

Cost Barriers to More Widespread Use of Peritoneal Dialysis in the United States

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ABSTRACT

The United States Department of Health and Human Services launched the Advancing American Kidney Health Initiative in 2019, which included a goal of transforming dialysis care from an in-center to a largely home-based dialysis program. A substantial motivator for this transition is the potential to reduce costs of ESKD care with peritoneal dialysis. Studies demonstrating that peritoneal dialysis is less costly than in-center hemodialysis have often focused on the perspective of the payer, whereas less consideration has been given to the costs of those who are more directly involved in treatment decision making, including patients, caregivers, physicians, and dialysis facilities. We review comparisons of peritoneal dialysis and in-center hemodialysis costs, focusing on costs incurred by the people and organizations making decisions about dialysis modality, to highlight the financial barriers toward increased adoption of peritoneal dialysis. We specifically address misaligned economic incentives, underappreciated costs for key stakeholders involved in peritoneal dialysis delivery, differences in provider costs, and transition costs. We conclude by offering policy suggestions that include improving data collection to better understand costs in peritoneal dialysis, and sharing potential savings among all stakeholders, to incentivize a transition to peritoneal dialysis.

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In response to an executive order on July 10, 2019, the United States Department of Health and Human Services launched the Advancing American Kidney Health Initiative (AAKHI) to improve the prevention and treatment of kidney failure.¹ A goal of this initiative is for 80% of new patients with ESKD to either receive dialysis at home, or have a kidney transplant by 2025. Because of a limited number of kidneys available for transplant, achieving this goal will require an unprecedented increase in the use of home dialysis. Current rates of home hemodialysis and peritoneal dialysis (PD) in the United States are only 2% and 11%, respectively.²

One reason for policy makers to encourage home dialysis is that it may reduce health care costs.^{3–5} Most patients dialyzed at home receive PD.⁶ Compared with in-center hemodialysis, patients receiving PD may be hospitalized less and require lower doses of expensive injectable medications, such as erythropoietin-stimulating agents.^{4,7} According to one estimate, even modest annual increases over 5 years of home hemodialysis from 1%–4% and PD from 8%–16% could save an estimated US\$233 million.⁸ Patients also report lifestyle advantages associated with home dialysis, such as more flexible schedules,^{9,10} and patients receiving home dialysis view

their medical care more favorably.^{11,12} When patients with advanced kidney disease received education about dialysis modalities, half reported a preference for PD.¹¹ Meanwhile, evidence suggests mortality is comparable across the different dialysis modalities.^{9,10}

Interest among US policymakers in promoting more widespread use of PD is not new. As far back as the early 1980s, debate surrounding the creation of a composite rate-payment system for dialysis care centered on concerns about access to home dialysis.¹³ Yet, despite decades of advocacy efforts and potential economic and quality-of-life advantages from PD, its use in the United States has generally decreased, and remains less than other high-income countries.^{14,15} Between 1988 and 2008, the proportion of patients with ESKD receiving dialysis at home decreased from 16% to 9%.¹⁶ Only recently has this downward trajectory reversed.

Historically, policy and economic incentives have had a profound influence on the delivery of US dialysis care. For decades, declining inflation-adjusted

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reimbursement for dialysis treatments coincided with the widespread adoption technologies and practices to deliver dialysis at a lower per-treatment cost (e.g., dialyzer membrane reuse).¹⁷ Rapid growth in the use of injectable drugs during dialysis in the 1990s and 2000s, in an effort to increase revenues, and sharp declines in the use of these medications immediately after a 2011 reimbursement reform that eliminated these incentives, highlight how responsive dialysis providers can be to economic incentives.^{18–20} If PD does, in fact, yield substantial cost savings relative to in-center hemodialysis, then it is not clear why dialysis providers have not made more progress toward overcoming noncost barriers to PD in an effort to maximize net revenues through lower costs. Decades of comparatively low rates of PD in the United States suggest a need to reconsider how costs influence decision making around dialysis modality.

A longstanding assertion that PD is less costly than in-center hemodialysis represents an oversimplification of the comparative costs. The assertion overlooks the features of costs that are most likely to influence behaviors, such as cost considerations from the point of view (or perspective) of key decision makers, and the ways in which costs translate into profit. It ignores differences in costs across dialysis providers and over time. Furthermore, studies comparing costs across different dialysis modality are observational, subject to selection bias, and commonly do not address the actual costs of delivering PD. An examination of dialysis costs that takes these key features into account can help to explain why the use of PD in the United States has been limited and can inform policy initiatives designed to promote more widespread use of home dialysis.

