intense HD and mortality was also studied in a large observational cohort of 40,842 patients who were treated with varying HD intensity regimens from March 31, 1996, through December 31, 2012, in New Zealand and Australia. The authors were able to conclude from their analysis that mortality decreased with more intense HD regimens (4).

References

1. ↑
Meyer TW, Sirich TL, Fong KD, Plummer NS, Shafi T, Hwang S, et al: Kt/V Urea and nonurea small solute levels in the hemodialysis study. *J Am Soc Nephrol* 27: 3469–3478, 2016
[PubMed](#) | [Crossref](#) | [Search Google Scholar](#) | [Export Citation](#)
2. ↑
Sirich TL, Fong K, Larive B, Beck GJ, Chertow GM, Levin NW, et al: Frequent Hemodialysis Network (FHN) trial group: Limited reduction in uremic solute concentrations with increased dialysis frequency and time in the Frequent Hemodialysis Network Daily Trial. *Kidney Int* 91: 1186–1192, 2017
[PubMed](#) | [Crossref](#) | [Search Google Scholar](#) | [Export Citation](#)
3. ↑
Chertow GM, Levin NW, Beck GJ, Daugirdas JT, Eggers PW, Klinger AS, et al: Frequent Hemodialysis Network (FHN) trials group: Long-term effects of frequent in-center hemodialysis. *J Am Soc Nephrol* 27: 1830–1836, 2016
[PubMed](#) | [Crossref](#) | [Search Google Scholar](#) | [Export Citation](#)
4. ↑
Marshall MR, Polkinghorne KR, Kerr PG, Hawley KM, Agar JW, McDonald SP: Intensive hemodialysis and mortality risk in Australian and New Zealand populations. *Am J Kidney Dis* 67: 617–628, 2016
[PubMed](#) | [Crossref](#) | [Search Google Scholar](#) | [Export Citation](#)

NephSAP
End-Stage Renal Disease and Dialysis
Volume: 17
Number: 5
Date: November 2018

Volume 17, Number 5

Search within... 
 Volume Journal

Sections

Figures

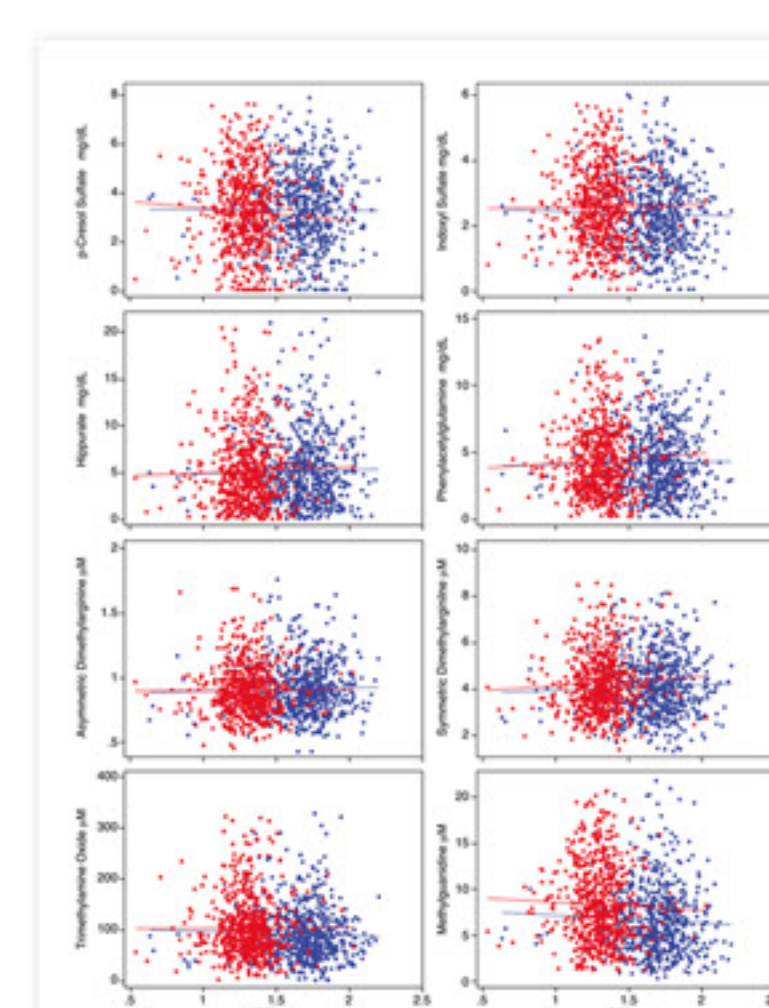

 VIEW IN GALLERY

Figure 12. Serum solute levels in high-dose dialysis patient (blue circles) and standard-dose dialysis (red circles). Kt/V urea accounted for very little of the variability of solute levels in this cohort. Reprinted with permission from reference 1 (Meyer TW, Sirich TL, Fong KD, Plummer NS, Shafi T, Hwang S, Banerjee T, Zhu Y, Powe NR, Hai X, Hostetter TH: Kt/Vurea and Nonurea Small Solute Levels in the Hemodialysis Study. *J Am Soc Nephrol* 27: 3469-3478, 2016).

