

10. Rodrigue JR, Schold JD, Morrissey P, Whiting J, Vella J, Kayler LK, et al.; KDOC Study Group: Direct and indirect costs following living kidney donation: Findings from the KDOC study. *Am J Transplant* 16: 869–876, 2016
11. Wiseman JF, Jacobs CL, Larson DB, Berglund DM, Garvey CA, Ibrahim HN, et al.: Financial burden borne by laparoscopic living kidney donors. *Transplantation* 101: 2253–2257, 2017
12. Tushla L, Rudow DL, Milton J, Rodrigue JR, Schold JD, Hays R; American Society of Transplantation: Living-donor kidney transplantation: Reducing financial barriers to live kidney donation—recommendations from a consensus conference. *Clin J Am Soc Nephrol* 10: 1696–1702, 2015
13. Rodrigue JR, Schold JD, Mandelbrot DA, Taber DJ, Phan V, Baliga PK: Concern for lost income following donation deters some patients from talking to potential living donors. *Prog Transplant* 26: 292–298, 2016
14. Sickand M, Cuerden MS, Klarenbach SW, Ojo AO, Parikh CR, Boudville N, et al.; Donor Nephrectomy Outcomes Research Network: Reimbursing live organ donors for incurred non-medical expenses: A global perspective on policies and programs. *Am J Transplant* 9: 2825–2836, 2009
15. Hays R, Rodrigue JR, Cohen D, Danovitch G, Matas A, Schold J, et al.: Financial neutrality for living organ donors: Reasoning, rationale, definitions, and implementation strategies. *Am J Transplant* 16: 1973–1981, 2016

See related article, “The Change in Living Kidney Donation in Women and Men in the United States (2005–2015): A Population-Based Analysis,” on pages 1301–1308.

Targeting Zero Infections in Dialysis: New Devices, Yes, but also Guidelines, Checklists, and a Culture of Safety

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J Am Soc Nephrol 29: 1083–1084, 2018.

doi: <https://doi.org/10.1681/ASN.2018020132>

Infection is the second leading cause of death and the number one cause for hospitalization in patients on dialysis.¹ The National Healthcare Safety Network (NHSN) reported 29,516 bloodstream infections in outpatient hemodialysis centers in 2014,² and 77% were considered vascular access–related. Nearly 70% of access-related bloodstream infections occurred in patients with a central venous catheter (CVC). Thus, use of CVC remains a leading cause of mortality and hospitalization for patients on hemodialysis.

Published online ahead of print. Publication date available at www.jasn.org.

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In this issue of the *Journal of the American Society of Nephrology*, Brunelli *et al.*³ report the results of a 13-month prospective, cluster-randomized study in patients on hemodialysis with CVC vascular access. They compared use of a catheter closure device, which uses rod and threads containing dry chlorhexidine and thus applies disinfectant between dialysis treatments, with a similar disinfecting cap that applies disinfectant only on the outside of the catheter connector. They found that the chlorhexidine-containing device inside the catheter lumen resulted in significantly fewer positive blood cultures and catheter-related bloodstream infections for both Gram-positive and Gram-negative infections, and resulted in fewer antibiotic starts. Although other comparisons of antibacterial lock solutions⁴ have suggested efficacy in reducing infections, this is the largest prospective, randomized controlled study to show reduced infections to date.

Reducing CVC use and increasing use of arteriovenous fistulas and grafts may be the best way to reduce vascular access–related bloodstream infections. Nevertheless, CVCs will remain for a subset of patients on hemodialysis, whether used as a bridge to a more permanent vascular access or used for longer periods in patients with small blood vessels, multiple previous vascular procedures, frail and/or elderly patients, or others who simply choose to have no further vascular access procedures. For such patients, devices such as the one studied here may contribute to fewer hospitalizations and reduced preventable infections. The Centers for Disease Control and Prevention (CDC) has published a list of core interventions for blood stream infection prevention,⁵ and provides checklists and audit tools to monitor these interventions. The core interventions include:

- Surveillance and feedback using NHSN.
- Meticulous use of hand hygiene, and observations of its use and consistency.
- Training staff and patients about infection prevention, and assessing competency.
- Using best practice in catheter/vascular access care, and observing use and consistency.
- CVC reduction.
- Chlorhexidine skin preparation, including adequate area of disinfection and drying time.
- Catheter hub disinfection (“scrub the hub”).
- Antimicrobial ointment to the catheter exit site during dressing changes.

