per 1.73 $m^2$ by fivefold in blacks compared with their white counterparts and by 2.5- to threefold compared with blacks with no *APOL1* renal risk variants. The *APOL1* two-renal-risk-variant genotype was the strongest of all 11 risk factors for development of CKD stage 3 or higher. Furthermore, presence of one *APOL1* renal risk variant also increased risk of CKD, although to a lesser degree.

Considering *APOL1* genotypes may be less critical in older candidates for living donor nephrectomy. Some older individuals with two *APOL1* renal risk variants will already manifest kidney disease and will not satisfy screening criteria. Moreover, they will presumably encounter fewer opportunities to develop renal injury or initiate *APOL1*-associated kidney damage given their shorter life expectancies.

The findings of Doshi *et al.*[9] should heighten our concern about an adverse effect of the *APOL1* two-renal-risk-variant genotype on the long-term kidney health of black living kidney donors. Without a uniformly consistent poor outcome, the effect of *APOL1* and the biochemical implications remain unclear. Additional studies are needed to clarify this apparent effect. Ideally, these studies will also uncover other factors that modify the risk for CKD/ESRD in some individuals with two *APOL1* renal risk variants. The newly launched National Institutes of Health prospective *APOL1* Long-Term Kidney Transplantation Outcomes Network (APOLLO) Study is addressing these issues. The APOLLO Study is evaluating allograft survival of kidneys from deceased and living black donors and the long-term renal outcomes of black living donors. In the meantime, black donor candidates should be informed of the association of *APOL1* renal risk variants with CKD/ESRD. Although it is not yet possible to quantify the risk in an individual, young two *APOL1* renal risk variant donors with a family history of ESRD, hypertension, or other risk factors likely face the highest risk. All donors should be counseled to adopt a healthy lifestyle after nephrectomy, with avoidance of tobacco, control of weight, regular assessments of kidney health, and periodic monitoring of blood glucose and BP (with treatment of hypertension). We must learn from the candidates their perception of benefits and risks of donation for themselves and the recipients. The amount of risk that is acceptable to a donor will vary between individuals and by relationship of the donor to the recipient. We anticipate that future investigations will clarify how an *APOL1*-associated process that can culminate in a proteinuric kidney disease reduces eGFR in its early stages, often with minimal albuminuria. This new knowledge will hopefully lead to novel approaches to preserve kidney function.

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## DISCLOSURES

Wake Forest University Health Sciences and B.I.F. have rights to an issued United States patent related to *APOL1* genetic testing. B.I.F. is a consultant for Ionis Pharmaceuticals. B.A.J. reports no disclosure relevant to this work.

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See related article, "*APOL1* Genotype and Renal Function of Black Living Donors," on pages 1309–1316.

# Gender Disparities and Financial Barriers to Living Kidney Donation

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Since the early history of living donor kidney transplantation, women have made up a higher percentage of living donors than men.[1,2] This disparity is likely multifactorial, including the higher rates of ESRD in men (such that unaffected family members are more likely to be women) and sex differences in rates of comorbidities (*e.g.*, hypertension) that limit donor candidacy. Additionally, studies show that women score higher on most measures of values associated with helping others and have higher voluntarism rates.[3,4]

Of concern, after 2004, living donation rates in the United States declined. Many reasons have been suggested: an increasingly older transplant population with fewer potential healthy donor candidates, increasing rates of obesity and hypertension in the general population, kidney allocation system changes, and inefficient donor education and evaluation processes.[5] Additionally, Gill *et al.*,[6] using United States registry data, previously reported that the decline in living donation rates was associated with the United States recession and that this decline was limited to donors in lower-income groups.

In this issue of the *Journal of the American Society of Nephrology* (JASN), Gill *et al.*[7] have extended their earlier observations to show an association between living donation rates and donors' sex and socioeconomic status. In contrast to previous studies, they adjusted for donor- and population-level differences in age, race, and median household income. In addition, given that the differences in ESRD rates between men and women might affect donor candidacy, they adjusted for age and the race-standardized rate of ESRD in men and women. They grouped zip codes, used as a surrogate for median household income, into quartiles. From 2004 to 2015, they found that donation rates remained stable in women but declined in men, further increasing gender disparities. For both men and women, donation rates were more stable in the higher-income quartiles than in the lower-income quartiles. The most precipitous decline in donation, however, was in men from lower-income groups. Gill *et al.*[7] suggest that the recession may have had a greater effect on men's ability to donate, because in the United States, a larger proportion of men are considered the primary household income earners. Moreover, a larger proportion of men in the United States do manual labor—which typically requires longer recovery times postdonation, often without employer-paid benefits.[8,9]

It has previously been established that living donors incur significant out-of-pocket costs.[10–12] Many donors, especially those from low-income groups, also lack paid leave to cover time off work for donation and recovery. In addition, some lack job security protections; others describe problems with access to care and life insurability. For many, such expenses are a major burden.[10,11] For other potential donors, such expenses may be a deterrent to donation.[13] The observations by Gill *et al.*[7] in this issue of the JASN suggest that financial concerns not only burden potential and actual donors but also affect United States donation rates and donor demographic characteristics.

Financial barriers for donors certainly may have become more severe during the most recent United States recession. However, such barriers existed before the recession and remain a major problem today, despite ongoing recovery of the United States economy. Today, donation rates remain below the prerecession levels.

Living donors are heroes; they undergo a major operation with associated risks and no medical benefit. Irrespective of donation rates, donors should not also have to pay donation-related expenses. Many countries have enacted policies to ensure that all living donation–related costs are reimbursed or directly covered and that donors' jobs and a living wage are protected during recovery.[14] The United States could and should build from those models. In 2014, a Best Practices in Living Donation consensus conference (supported by 11 professional societies, including the American Society of Nephrology) recommended designing and implementing policies in the United States to support living donor financial neutrality.[8,12] Since then, more granular definitions of "financial neutrality" and associated implementation strategies have been proposed.[15] The medical community has reached the consensus that living donor financial neutrality is the "right" thing to do. The body of research from Gill *et al.*[6,7] suggests that eliminating financial barriers may also decrease gender disparities in living kidney donation.

## DISCLOSURES

None.

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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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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.

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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 solutions[4] 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