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ASSISTED PERITONEAL DIALYSIS: GLOBAL MODELS, USA LANDSCAPE, AND THE TRANSFORMATIVE ROLE OF MOBILE PHLEBOTOMY AS LAST-MILE DELIVERY

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Assisted PD and Mobile Phlebotomy in the USA.

ABSTRACT

Background: Peritoneal dialysis (PD) remains chronically underutilized globally, representing approximately 11% of kidney replacement therapy (KRT) despite demonstrating equivalent or superior clinical outcomes compared to in-centre haemodialysis (HD) for many patient populations. Barriers, including physical frailty, cognitive impairment, caregiver burnout, and psychosocial challenges, prevent a sizeable proportion of eligible patients from initiating or sustaining home-based therapy. Assisted PD (AsPD) programmes—in which trained personnel visit patients at home to support therapy execution—have meaningfully expanded access in Europe, Canada, and Australia. **Objective:** This paper undertakes a systematic narrative review of: (1) the clinical rationale and outcomes evidence for assisted PD; (2) international models of AsPD delivery across France, Denmark, the United Kingdom, Canada, Australia, China, Brazil, and the United States; (3) the evolving US policy and reimbursement landscape; and (4) the novel proposition of integrating mobile phlebotomy services as the critical last-mile care delivery mechanism for monthly blood draws, exit-site infection surveillance, and PD eligibility support within a US-specific assisted PD model. **Methods:** A structured literature search was conducted across PubMed, MEDLINE, Nephrology Dialysis Transplantation, the Clinical Journal of the American Society of Nephrology, and policy documents from ISPD, CMS, and USRDS. Studies published between 2010 and 2025 were prioritised, with landmark earlier studies retained for foundational context. **Results:** Assisted PD has consistently been shown to increase PD initiation rates, expand PD eligibility from 63% to 80% among patients with barriers to self-care, reduce transfers to HD, lower peritonitis rates, reduce hospitalisation, and improve quality of life. International models vary by who provides assistance, how frequently, and through what funding mechanisms. In the United States, a landmark 2022 feasibility study by Hussein et al. demonstrated that patient care technician (PCT)-led assisted PD is operationally viable. A major structural gap remains: Medicare does not yet reimburse assisted PD services, and monthly blood draws for laboratory monitoring continue to require patient travel. Mobile phlebotomy—now deployed at scale in the US by providers such as Quest Diagnostics (with 5,000 phlebotomists in 44 states), myOnsite Healthcare (a nationwide mobile phlebotomy provider with whom the author maintains an advisory engagement), and the National Phlebotomy Provider Network—offers a readily available, scalable mechanism to close this gap by delivering specimen collection, exit-site inspection, and nephrologist eligibility liaison directly to the patient's home. **Conclusion:** A hybrid model integrating nurse or PCT-assisted PD with mobile phlebotomy services represents a pragmatic, low-capital solution to drive PD initiation, retention, and quality of care in the United States. Policy reforms enabling Medicare reimbursement for both assisted PD visits and mobile phlebotomy specimen collection are the critical enabling steps. Such a model directly supports the ambitions of the 2019 Advancing American Kidney Health Executive Order.

KEYWORDS: peritoneal dialysis, assisted peritoneal dialysis, home dialysis, mobile phlebotomy, kidney replacement therapy, end-stage kidney disease, USA dialysis policy, last-mile healthcare delivery, home blood draw, PD retention.

1. INTRODUCTION

Chronic kidney disease (CKD) constitutes one of the most consequential public health burdens of the twenty-first century. The International Society of Nephrology's Global Kidney Health Atlas[4] estimates that 850 million individuals worldwide live with CKD—a prevalence far exceeding that of diabetes mellitus or human immunodeficiency virus. Of those who progress to kidney failure requiring kidney replacement therapy (KRT), the overwhelming majority receive in-centre haemodialysis (HD), despite decades of evidence demonstrating that peritoneal dialysis (PD) offers comparable or superior clinical outcomes alongside substantial quality-of-life and economic advantages for appropriately selected patients.[1,2]