In this commentary, we examine important cost considerations that may limit more widespread use of PD in the United States. We focus on the economic perspective of key decision makers about dialysis modality—patients/caregivers, physicians, and dialysis facilities. We address misaligned economic incentives and highlight underappreciated

costs for key stakeholders involved in PD delivery. Finally, we present actionable policy solutions to address cost-related barriers to the use of PD.

The Roles of Perspective and the Alignment of Economic Incentives

Many studies comparing the cost of different dialysis modalities in the United States adopt the viewpoint of a health care payer, focusing on costs incurred by government payers or private insurers.^{8,21–23} There are advantages to adopting the payer perspective. The payer perspective overlaps well with societal interests, by considering health care costs that patients incur across a wide range of clinical settings. Treatment interventions that reduce total health care expenditures benefit society through a lower public tax burden and/or reduced health insurance premiums. Information about costs incurred by health care payers is also increasingly available to researchers at little or no cost through administrative claims datasets.

In contrast, the assessment of costs from other perspectives can be more difficult. Measuring costs incurred by health care providers requires the application of complex costing methods, which can vary and require access to detailed accounting records that are often proprietary. Although Medicare requires institutional providers, such as hospitals, skilled nursing facilities, hospices, and dialysis facilities, to regularly submit information about costs, and these cost reports are publicly available, their accuracy may be limited.^{24,25} Meanwhile, measuring costs incurred by patients and informal care givers (e.g., relatives and volunteers) involves the administration of surveys and the challenging task of assigning dollar values to things, such as time, effort, and stress.²⁶

Unfortunately, analyses conducted from the viewpoint of the payer provide limited information about how cost differences influence actual treatment decisions. Health care payers are rarely involved in making treatment decisions for individual patients. Although spending reported on billing claims may

comprise a large part of a health care provider's revenue for delivering a given service, it provides limited information about the costs incurred by the provider. When considering the economic incentives governing dialysis modality choices, a cost saving to payers from the use of a less expensive modality would only be expected to influence care delivery if it benefits the dialysis providers, patients, caregivers, and physicians who make treatment decisions. Analyses conducted from the payer's perspective lack critical information about who benefits from potential savings.

Increased use of PD in the years leading up to, and after, expansion of the Medicare ESRD Prospective Payment System (PPS) in 2011 highlight the important roles of perspective and alignment of economic incentives through shared cost savings. Before 2011, dialysis facilities were generally reimbursed less for PD compared with in-center hemodialysis. This changed after expansion of the ESRD PPS, when reimbursement to facilities became similar for the two modalities, corresponding to a more substantial increase in PD revenues than for in-center hemodialysis revenues relative to baseline.²⁷ This shifted some of the potential savings from lower PD costs from payers to dialysis facility revenues, coinciding with a near doubling of PD use between 2008 and 2016.^{22,28,29}

Similar to expansion of the ESRD PPS, policies to promote PD will be most effective if they pass a meaningful portion of cost savings from payers to the patients, caregivers, physicians, and dialysis facilities who make decisions about treatment modality. At a minimum, additional economic incentives must overcome cost-related obstacles that each of these entities face (Figure 1).

Patient and Caregiver Costs

Patients and caregivers spend considerable time and effort either traveling to and receiving dialysis in-center, or administering PD at home. This is time that could otherwise be spent pursuing valued activities. The time and effort required to administer PD at home may be important