References

Related Articles

Altmetrics

Metrics


 DOWNLOAD VIDEO

Video 1. Model I represents adjustment for demographics and medical history and model II was adjusted for additional adjustment for modifiable factors (Abbreviation: PY, patients years). In patients who are inflamed, the higher the BMI, the lower the mortality.

All-cause mortality was not significantly associated with any of the measured solutes. The authors argued that the failure to achieve a greater reduction in nonuremic solute levels might explain the failure of the HEMO study to provide a mortality benefit to patients. Using the Frequent Hemodialysis Network (FHN) daily trial data, Sirich and colleagues (2) investigated the effect of frequent dialysis on other small solute concentrations. Urea and other small solute concentrations were measured and compared from baseline to the end of trial in frequent (in-center daily) and conventional (thrice-weekly) HD groups. The frequent group had 18% lower levels of urea than those in the conventional group. Also, the frequent dialysis group had 25% lower phenylacetyl-glutamine, 17% lower hippurate, and 13% lower indoxyl sulfate. However, there was a 4% higher p-cresol sulfate in the frequently treated group. Furthermore, metabolic analysis of 107 solutes showed only a small average reduction. In summary, frequent dialysis in this cohort produced only a very modest decline in measured solutes (2). The FHN daily trial showed an improvement of the two composite outcomes with more frequent HD: death or change in left ventricular mass and death or change in self-reported physical health. Recently, Chertow and colleagues (3) reported long-term outcomes in the FHN cohort. For this study, patients returned to the conventional thrice-weekly HD schedule after the initial 12-month intervention in the FHN protocol. A total of 245 patients were followed over a median of 3.6 years, with 228 patients entering year 2 and 215 patients entering year 3. Over the entire follow-up period, 16% of the frequent patients (20 of 125) died versus 28% (34/120) of conventional patients (hazard ratio [HR], 0.54; 95% confidence interval [95% CI], 0.31 to 0.93), a statistically significant difference even after time-censoring after kidney transplantation (Figure 13). In a reassessment of a subset of patients from both groups, the reduction of left ventricular mass was maintained but was not statistically significant. Self-reported physical health data did not persist. The major limitation of this study was the lack of information regarding frequency of HD beyond a few months after conclusion of the original study. However, the survival difference observed after 1 year of frequent dialysis treatments suggested a durable benefit of the intervention. More intense HD and mortality was also studied in a large observational cohort of 40,842 patients who were treated with varying HD intensity regimens from March 31, 1996, through December 31, 2012, in New Zealand and Australia. The authors were able to conclude from their analysis that mortality decreased with more intense HD regimens (4).

References

1. ↑
Meyer TW, Sirich TL, Fong KD, Plummer NS, Shafi T, Hwang S, et al: Kt/V Urea and nonurea small solute levels in the hemodialysis study. *J Am Soc Nephrol* 27: 3469–3478, 2016
[PubMed](#) | [Crossref](#) | [Search Google Scholar](#) | [Export Citation](#)
2. ↑
Sirich TL, Fong K, Larive B, Beck GJ, Chertow GM, Levin NW, et al: Frequent Hemodialysis Network (FHN) trial group: Limited reduction in uremic solute concentrations with increased dialysis frequency and time in the Frequent Hemodialysis Network Daily Trial. *Kidney Int* 91: 1186–1192, 2017
[PubMed](#) | [Crossref](#) | [Search Google Scholar](#) | [Export Citation](#)
3. ↑
Chertow GM, Levin NW, Beck GJ, Daugirdas JT, Eggers PW, Klinger AS, et al: Frequent Hemodialysis Network (FHN) trials group: Long-term effects of frequent in-center hemodialysis. *J Am Soc Nephrol* 27: 1830–1836, 2016
[PubMed](#) | [Crossref](#) | [Search Google Scholar](#) | [Export Citation](#)
4. ↑
Marshall MR, Polkinghorne KR, Kerr PG, Hawley KM, Agar JW, McDonald SP: Intensive hemodialysis and mortality risk in Australian and New Zealand populations. *Am J Kidney Dis* 67: 617–628, 2016
[PubMed](#) | [Crossref](#) | [Search Google Scholar](#) | [Export Citation](#)