PD is a home-based modality in which a catheter is placed in the peritoneal cavity to facilitate the exchange of dialysate solution, enabling toxin removal and fluid regulation without requiring frequent clinic attendance. Continuous ambulatory peritoneal dialysis (CAPD) and automated peritoneal dialysis (APD) are the two principal variants. PD confers multiple advantages: preservation of residual kidney function, haemodynamic stability, avoidance of vascular access complications, flexibility, reduced healthcare facility exposure, and lower per-patient costs relative to in-centre HD.[3,4]

Despite these advantages, PD accounts for only approximately 11% of the global KRT population—roughly 680,000 of 6 million patients worldwide.[4] In the United States, approximately 12% of dialysis patients utilise PD.[5,6] The 2019 Executive Order on Advancing American Kidney Health (AAKH) set an aspirational target of 80% of incident end-stage kidney disease (ESKD) patients receiving home dialysis or transplantation by 2025—a goal that has yet to be achieved and that underscores the structural barriers still impeding PD growth.[7,8]

A principal driver of PD underutilisation is the expectation that patients perform self-care therapy. For elderly patients, those with frailty, cognitive impairment, physical limitations, or psychosocial barriers—who represent a growing proportion of incident dialysis patients—self-care PD is often not feasible without additional support. Assisted PD (AsPD) programmes, in which trained healthcare professionals visit patients at home to support or perform dialysis tasks, have emerged as a powerful strategy to overcome these barriers in multiple countries. However, AsPD has been slow to penetrate the US healthcare system, principally due to the absence of Medicare reimbursement for home assistance visits and the absence of a scalable care delivery model.

A parallel, underexplored solution lies in the rapid expansion of the US mobile phlebotomy industry. Services such as Quest Mobile™, myOnsite Healthcare, and the National Phlebotomy Provider Network now offer nationwide at-home blood draw services, providing a readily available infrastructure that can serve as the 'last-mile delivery' arm of an integrated AsPD programme. These services can combine monthly blood specimen collection (essential for monitoring dialysis adequacy, electrolytes, and anaemia management) with exit-site inspection and care—tasks that currently require burdensome patient travel and that, when neglected, directly increase the risk of peritonitis and technique failure.

This paper synthesises the global evidence base for AsPD, catalogues international delivery models, analyses the US-specific landscape, and advances a conceptual framework for integrating mobile phlebotomy services as the last-mile delivery infrastructure for an AsPD programme in the United States.

2. RATIONALE FOR ASSISTED PERITONEAL DIALYSIS: UNDERSTANDING BARRIERS TO SELF-CARE

2.1 Epidemiological Drivers of Assisted PD Need

The demographic profile of the incident dialysis population is shifting in ways that heighten the need for assisted care. Older adults—defined as those aged 65 years and above—represent the fastest-growing cohort of patients with ESKD in high-income countries.[4] Advancing age is associated with frailty, reduced physical dexterity, sensory impairment, cognitive decline, and polypharmacy—all of which impede the execution of the aseptic techniques required for self-care PD. In several published series, the mean age of patients receiving AsPD has ranged from 71 to 79 years.[9,10]

Age-related inequities in PD selection are well-documented. In the Netherlands, patients aged over 70 years were six times more likely to choose HD over PD relative to patients aged 18–40, a disparity driven largely by concerns about self-care capacity.[10] In the United Kingdom, each year of advancing age was associated with a 2% reduction in the odds of selecting PD therapy. These data underscore that without structured assistance, PD systematically excludes the patients who might benefit most from its haemodynamic gentleness and home-based convenience.[11]

2.2 Physical and Cognitive Barriers to Self-Care

Physical barriers to self-care PD include: (a) reduced upper limb strength and endurance necessary to lift PD solution bags (typically 2–5 litres); (b) diminished fine motor dexterity required for aseptic catheter connections and disconnections; and (c) impaired vision or hearing that prevents patients from responding appropriately to automated cycler alarms or programming APD machines. Cognitive barriers encompass dementia, learning disabilities, active psychiatric conditions such as depression or schizophrenia, and functional illiteracy that impairs comprehension of written PD instructions.[12,13]

Beyond physical and cognitive factors, psychosocial barriers represent a substantial and modifiable domain. These include care partner unavailability or burnout, patient anxiety regarding the technique and infection risk, inadequate pre-dialysis education, technophobia, and low health literacy. Among caregivers of PD patients, up to 60% experience mild-to-moderate burden (as measured by the Zarit Burden Interview tool), with 13% experiencing moderate-to-severe burnout.[13] Assisted PD directly addresses both patient and caregiver burden by reducing or eliminating the dependency on informal caregiving for core therapy tasks.