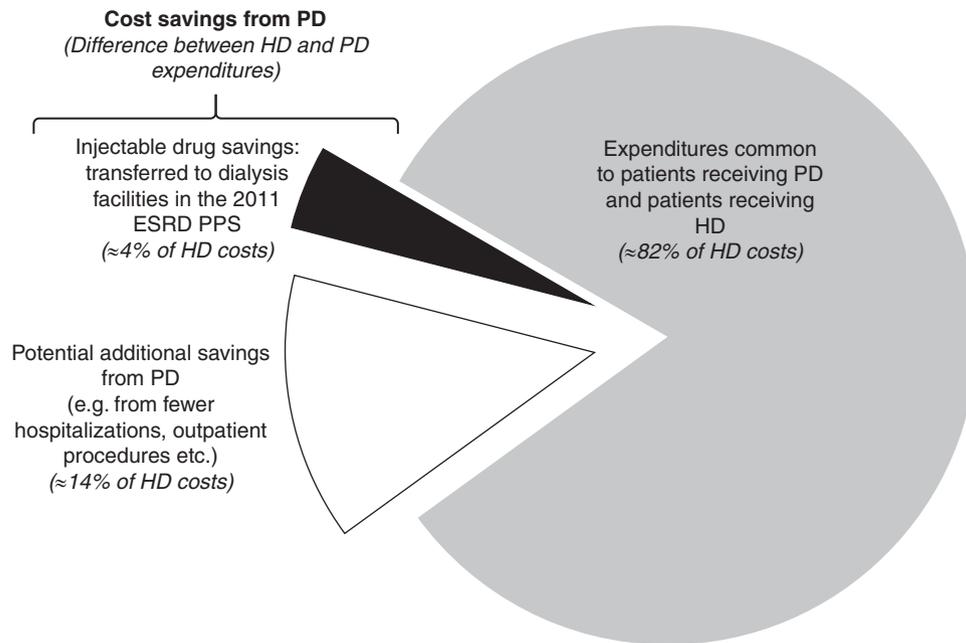


Figure 1. Estimated cost savings from more widespread use of PD that could be shared between Medicare and other key decision makers. The chart divides 100% of Medicare Parts AB expenditures in the expanded End-Stage Renal Disease Prospective Payment System into categories. Using total in-center hemodialysis (ICHD) costs as a baseline, dialysis and nondialysis costs were apportioned from data published in the United States Renal Data System (USRDS) Annual Data Report (ADR). We assumed that non-dialysis costs and injectable medication costs vary by modality. The ratio of non-dialysis costs in PD versus ICHD (0.78) was derived from USRDS ADR data. The proportion of total dialysis costs accounted for by injectable medications (0.28) and the ratio of injectable medication costs in PD versus ICHD were obtained from a study of Medicare cost reports. HD, hemodialysis.

considerations when patients and their caregivers are choosing a dialysis modality.^{30,31} Yet, little is known about costs to US patients and caregivers associated with different dialysis modalities.

Studies of patients and caregivers outside of the United States indicate that dialysis costs cause significant strain on families, particularly in socioeconomically disadvantaged populations.^{32,33} A study of PD in Taiwan found that patients and caregivers spend the equivalent of US\$175 per month on out-of-pocket expenses and incur US\$387 in monthly productivity losses related to dialysis.³⁴ A survey New Zealand found that participants who were socioeconomically disadvantaged faced substantial economic barriers to home dialysis, including unsuitable housing, lack of home ownership, and not being able to afford additional out-of-pocket costs.³⁵ A survey in Ontario, Canada, similarly found that built environment and social support are common obstacles to PD for patients with a low income.³⁶ In a US

study, adjustment for socioeconomic factors such as poverty, education, employment, and segregation, reduced disparities in PD initiation among Black and Hispanic patients to an extent comparable to adjustment for medical factors.³⁷

Studies in other chronic diseases in the United States demonstrate similar burdens to patients and caregivers. Caregivers for patients with chronic diseases or disabilities (broadly defined) report spending 26% of their income (US\$7242 annually) on care-giving activities. The financial strain was greatest for Latino and Black caregivers.³⁸

Unlike in-center hemodialysis, PD does not require that patients travel to a dialysis facility multiple times per week for treatment. PD can also be primarily administered at night, when many patients would already be at home. Although this added flexibility may help some patients continue working after initiating dialysis,³⁹ others may dedicate considerable time, physical space, and

stress, to administering dialysis at home. Informal caregivers may have to assume more responsibilities in PD where they must perform tasks that would otherwise be carried out by in-center dialysis staff.⁴⁰ Perceived costs and/or burden incurred by caregivers may deter patients from choosing PD,⁴¹ particularly among patients from socioeconomically disadvantaged backgrounds.³⁶

A better understanding of costs faced by patients on dialysis and caregivers, and policies that reimburse patients and caregivers for these costs, may lead to increased uptake of PD.

Physician Costs

For nephrologists, preparing patients for the initiation of PD often requires costs in the form of time and effort spent educating patients with CKD about their prognosis and dialysis modality options. When physicians engage in these discussions, they typically do so at the expense of other revenue-generating activities.