End-Stage Renal Disease and Dialysis

Restricted Access

Authors: Ruediger W. Lehrich, MD John P. Middleton, MD

VIEW MORE +

CITATION ALERTS

Correspondence should be addressed to P Luke: peter.luke@nuth.nhs.uk

GET PERMISSIONS

DOI: <https://doi.org/10.1530/ERP-18-0024> Online Publication Date: Nov 2018
 Page(s): 139-147 Copyright: © 2018 The authors 2018
 Volume / Number: Volume 17: Number 5

DOWNLOAD PDF

ABSTRACT / EXCERPT FULL TEXT PDF SUPPLEMENTAL DATA

Abstract

This issue of NephSAP on end-stage renal disease (ESRD) and dialysis discusses the most recent survival data and, importantly, examines other traditional and nontraditional clinical outcomes, including quality of life (QoL), cognition, cardiovascular disease, depression, and frailty. Some of the most relevant and promising new data will be highlighted below.

Managing the Endocrine and Metabolic Consequences of ESRD

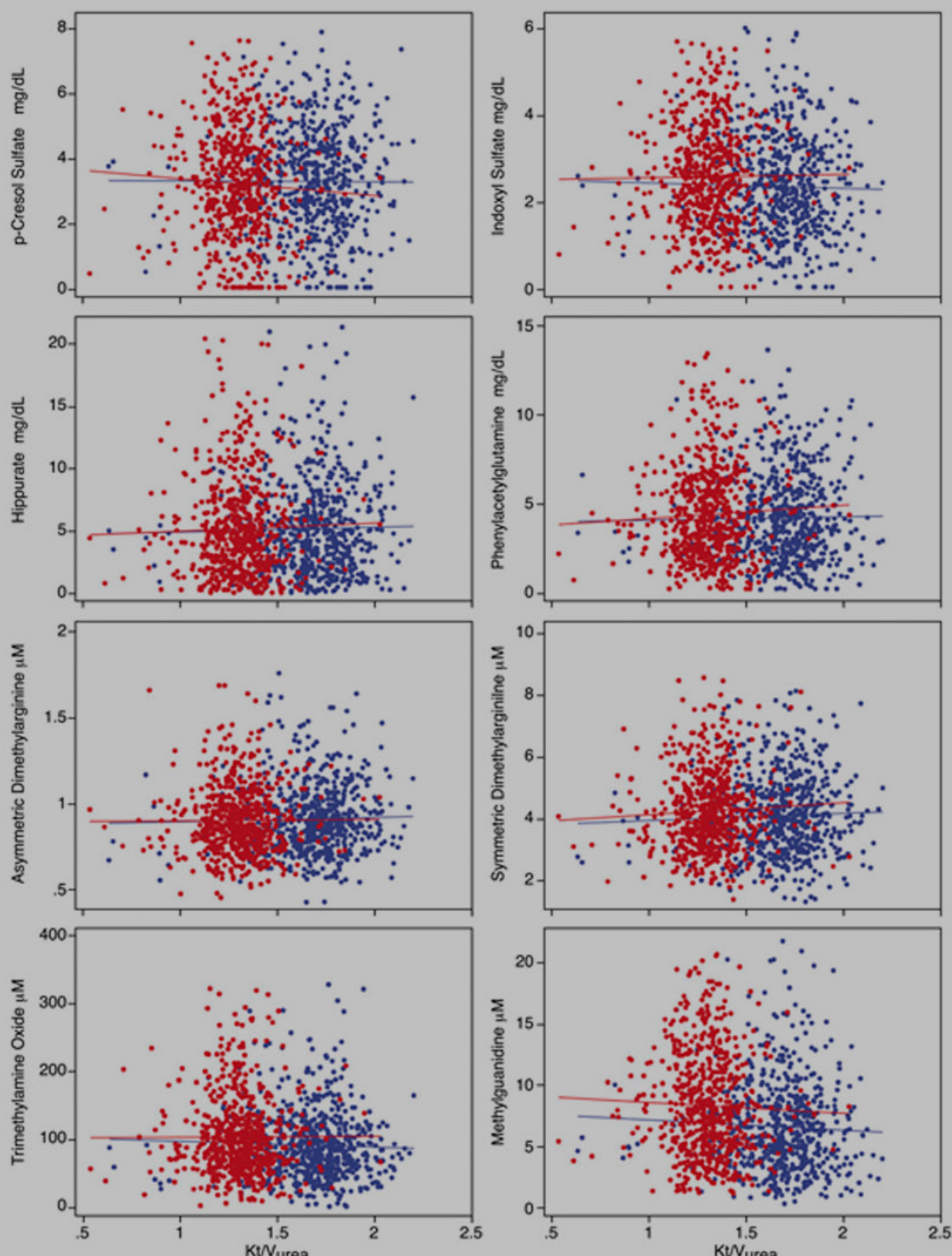
Determination of Hemodialysis Adequacy

Since the 1980s, measuring the adequacy of a dialysis treatment with determination of Kt/V. Results of the Hemodialysis Global Outcomes (KDIGO) guidelines for adequate dialysis, a single-pool Kt/Vurea of 1.4 is recommended for patients undergoing conventional thrice-weekly HD. Concerns have been referred to as middle molecules and small solutes whether high-dose dialysis could lower uremic symptoms. A study randomized patients to high-dose versus standard-dose dialysis. The high-dose group achieved a Kt/Vurea of 1.72 versus 1.31. Measurements were made for trimethylamine N-oxide, phenylacetylglutamine, symmetric dimethylarginine, and hippurate. Some differences between the high-dose group and standard-dose group were observed. Increased solute production caused the variable reduction in solute levels. As Figure 12 illustrates, the prescribed Kt/Vurea accounted for little of the variation in solute concentrations (Figure 12).

To achieve adequate clearance of uremic toxins, a single-pool Kt/Vurea of 1.4 is recommended, while attaining a minimum Kt/V of 1.2 for patients undergoing conventional thrice-weekly HD.

Character Limit: 500 / 500

CANCEL SAVE



DOWNLOAD FIGURE

Figure 12. Serum solute levels in high-dose dialysis patient (blue circles) and standard-dose dialysis (red circles). Kt/V urea accounted for very little of the variability of solute levels in this cohort. Reprinted with permission from reference 1 (Meyer TW, Sirich TL, Fong KD, Plummer NS, Shafi T, Hwang S, Banerjee T, Zhu Y, Powe NR, Hai X, Hostetter TH: Kt/Vurea and Nonurea Small Solute Levels in the Hemodialysis Study. *J Am Soc Nephrol* 27: 3469-3478, 2016).



DOWNLOAD VIDEO

Video 1. Model I represents adjustment for demographics and medical history and model II was adjusted for additional adjustment for modifiable factors (Abbreviation: PY, patients years). In patients who are inflamed, the higher the BMI, the lower the mortality.