2.3 System-Level and Provider Barriers

Provider-related barriers also constrain PD utilisation. Nephrologists' preconceptions about patients' capacity for home dialysis—sometimes rooted in biases related to age, socioeconomic status, health literacy, or prior dialysis modality exposure—constitute a significant barrier to PD recommendation.[14] A global scenario-based survey of kidney care physicians found that provider preconceptions suppressed PD eligibility determinations across diverse clinical scenarios, independent of actual patient capacity.[14] The availability of an assisted PD programme modifies provider behaviour by expanding the perceived eligibility of patients for PD, thereby increasing referral rates.

Among populations with greater socioeconomic disadvantage, kidney failure imposes a disproportionate burden, and these disparities manifest in lower rates of home dialysis uptake. Factors including poverty, housing instability, inadequate storage for PD supplies, and care partner limitations present real challenges that cannot be overcome by patient education alone.[15] Assisted PD, particularly when integrated with supply delivery and mobile specimen collection, represents a structural solution to socioeconomic barriers that otherwise systematically exclude vulnerable populations from the benefits of home-based KRT.

3. CLINICAL EVIDENCE FOR ASSISTED PERITONEAL DIALYSIS

3.1 Impact on PD Initiation and Eligibility

The introduction of AsPD services has consistently been associated with increased PD initiation rates across diverse healthcare systems. Boyer et al.[16] conducted a single-centre study that demonstrated a significant increase in PD initiation rate following the implementation of an AsPD service in the United Kingdom, with the benefit concentrated particularly in older patients who would otherwise have defaulted to in-centre HD—a finding that was not confounded by changes in transplantation or mortality rates. These results aligned with earlier UK data showing that in centres where AsPD was not available, the majority of patients over 65 years were on HD at 90 days, contrasting with France, where AsPD availability has historically been high, and PD is predominantly a treatment of the elderly.

Perhaps the most compelling evidence for eligibility expansion comes from a Canadian study demonstrating that the provision of AsPD increased PD eligibility from 63% to 80% among patients with documented barriers to self-care PD, and increased PD selection from 40% to 57%, ultimately resulting in PD utilisation rising from 23% to 39%.[17,13] These data suggest that a substantial proportion of patients currently receiving in-centre HD would have been appropriate PD candidates had structured assistance been available at the time of modality selection.

3.2 Technique Survival and Retention

One of the most significant clinical problems in PD is technique failure—the permanent transfer to in-centre HD due to peritonitis, inadequate dialysis, mechanical complications, or psychosocial factors. AsPD has been associated with meaningful reductions in technique failure rates. Oliver et al.[18] demonstrated that hospitalisation rates for patients on assisted PD were comparable to those receiving in-centre HD but with superior quality-of-life metrics, indicating that assisted patients who would otherwise have received in-centre treatment had equivalent or better clinical outcomes on PD. A cohort study from the French Peritoneal Dialysis Registry by Boyer et al.[19] reported that the time-dependent protective effect of nurse assistance on PD duration was most pronounced in the first 12 months following initiation.

Technique survival analysis from the REIN (Renal Epidemiology and Information Network) registry in France found that nurse-assisted PD patients had a significantly lower risk of transfer to in-facility HD compared to autonomous PD patients in multivariate-adjusted analyses, supporting the contention that publicly-funded nursing assistance should be considered a clinical and economic priority.[20] The authors concluded that these data support the promotion of reimbursement of nursing assistance for PD as a strategy to improve home dialysis technique survival.