The Centers for Medicare and Medicaid Services (CMS) recently added reimbursement for education in advanced CKD, but restrictions on who could perform this service to patients with CKD stage 4 limited its use. Only 61% of patients report receiving education about home dialysis before the onset of ESKD.⁴² Meanwhile, in 2016 only 0.9% of qualifying ESKD Medicare beneficiaries initiating dialysis were found to have utilized the Kidney Education benefit.⁴³

For surgeons, frequent complications of PD catheter placement can become time consuming and low surgical volumes of PD catheter placement generates costs from a perpetual need to “relearn” the procedure.⁴⁴ Reimbursement to surgeons for PD catheter placement is also substantially less than vascular access placement for hemodialysis.⁴⁴ If these costs result in fewer surgeons available to place PD catheters, and longer wait times, patients may miss the key window for using PD. Patients who commence PD after a delay are less likely to ultimately start PD.^{45,46}

Assistance from lower-cost health care providers (e.g. Registered Nurses or advanced practitioners) in providing routine aspects of dialysis education could mitigate some added costs, whereas other opportunities to reduce physician costs may be limited. Yet, additional time required by physicians to prepare patients for PD has not traditionally been reimbursed separately. Rather than passing potential cost savings from PD to physicians and reimbursing physicians for added costs associated with home dialysis, the system of reimbursement for dialysis care includes incentives that do precisely the opposite.

Interviews conducted as a part of a General Accountability Office report indicate the dialysis reimbursement policy discourages physicians from offering home dialysis to their patients.¹⁶ An empirical analysis found that enactment of the current system of dialysis reimbursement for physicians in 2004 led to a 0.7%–0.9% absolute (12%–16% relative) reduction in the use of PD.⁴⁷ For several years, CMS identified home

dialysis payments for nephrology physician services as “potentially misvalued.”⁴⁶ Policies that reimburse physicians for additional costs associated with PD may be important for increasing the use of PD.

Heterogeneity of Dialysis Facility Costs

All Medicare-certified dialysis facilities in the United States must submit cost reports to CMS on at least an annual basis. In these reports, facilities provide information about the costs incurred when delivering dialysis. Despite limitations, information on cost reports has been used to compare dialysis costs across different facilities and over time, to identify predictors of facility costs, and to assess the adequacy of dialysis reimbursement.^{48–50} Yet, dialysis facility cost reports do not readily distinguish treatment costs across different dialysis modalities. A recent analysis of dialysis facility cost reports noted insufficient information to identify differences across modalities in facility expenses for certain labor costs (such as Registered Nurse costs), dialysis machines and equipment, and that instructions for how to allocate other costs (such as capital costs) across modalities may be outdated.⁵¹ In the absence of reliable data, any effort to characterize costs of PD in the United States is speculative at best. However, there are several reasons to suspect that costs vary widely across dialysis providers.

In other areas of health care, such as hospital care and nursing home services, costs vary substantially across both regions and institutions.^{52,53} Several smaller studies conducted outside of the United States suggest the cost of PD relative to in-center hemodialysis also varies. A recent analysis of costs in dialysis centers across Alberta, Canada, found PD was, on average, less expensive than hemodialysis. This difference was primarily due to reduced inpatient operating and infrastructure costs, medication costs, and allied health care labor costs at facilities delivering PD.⁵⁴ In contrast, a study of dialysis facility costs in rural Australia

found PD was more expensive than both home and in-center hemodialysis. The authors speculated this was due to differences in the price of PD consumables (e.g., equipment and dialysate).⁵⁵ Expenditures for both in-center hemodialysis⁵⁶ and PD also vary across countries. An international survey found that PD costs in North America and the Caribbean were among the highest reported.³³ Combined, these analyses suggest any number of factors may contribute to modality-related cost differences.

Variation in the cost of PD could also occur if dialysis facilities become more cost efficient as they deliver more PD treatments. Decreasing costs among higher volume providers, “economies of scale,” occur in in-center hemodialysis.^{49,57,58} Similar efficiencies could occur with increased delivery of PD if facilities require a minimum number of patients receiving PD to recoup upfront costs of the equipment, supplies, specialized labor, and space, which are paid by facilities.

High incidence of transition to hemodialysis—where patients switch from PD to in-center hemodialysis—may also contribute to cost heterogeneity. Annual switch rates resulting from transition to hemodialysis are as high as 35%.^{59,60} In one analysis, although patients receiving PD incurred fewer overall health care expenditures over a 3-year period than those receiving in-center hemodialysis, cost savings did not occur among those who switched to in-center hemodialysis.²⁶ Facilities with >25 patients using PD had a lower incidence of transition to hemodialysis than those with <25 patients. This suggests a mechanism whereby costs may decline as facilities acquire the resources and expertise needed to deliver more PD treatments.⁵⁹

In geographic regions where the use of PD is more limited, costs may also be higher due to inexperienced staff and limited resources within the broader health care system. An international comparison of dialysis costs found PD was less expensive relative to in-center hemodialysis in countries where PD comprised a larger share of all dialysis

treatments.³ As more patients receive home dialysis, hospitals and postacute care facilities may become better equipped to accommodate PD, and resources for home dialysis education and preparation may be more accessible.