All-cause mortality was not significantly associated with any of the measured solutes. The authors argued that the failure to achieve a greater reduction in nonuremic solute levels might explain the failure of the HEMO study to provide a mortality benefit to patients. Using the Frequent Hemodialysis Network (FHN) daily trial data, Sirich and colleagues (2) investigated the effect of frequent dialysis on other small solute concentrations. Urea and other small solute concentrations were measured and compared from baseline to the end of trial in frequent (in-center daily) and conventional (thrice-weekly) HD groups. The frequent group had 18% lower levels of urea than those in the conventional group. Also, the frequent dialysis group had 25% lower phenylacetylglutamine, 17% lower hippurate, and 13% lower indoxyl sulfate. However, there was a 4% higher p-cresol sulfate in the frequently treated group. Furthermore, metabolic analysis of 107 solutes showed only a small average reduction. In summary, frequent dialysis in this cohort produced only a very modest decline in measured solutes (2). The FHN daily trial showed an improvement of the two composite outcomes with more frequent HD: death or change in left ventricular mass and death or change in self-reported physical health. Recently, Chertow and colleagues (3) reported long-term outcomes in the FHN cohort. For this study, patients returned to the conventional thrice-weekly HD schedule after the initial 12-month intervention in the FHN protocol. A total of 245 patients were followed over a median of 3.6 years, with 228 patients entering year 2 and 215 patients entering year 3. Over the entire follow-up period, 16% of the frequent patients (20 of 125) died versus 28% (34/120) of conventional patients (hazard ratio [HR], 0.54; 95% confidence interval [95% CI], 0.31 to 0.93), a statistically significant difference even after time-censoring after kidney transplantation (Figure 13). In a reassessment of a subset of patients from both groups, the reduction of left ventricular mass was maintained but was not statistically significant. Self-reported physical health data did not persist. The major limitation of this study was the lack of information regarding frequency of HD beyond a few months after conclusion of the original study. However, the survival difference observed after 1 year of frequent dialysis treatments suggested a durable benefit of the intervention. More intense HD and mortality was also studied in a large observational cohort of 40,842 patients who were treated with varying HD intensity regimens from March 31, 1996, through December 31, 2012, in New Zealand and Australia. The authors were able to conclude from their analysis that mortality decreased with more intense HD regimens (4).