3.3 Infection Outcomes

The prevailing concern that assisted PD—particularly when performed by non-family healthcare workers—might increase peritonitis risk has not been substantiated in well-conducted studies. Verger et al.[21] analysed data from the French Language Peritoneal Dialysis Registry and found that nurse-assisted APD patients had peritonitis rates comparable to or lower than self-care APD patients. Critically, nurse-assisted CAPD patients demonstrated favourable infection outcomes attributed to the consistent application of aseptic technique by trained professionals. More recent data from Australia, Canada, and the US feasibility programme have confirmed that professionally-delivered AsPD does not increase peritonitis rates relative to self-care.[22]

The ISPD 2023 Catheter-Related Infection Guidelines established a target exit-site infection rate of no more than 0.40 episodes per year at risk, emphasising the importance of regular, skilled exit-site assessment as a preventive measure.[23] This standard supports the clinical rationale for regular home visits by trained personnel—precisely the model that mobile phlebotomy-based AsPD can deliver.

3.4 Quality of Life and Hospitalisation

Iyasere et al.[11] conducted a landmark comparison of quality of life and physical function in older patients receiving AsPD versus in-centre HD and found that, while physical component scores were similarly impaired in both groups (reflecting the high frailty burden), mental health scores and patient satisfaction with treatment were superior in the AsPD group. Longitudinal follow-up confirmed that AsPD patients maintained quality of life over time, without the functional deterioration associated with the transport burden and schedule constraints of thrice-weekly in-centre HD.[24]

From a health system perspective, AsPD is linked to much lower hospitalization rates than in-centre HD. Oliver et al.[18] reported that hospitalization rates for AsPD patients were significantly lower than for matched in-center HD patients, leading to health system cost savings that largely offset the additional expense of home assistance visits. Comprehensive economic analyses across multiple health systems have consistently shown that, even with the added cost of professional home visits, AsPD remains more cost-effective than in-center HD when both direct and indirect costs are fully considered.[13,9]

4. INTERNATIONAL MODELS OF ASSISTED PERITONEAL DIALYSIS

4.1 Classification Framework

International AsPD programmes can be usefully classified along two dimensions: (1) who provides the assistance and in what clinical role; and (2) to whom and for how long assistance is provided. These axes yield a taxonomy of models that reflects the diverse healthcare system architectures, funding mechanisms, and cultural contexts in which AsPD has been implemented.

4.2 France: The Community Nurse Model

France has the longest and most established tradition of AsPD globally, with assistance available since the 1980s and currently representing approximately 45–56% of the French PD population receiving some form of assistance.[4,19] The French model is predominantly delivered through community nurses (infirmières libérales) who are publicly reimbursed for home visits under the national healthcare system. Non-disconnect CAPD with UV-flash technology is the predominant technique used in France, as this approach maximises efficiency by having the nurse telephone the patient to initiate the drain cycle upon her arrival, thereby minimising the time of the visit to approximately 15–20 minutes. The nurse removes the old bag, connects the new one, and departs—leaving the patient to fold and store the used bag. The proportion of PD patients in France who are elderly—54% of males and 59% of females aged over 70—reflects the effectiveness of this model in extending PD access to populations that would otherwise be excluded from home therapy.

4.3 Denmark: Expanding Access Through Community Nurses

Denmark developed its AsPD programme more recently than France but has demonstrated comparable outcomes. Community nurses, employed through the municipal home care system, provide assistance primarily for APD patients. Two daily visits are typically made: a morning visit for machine disconnection, bag removal, and placement of new solution bags, and an evening visit for machine set-up and patient connection. The programme has been particularly effective at enabling older, frail patients to remain in their own homes while receiving adequate dialysis, addressing both the growing ESKD burden in the elderly Danish population and the health-system imperative to reduce in-centre HD dependency.[9,25]

4.4 United Kingdom: Healthcare Assistant-Led APD Support

The United Kingdom developed a distinct AsPD model, implemented broadly from 2011 onwards, in which hospital-employed and trained healthcare assistants (HCAs) rather than nurses visit patients at home once daily. The UK model assigns a more limited scope of practice to the HCA: the assistant sets up the APD machine and checks the equipment but does not connect or disconnect the PD catheter, which remains the patient's responsibility. The HCA also performs exit-site inspection and dressing, assists with patient weighing, and liaises with the home dialysis nursing team for troubleshooting. This model was designed partly to manage cost and partly to respect nursing practice boundaries within the NHS regulatory framework.