Variation in access to predialysis nephrology care may also contribute to cost differences across modalities. Initiating care with a nephrologist before ESKD is associated with improved health outcomes, including fewer hospitalizations, better preparation for dialysis, and a greater likelihood of receiving a kidney transplant.^{61–63} Patients without regular predialysis care, who are less stable when initiating dialysis, may incur higher costs as they initiate PD due to complications associated with PD catheter placement and more frequent transitions to hemodialysis. Through this process, existing racial, ethnic, and socioeconomic disparities in access to predialysis care^{64,65} could translate into similar differences in PD costs.

The ESRD PPS and proposed payment models under the AAKHI include several mechanisms to adjust reimbursement for cost variations.¹ For example, the ESRD PPS adjusts dialysis facility reimbursement for geographic differences in wages, small facility size, providers in rural areas, and patient mix. Similarly, models resulting from the AAKHI will adjust for expected differences in cost due to observed patient characteristics. Reliable data about differences in cost between dialysis modalities would help to ensure these and other reimbursement mechanisms sufficiently address modality-related cost differences.

Cost of Transitioning to More PD

Most comparisons of dialysis modality costs focus on average costs. A typical cost analysis compares per-patient costs associated with one modality to per-patient costs associated with the other modality after adjusting for observed characteristics that vary across patients and providers. Although differences in average costs can help to identify opportunities for longer-term cost efficiencies,

they do not describe cost considerations influencing dialysis facility decisions in the more immediate period. Instead, dialysis providers are most likely to make strategic decisions on the basis of the expected costs associated with placing additional patients on a given dialysis modality.¹² In economics, this is referred to as the “marginal cost” of production, and is a key driver of firm behavior.⁶⁶

Even if the average cost of PD measured across one or more dialysis providers is less than the average cost of in-center hemodialysis and revenues are equal, it may still be economically advantageous for many facilities to continue providing more in-center hemodialysis. One way that this might occur is if the cost of PD relative to in-center hemodialysis is substantially higher for the new patients who would be started on PD. This would occur if patients who are newly placed on PD are not as well suited to the modality, compared with those who are already receiving PD. For example, patients who are sicker and were not traditionally offered PD may now receive this modality. Analyses of the increased use of PD beginning in 2008, reassuringly, suggest additional patients started on PD are not sicker or less suited for the modality.⁶⁷

Prior investment in infrastructure and in the capacity to produce in-center hemodialysis can also decrease the marginal cost of in-center hemodialysis, thereby making PD less attractive in the short term for some providers.¹² Increasing the capacity to deliver PD requires upfront investments in space for PD training, the hiring and training of specialized PD nurses, and the purchase of new equipment to enable patients to administer dialysis at home. These investments are not required for in-center hemodialysis if a dialysis facility already has the staffing and equipment needed to deliver additional hemodialysis treatments. By putting a patient on PD, instead of in-center hemodialysis, dialysis facilities not operating at capacity end up with an empty dialysis chair, reducing their ability to recoup fixed operating costs and costs of

prior in-center hemodialysis investments. A recent General Accountability Office report on barriers to home dialysis discussed this temporary increase in the relative cost of PD.¹⁶ Although capacity-related barriers to home dialysis may resolve on their own with time as prior investments in dialysis supplies and space become obsolete, they can slow the transition to PD.

Temporary shortages in the supply of equipment and labor necessary to deliver PD may also slow its adoption. Manufacturing PD materials is a complex process, and it can take months to years to develop new production of safe and high quality materials.⁶⁸ Dialysis providers encountered shortages of PD fluid supplies in 2014–2015 after expansion of the ESRD PPS led to increased use of PD.⁶⁸ Citing increased demand as the cause of shortages, Baxter Healthcare Corporation reported being unable to expand its capacity to meet the growing need for PD solution.⁶⁸ From 2014 until 2020, PD solutions remained in shortage as some patients who could be using PD were left to start in-center hemodialysis.⁶⁹

Policies to address transition costs could increase access to PD (Figure 2).