Perhaps the largest challenge for dialysis staff and patients is how to use devices like the one studied here, and engage all of the CDC-recommended practices in the setting of real-world busy dialysis facilities. Dialysis staff work hard to give patients their required treatments and individual care as well as keep them safe. Whose responsibility is it to eliminate preventable blood stream infections? In 2016, the CDC awarded a grant to the American Society of Nephrology to develop a program to

engage nephrologists and dialysis medical directors to target zero infections in hemodialysis facilities.⁶ Nephrologists Transforming Dialysis Safety (NTDS) has worked to share knowledge, bring experts in healthcare-associated infection at the state and federal level together with nephrologists, teach the next generation of nephrologists, and learn from previous experiences such as the Ebola outbreak, to prepare dialysis facilities to respond to the next highly infectious disease that may threaten patients on dialysis. In addition to catheter/vascular access–related infections, NTDS has considered other bloodborne diseases such as hepatitis C, and has examined the importance and effectiveness of antibiotic stewardship programs to reduce unnecessary or inappropriate antibiotic treatment. These programs can reduce the incidence of multiple drug-resistant organisms that are more common in patients on hemodialysis than in the general population.⁷

To accomplish this large task, NTDS believes that nephrologists must assume a major role in the responsibility to target zero preventable infections. We need a system-wide working transformation, where physicians, extenders, nurses, social workers, dietitians, administrators, and patients work collaboratively with a common patient-centered goal to target zero infections. This requires personal commitment, passion to reach the goal, and inspiring leadership in each dialysis facility. Imagine, for example, a work plan, where the rounding nephrologist and her team ask questions at each chairside about infection-prevention practices, with the same focus as we currently see applied to dialysis adequacy, anemia, or bone disease.

All this is best accomplished when a culture of safety is created in the dialysis facility: where patients and staff alike are encouraged to report safety challenges without fear of reprisal, and all work together to fix systems to minimize risk. How do we know where our vulnerabilities lie in each dialysis unit? CDC recommends routine observations of hand hygiene and vascular access care. In addition, water/dialysate delivery safety, physical plant safety such as water on the floor or hazardous equipment placement, and breaches in staff practices can all lead to harm. In one survey, the leading cause of patient safety risks identified by dialysis staff themselves was staff shortcuts or other breaches in care protocols.⁸ These errors can be identified only when staff and patients feel safe in reporting them. In such a culture of safety, all staff and patients know that such reporting is welcomed, so that systems of care can be fixed, and patients can be safe. Nephrologists can take a leadership role in creating such safe environments.

Devices such as those studied by Brunelli *et al.*³ will help reduce infections for patients requiring CVC access for hemodialysis. If used in the context of a vigorous program to reduce use of CVCs, with the evidence-based CDC-recommended policies and procedures, life-threatening infections can be substantially reduced. If these efforts can be utilized in a dialysis facility culture of safety, where systems thinking, a common goal, and inspired leadership show the way, we can achieve our goal of zero preventable infections.

DISCLOSURES

A.S.K. is Chair of the Project Committee of Nephrologists Transforming Dialysis Safety, a project of the American Society of Nephrology in partnership with the Centers for Disease Control and Prevention.

REFERENCES

1. United States Renal Data System: 2017 USRDS Annual Data Report: End-stage Renal Disease in the United States, Bethesda, MD, National Institutes of Health, National Institute of Diabetes and Digestive and Kidney Diseases, 2017
2. Nguyen DB, Shugart A, Lines C, Shah AB, Edwards J, Pollock D, et al.: National Healthcare Safety Network (NHSN) dialysis event surveillance report for 2014. *Clin J Am Soc Nephrol* 12: 1139–1146, 2017
3. Brunelli S, VanWyck D, Njord L, Ziebol R, Lynch L, Killian D: Cluster-randomized trial of devices to prevent catheter-related bloodstream infection. *J Am Soc Nephrol* 29: 1336–1343, 2018
4. Liu Y, Zhang AQ, Cao L, Xia HT, Ma JJ: Taurolidine lock solutions for the prevention of catheter-related bloodstream infections: A systematic review and meta-analysis of randomized controlled trials. *PLoS One* 8: e79417, 2013
5. Centers for Disease Control and Prevention: Dialysis safety core interventions, 2016. Available at: <https://www.cdc.gov/dialysis/prevention-tools/core-interventions.html>. Accessed February 5, 2018
6. Harris RC: Improving dialysis care: ASN partners with CDC to prevent infections, 2016. Available at: <http://www.kidneynews.org/kidney-news/leading-edge/improving-dialysis-care-asn-partners-with-cdc-to-prevent-infections>. Accessed February 5, 2018
7. Cunha CB, D'Agata EM: Implementing an antimicrobial stewardship program in out-patient dialysis units. *Curr Opin Nephrol Hypertens* 25: 551–555, 2016
8. Garrick R, Kliger A, Stefanchik B: Patient and facility safety in hemodialysis: Opportunities and strategies to develop a culture of safety. *Clin J Am Soc Nephrol* 7: 680–688, 2012

See related article, "Cluster-Randomized Trial of Devices to Prevent Catheter-Related Bloodstream Infection," on pages 1336–1343.