Boyer et al.[16] demonstrated that following the introduction of the HCA-based AsPD service at a single UK centre, PD initiation rates increased significantly, with the benefit concentrated in elderly patients who would not otherwise have been considered suitable PD candidates. The NHS England GIRFT (Getting It Right First Time) Programme has subsequently recommended that each renal unit target a minimum 20% prevalence rate of home dialysis across its patient population, with AsPD identified as a key enabler for achieving this target.[26]

4.5 Canada: Multi-Modal Assistance with Bundled Funding

Canadian AsPD programmes, primarily developed in Ontario and Quebec, provide up to two daily visits to assist patients with machine set-up, connections, and disconnections. The Ontario programme is funded through a bundled payment mechanism from Ontario Health, which provides greater flexibility than fee-per-visit reimbursement. The Quebec pilot study by Melanson et al.[27] documented successful implementation at a large dialysis unit, with nurse-delivered assistance supporting both incident and prevalent PD patients through physical function limitations, caregiver absences, and acute self-care events. Oliver and Salenger[10] argued in a seminal commentary that the Canadian AsPD experience demonstrated its viability in a North American regulatory context and provided a roadmap for US implementation.

4.6 Australia: PCT-Led Programmes in Western Australia

Western Australia has implemented an assisted APD programme in which patient care technicians (PCTs) deliver home support under nursing supervision. An economic analysis of the Western Australian programme demonstrated favourable clinical and economic outcomes relative to in-centre HD, with technique survival rates and peritonitis rates comparable to international benchmarks.[13] The Australian experience is of particular relevance to the United States because it demonstrates the feasibility of PCT-led, rather than nurse-led, AsPD—a distinction that matters enormously in the US context, where nursing scope-of-practice regulations and cost constraints make full nursing visits prohibitive.

4.7 China: Adapting Assistance to a High-Volume PD System

China has the world's largest absolute population of PD patients and has actively developed assisted PD models suited to its unique healthcare infrastructure. Xu et al.[29] described the Chinese experience with AsPD, noting that family member assistance predominates due to cultural norms and healthcare system structure, but that professionally-delivered assistance in periurban and rural areas is growing. The China model is notable for its emphasis on community health workers and telemedicine supplementation, creating a hybrid model that leverages digital health platforms alongside human assistance—an approach increasingly viewed as the future of AsPD globally.[4]

4.8 Brazil: Emerging Programmes in a Middle-Income Context

Brazil has developed AsPD programmes in the context of a mixed public-private healthcare system, with home assistance primarily delivered through nursing staff employed by dialysis centres or contracted home healthcare agencies. The Brazilian experience is notable for demonstrating that AsPD can be implemented in a middle-income country setting with meaningful increases in PD penetration, challenging the assumption that AsPD is viable only in high-income countries with robust home care infrastructure.[28]

4.9 United States: The Emerging Frontier

The United States has historically lagged behind peer nations in AsPD development. The structural impediments are multiple: the absence of Medicare reimbursement for home assistance visits; a dialysis market dominated by large organisations with capital investments in in-centre HD; scope-of-practice regulations that complicate nurse-delivered home assistance; and a healthcare culture that has historically treated in-centre HD as the default modality. The pivotal 2022 feasibility study by Hussein et al.[30] at Satellite Healthcare (affiliated with Stanford University) established that PCT-delivered AsPD is operationally viable in the United States. Their programme expanded from two centres in August 2020 to sixteen by October 2022, serving 73 patients with a median assistance duration of eight days (IQR 2–21 days). The most common referral indications were physical function limitations (70%), psychosocial challenges (46%), and cognitive impairment (39%). The programme operated within existing regulatory and cost constraints by having PCTs—rather than licensed nurses—deliver assistance, and by absorbing programme costs through the dialysis facility's operational budget pending dedicated reimbursement.[30,22]

The expanded description of this programme's outcomes, published by Hussein et al.[22] in 2024, documented 604 visits delivered to 73 patients, with a median of 5 visits per patient. The programme demonstrated that PCT-led AsPD can support both incident patients (new to PD) and prevalent patients experiencing self-care events that threaten technique survival. These results establish a critical proof-of-concept that PCT-led AsPD is not merely theoretically feasible but practically deliverable within the US healthcare system—and that the principal barrier to scale is reimbursement policy, not operational capability.