Policy Solutions

After several years of increasing use of PD in association with expansion of the ESRD PPS, increasing PD starts began to plateau by 2017. To continue placing more patients on PD, ongoing and future policy initiatives must align economic incentives to address costs to patients, caregivers, and physicians. These initiatives should also address cost differences that may contribute to disparities in the use of PD. This will require the collection of reliable data on cost differences across dialysis modalities, including differences in dialysis access costs. More robust mechanisms are also needed to address variation in costs across dialysis providers and to help providers to overcome both short- and long-term costs of expanding their home dialysis programs. In some instances, recently enacted policies have begun

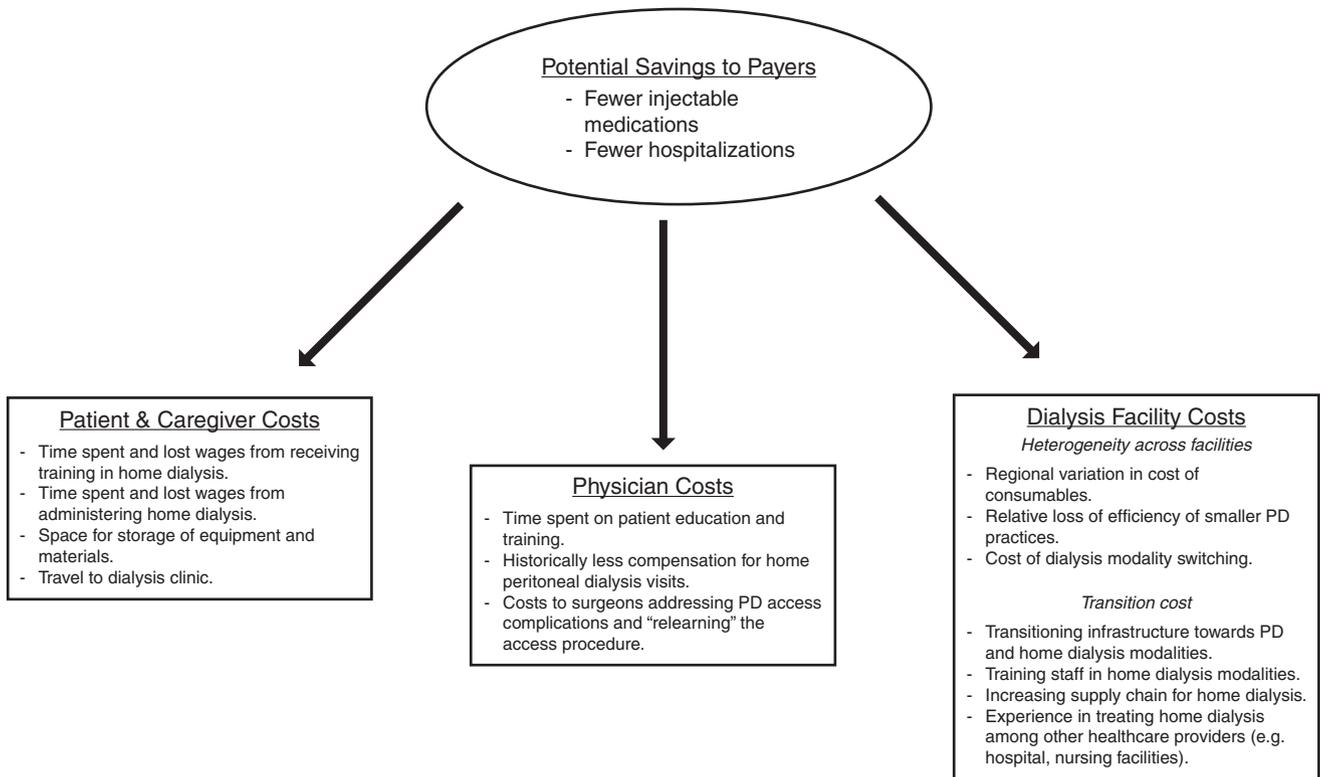


Figure 2. Opportunities to transfer potential savings from payers to patients, caregivers, physicians, and dialysis facilities to address additional costs associated with the use of PD. Potential savings to payers from more use of PD could be used to offset costs to patients and caregivers, physicians, and dialysis facilities.

to address these issues. In others, new approaches are necessary.