References

- Meyer TW, Sirich TL, Fong KD, Plummer NS, Shafi T, Hwang S, et al: Kt/V Urea and nonurea small solute levels in the hemodialysis study. *J Am Soc Nephrol* 27: 3469-3478, 2016
[PubMed](#) | [Crossref](#) | [Search Google Scholar](#) | [Export Citation](#)
- Sirich TL, Fong K, Larive B, Beck GJ, Chertow GM, Levin NW, et al: Frequent Hemodialysis Network (FHN) trial group: Limited reduction in uremic solute concentrations with increased dialysis frequency and time in the Frequent Hemodialysis Network Daily Trial. *Kidney Int* 91: 1186-1192, 2017
[PubMed](#) | [Crossref](#) | [Search Google Scholar](#) | [Export Citation](#)
- Chertow GM, Levin NW, Beck GJ, Daugirdas JT, Eggers PW, Klinger AS, et al: Frequent Hemodialysis Network (FHN) trials group: Long-term effects of frequent in-center hemodialysis. *J Am Soc Nephrol* 27: 1830-1836, 2016
[PubMed](#) | [Crossref](#) | [Search Google Scholar](#) | [Export Citation](#)
- Marshall MR, Polkinghorne KR, Kerr PG, Hawley CM, Agar JW, McDonald SP: Intensive hemodialysis and mortality risk in Australian and New Zealand populations. *Am J Kidney Dis* 67: 617-628, 2016
[PubMed](#) | [Crossref](#) | [Search Google Scholar](#) | [Export Citation](#)

NephSAP
 End-Stage Renal Disease and Dialysis
 Volume: 17
 Number: 5
 Date: November 2018

Volume 17, Number 5

Search within...
 Volume Journal

Sections

Figures

VIEW IN GALLERY

Figure 12. Serum solute levels in high-dose dialysis patient (blue circles) and standard-dose dialysis (red circles). Kt/V urea accounted for very little of the variability of solute levels in this cohort. Reprinted with permission from reference 1 (Meyer TW, Sirich TL, Fong KD, Plummer NS, Shafi T, Hwang S, Banerjee T, Zhu Y, Powe NR, Hai X, Hostetter TH: Kt/Vurea and Nonurea Small Solute Levels in the Hemodialysis Study. *J Am Soc Nephrol* 27: 3469-3478, 2016).

References

Related Articles

Altmetrics

Metrics

End-Stage Renal Disease and Dialysis

Restricted Access

Authors: [Ruediger W. Leirich, MD](#) [John P. Middleton, MD](#)

[VIEW MORE +](#)

Correspondence should be addressed to P Luke: peter.luke@nuth.nhs.uk

DOI: <https://doi.org/10.1530/ERP-18-0024> **Online Publication Date:** Nov 2018

Page(s): 139-147

Copyright: © 2018 The authors 2018

Volume / Number: [Volume 17: Number 5](#)

CITATION ALERTS

GET PERMISSIONS

DOWNLOAD PDF

[ABSTRACT / EXCERPT](#) [FULL TEXT](#) [PDF](#) **[SUPPLEMENTAL DATA](#)**

Downloadable materials

- [Figure 12 - Serum solute levels in high-dose dialysis patient \(blue circles\) and standard-dose dialysis \(red circles\).](#)
- [Figure 13 - Survival of patients randomized to the frequent and conventional hemodialysis groups in extended followup.](#)
- [Video 1 - All-cause death hazard ratios of annual change in RKF \(renal CLurea\).](#)
- [Figure 15 - All-cause \(A\), cardiovascular \(B\), and noncardiovascular \(C\) mortality rate by BMI \(Q1, lowest BMI; Q5, highest BMI\) and inflammation.](#)
- [Video 2 - Efficacy of the intravenous calcimimetic etelcalcetide on serum parathyroid hormone concentrations in patients receiving hemodialysis.](#)
- [Audio 1 - NephSAP Volume 12, Number 2, Acute Kidney Injury and Critical Care Nephrology](#)



NephSAP End-Stage Renal Disease and Dialysis

Volume: 17
Number: 5
Date: November 2018

Volume 17, Number 5

Search within...

Volume Journal

Sections

Figures

References

Related Articles

Altmetrics



Metrics