5. THE UNITED STATES POLICY AND REIMBURSEMENT LANDSCAPE

5.1 The Advancing American Kidney Health Initiative (2019)

On July 10, 2019, President Trump signed the Executive Order on Advancing American Kidney Health (AAKH), establishing the most comprehensive federal initiative to transform kidney failure care in US history.[7,31] The AAKH articulated three principal goals: (1) reducing the risk of kidney failure through prevention; (2) improving access to and quality of person-centred treatment, with a target of 80% of incident ESKD patients receiving home dialysis or transplantation by 2025; and (3) increasing access to kidney transplantation. The AAKH directly enabled the Centers for Medicare and Medicaid Services Innovation Center (CMMI) to develop the End-Stage Renal Disease Treatment Choices (ETC) payment model, which introduces financial incentives and penalties for dialysis facilities and nephrologists based on their home dialysis and transplantation rates.[32]

The AAKH's home dialysis target of 80% represents a dramatic aspiration given that home dialysis (PD plus home HD combined) accounted for approximately 12% of prevalent dialysis patients at the time of the order. While the 2025 target has not been achieved, the AAKH has nonetheless shifted the policy and commercial landscape in favour of home therapies, incentivising dialysis organisations to invest in home programme infrastructure, patient education, and care support models—including AsPD.[33]

5.2 Medicare Payment Reform and PD Trends

The 2011 Medicare prospective payment system (PPS) reform for dialysis represented an earlier, formative policy shift that increased PD utilisation. Caroline et al.[34] analysed USRDS and Medicare data and demonstrated that following PPS implementation, the proportion of patients with early PD experience within 90 days of initiation increased from 9.4% to 12.6%, and late PD use (91–730 days) increased from 12.1% to 16.1%. The PPS was also associated with increased HD-to-PD switches and decreased PD-to-HD switches among early PD patients, suggesting that financial incentives can meaningfully shift modality distribution even in a system with substantial structural inertia.

5.3 Telehealth Policy Expansion

The 2018 Bipartisan Budget Act (HR 1892) represented a significant telehealth policy advance for home dialysis patients in the United States. Prior to 2019, federal regulations restricted telehealth originating sites to rural or health-professional-shortage areas, effectively excluding most home dialysis patients from telehealth consultations. The Bipartisan Budget Act removed geographic restrictions for home dialysis patients, permitting two monthly telehealth visits for every in-person quarterly visit and designating the patient's home as an eligible originating site.[35,36] The COVID-19 pandemic further expanded telehealth access through Public Health Emergency (PHE) waivers, and certain provisions were extended through December 31, 2024.[36] These telehealth policy reforms create an enabling environment for hybrid AsPD models in which remote monitoring, teleconsultation, and periodic in-home visits are combined.

5.4 The Medicare Reimbursement Gap for Assisted PD

The most critical structural barrier to AsPD scale-up in the United States remains the absence of dedicated Medicare reimbursement for home assistance visits. As Hussein et al.[30] explicitly noted, Medicare does not pay for assisted home dialysis, and there is no Current Procedural Terminology (CPT) code for AsPD services. In the current fee-for-service framework, dialysis facilities that provide AsPD must absorb the cost of home visits within the bundled dialysis payment—a model that creates a financial disincentive for most facilities outside value-based care contracts. Baerman et al.[3] comprehensively documented the multiple cost-related barriers to PD expansion in the United States, concluding that policy solutions must align the economic incentives of facilities, nephrologists, payers, and patients to drive the transition toward home-based therapy.