Policy solutions should share savings between payers, dialysis providers, patients, caregivers, and physicians, to ensure all decision makers are encouraged to use PD. The decision to enact a given policy solution more broadly, versus first trying it in a demonstration project, should depend on the quality of supporting evidence and consideration of potential costs and disruption from the policy. When faced with uncertainties in these parameters, more data collection may be necessary. It will be particularly important to demonstrate that new incentives lead to overall cost savings. A recent analysis of Medicare costs did not identify savings associated with the use of PD. If true, then even small reimbursement incentives might lead to PD being more costly.⁷⁰

Several recent policy initiatives are already helping to address costs to physicians. An expansion of the scope of the CKD education benefits that broadens

the types of health care providers who can provide these services will help to more fully compensate physician practices for costs associated with PD.⁷¹ New payment models emerging from the AAKHI also create new economic incentives for physicians to encourage patients to choose home dialysis. The ESRD Treatment Choices model does this in two ways. In the first 3 years it provides additional payments to nephrologists and dialysis providers when their patients receive home dialysis. It also includes payment adjustments linked to the number of patients receiving home dialysis. The Kidney Care Choices alternative payment models create indirect economic incentives by rewarding physicians for their performance on health care utilization and quality measures. If home dialysis modalities do indeed result in fewer Medicare expenditures, then physicians and dialysis facilities participating in Kidney Care Choices models will see increased payments for these patients.

Increasing the use of PD also requires changes to organizations that are not affected by new payment models, such as hospitals, skilled nursing facilities, and acute rehabilitation facilities. Inclusion of these entities in new models could facilitate the care of patients receiving PD.⁷² Additionally, the provision of PD could be included as a requirement within conditions for coverage regulations directed toward these entities.

In contrast to efforts to address physician costs, less has been done to understand or address costs to patients and caregivers. One policy option would be to limit cost sharing for patients who receive PD by lowering their coinsurance and deductibles. This would be similar to pharmacy tiered benefit structures that encourage the use of lower cost prescription drugs by reducing copays. Funding for trained health care workers to visit patient homes and assist in administering PD (referred to as assisted PD), and compensation for

Table 1. Policy solutions

Areas for Policy	Policy Measures	
	Current Measures	New Measures
Physician Costs	<ul style="list-style-type: none"> • CKD education benefits expanded • Additional types of health care providers included in education benefitsAim: to fully compensate physicians for the costs of initiating PD 	<p>AAKH new payment models:</p> <ul style="list-style-type: none"> • ESRD ETC: provides additional payments for providers of patients on home dialysis • KCC: Incentives on the basis of health care utilization increase payments if PD expenditures are lower
Costs to patients and caregivers		<ul style="list-style-type: none"> • Increase reimbursements for time spent educating patients
		<ul style="list-style-type: none"> • Additional research regarding cost to patients and caregivers is needed • Lower coinsurance and deductibles for PD patients • Fund skilled home health assistants to administer PD • Compensate trained family members administering PDAim: To expand the patients capable of PD
Cost to dialysis providers		<p>Reimbursement models address the increased cost of transitioning to home dialysis services:</p> <ul style="list-style-type: none"> • ESRD prospective payment system includes home dialysis training bonuses • ETC model increases payments for home dialysis in the first 3 years • ESRD PPS and AAKH payment models adjust for geographic wage and patient demographic differences
Heterogeneity in dialysis center costs		<ul style="list-style-type: none"> • Home dialysis capabilities are limited by the supply chain of materials • Emergency use authorizations increased production for dialysis during the COVID-19 pandemic • Similar measures should be implemented for home dialysis supplies • Data regarding differences in cost variations specific to PD patients needed • Implement new data into patient-mix adjustments for reimbursements • Increased use of incremental PD

ETC, Extended Treatment Choices; KCC, Kidney Care Choices; COVID-19, coronavirus disease 2019.

family members trained to provide PD, could also mitigate costs incurred by caregivers. As an example, Australia provides a yearly payment and reimbursement for electricity to patients on PD and home hemodialysis.⁷³ A bill recently introduced in the US House of Representatives includes reimbursement for assisted PD.⁷⁴ Yet, a survey of Australian nephrologists revealed costs to patients as the most frequently cited barrier to home dialysis expansion.⁷⁵ It will be important that any government assistance programs, such as tax credits or direct payment, reach lower-income patient populations that may be particularly affected by cost barriers.

Assisted PD may be particularly effective for patients who are older or frail and rely on caregivers to assist with treatments. Several countries have achieved a higher proportion of patients on PD through implementation of assisted PD. Limiting the duration of PD assistance could help to mitigate associated expenditure increases. Innovations in telehealth may also be able to reduce costs by facilitating frequent communication between patients, caregivers, and clinicians.⁷⁶ Efforts to encourage the use of incremental PD in patients starting dialysis may also yield cost savings.⁷⁷

Introduced to Congress on May 18, 2021, the bipartisan Credit for Caring Act aims to provide up to US\$5000 federal tax credit for eligible working family caregivers. Such compensation for dialysis caregivers could help incentivize families to strongly consider home dialysis. A better understanding of the extent to which patients rely on caregivers for their PD, and associated costs, would facilitate these policy efforts.⁷⁸

The United States' response to dialysis supply shortages seen during the coronavirus disease 2019 pandemic serves as a blueprint for how to mitigate costs associated with future shortages in home dialysis supplies. The US Food and Drug Administration approved several emergency use authorizations for medical devices, including kidney replacement therapy supplies, in the acute care setting due to shortages

during the pandemic.^{78,79} In Massachusetts, a state economic agency developed a manufacturing response team tasked with supporting businesses as they began manufacturing new products thus opening up the supply chain of much needed resources.⁷⁹ This team arranged collaboration with health systems and researchers, which helped manufacturers to overcome the barriers to begin producing new materials.⁸⁰ Similar approaches could be applied to facilitate the production and distribution of home dialysis supplies during a transition to increased home dialysis under the AAKHI (Table 1).

Limitations

Our analysis has several limitations. This is a nonsystematic review of costs and economic barriers to more widespread use of PD. The interpretation of data and suggested policy options reflect the authors' opinion. There may be other policy options to address both cost and barriers to PD that are not discussed in this commentary. The consideration of home hemodialysis costs was beyond the scope of this study.

The substantial portion of Medicare's budget allocated to ESKD care, combined with high morbidity and mortality associated with dialysis, makes it essential to find ways to reduce costs while maintaining a high quality of care. The AAKHI sets forth an ambitious goal of transforming ESKD treatment in the United States to PD. Despite evidence that expanding the use of PD could reduce health care expenditures in a patient-centered way and without compromising patient health outcomes, it is used relatively infrequently in the United States. We identified several cost considerations that limit the use of PD, including misaligned economic incentives, costs incurred by the people making decisions about dialysis modality, variation in costs across dialysis providers, and temporary costs incurred during the transition to increased use of PD. Improved data collection, combined with policies that address these limitations through shared savings, will be necessary to achieve the ambitious goals set forth in the AAKHI.

DISCLOSURES

J.I. Shen reports being a scientific advisor or member of the North American Council of the International Society of Peritoneal Dialysis, the Peritoneal Dialysis Outcomes and Practice Patterns Study (PDOPPS) Steering Committee, and Peritoneal Dialysis International Editorial Board; and reports other interests/relationships with the American Society of Nephrology (member) and the National Kidney Foundation (member). K. Erickson reports having consultancy agreements with Acumen; reports receiving honoraria from Dialysis Clinic, Inc., Satellite Healthcare, and the University of Missouri; reports being a scientific advisor or member of the *American Journal of Kidney Diseases* (associate editor), American Society of Nephrology Public Policy Board's Quality Committee (member), and *CJASN* (associate editor); and reports receiving research funding from a Health Care Service Corporation's Affordability Cures grant. W.C. Winkelmayer reports having consultancy agreements with and receiving honoraria from Akebia, AstraZeneca, Bayer, Otsuka, and Reata; reports being a scientific advisor or member of the *American Journal of Kidney Diseases*, *American Journal of Nephrology*, *CJASN*, *Journal of the American Medical Association* (Associate Editor), and *Kidney Disease: Improving Global Outcomes* (co-chair) Seminars in Dialysis (Editorial Boards). All remaining authors have nothing to disclose.

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AUTHOR CONTRIBUTIONS

E. Baerman, K. Erickson, J. Kaplan, J. Shen, and W. Winkelmayer conceptualized the study; E. Baerman was responsible for the data curation; E. Baerman, K. Erickson, and J. Kaplan were responsible for the formal analysis; K. Erickson was responsible for the funding acquisition; E. Baerman, K. Erickson, J. Kaplan, J. Shen, and W. Winkelmayer were responsible for the investigation; E. Baerman, K. Erickson, J. Kaplan, J. Shen, and W. Winkelmayer were responsible for the methodology; K. Erickson was responsible for the project administration; K. Erickson and W. Winkelmayer were responsible for the resources; K. Erickson provided supervision; E. Baerman, K. Erickson, and J. Kaplan were responsible for the visualization; E. Baerman, K. Erickson, and J. Kaplan wrote the original draft; and E. Baerman, K. Erickson, J. Kaplan, J. Shen, and W. Winkelmayer reviewed and edited the manuscript.

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