Legislative proposals have begun to address this gap. The Home Dialysis Act, introduced in the US House of Representatives, sought to expand access to home dialysis by improving patient education and reimbursement for home support services. Bipartisan support for home dialysis expansion, including from Representative Bobby L. Rush's 2021 legislation, reflects growing legislative recognition that structural barriers rather than patient preferences or clinical contraindications are the primary constraints on home dialysis growth.[30]

6. MOBILE PHLEBOTOMY SERVICES AS LAST-MILE DELIVERY FOR ASSISTED PD IN THE USA

6.1 The Last-Mile Problem in Home Dialysis Care

In logistics and supply-chain management, 'last-mile delivery' refers to the final stage of the delivery process—the most expensive, time-consuming, and operationally complex step of bringing a product or service to the end consumer. In the context of home dialysis care, an analogous last-mile problem exists: the delivery of clinical monitoring and supportive services directly to the patient's home. For PD patients, this last-mile challenge encompasses: monthly blood specimen collection for laboratory monitoring of dialysis adequacy, electrolytes, haemoglobin, and parathyroid hormone; regular exit-site inspection and care; and eligibility reassessment to determine whether self-care PD can be initiated, resumed, or maintained. Each of these tasks currently requires the patient to travel to a clinic or facility—a burden that disproportionately affects the elderly, frail, and socioeconomically disadvantaged patients who have the most to gain from home-based therapy.

6.2 The Mobile Phlebotomy Industry in the United States: Current Landscape

Mobile phlebotomy—the practice of collecting blood and other biological specimens at a patient's home, workplace, or other non-clinical location by a trained phlebotomist—has emerged as a rapidly growing segment of the US healthcare delivery ecosystem. The industry has historically served life insurance applicants, concierge medical practices, and homebound patients, but has expanded dramatically in recent years, driven by consumer demand for convenient healthcare services, the growth of home health agencies, and the COVID-19 pandemic's acceleration of decentralised care delivery.

In November 2023, Quest Diagnostics—the nation's largest diagnostic information services provider—launched Quest Mobile™, deploying a network of 5,000 trained mobile phlebotomists across 44 states.[37] The service enables patients whose physicians have ordered laboratory testing to schedule at-home specimen collection at a convenience fee of $55 per visit. Quest Mobile represents the most scalable and geographically comprehensive mobile phlebotomy network in the United States and provides an immediately available infrastructure that could be contracted by nephrologists, dialysis facilities, or managed care organisations to serve home PD patients.

Beyond Quest Mobile, a growing ecosystem of mobile phlebotomy providers serves the US market. myOnsite Healthcare is a leading nationwide mobile phlebotomy service provider offering professional, certified phlebotomists who travel to the patient's home, workplace, or care setting at scheduled appointment times. The service is particularly well-suited to the needs of chronic disease populations, including home dialysis patients, given its emphasis on flexible scheduling, clinical-grade specimen handling, and seamless integration with all major diagnostic laboratories, including LabCorp, Quest Diagnostics, WestPac Labs, and hospital laboratory systems.[38] The author maintains an advisory engagement with myOnsite Healthcare, through which the clinical application of mobile phlebotomy services to the peritoneal dialysis population has been actively explored; this engagement informs the service delivery framework proposed in Section 6.6. myOnsite Healthcare provides mobile phlebotomy visits at a transparent fee structure (typically $75–$150 per visit, depending on location and complexity), with real-time phlebotomist tracking, professional-grade infection control practices, and on-demand scheduling that makes monthly home blood draws for PD patients logistically straightforward. The National Phlebotomy Provider Network (NPPN) offers a fully outsourced specimen collection, processing, and delivery service, operating as a laboratory-agnostic network, which enables referring physicians to direct specimens to their preferred diagnostic laboratory.[39] Travalab and other regional providers complement national networks with same-day and next-day appointment availability in metropolitan areas.

Mobile phlebotomy visit fees in 2026 typically range from $60 to $150 per visit, with laboratory testing billed separately. Insurance coverage for the at-home collection fee varies: Medicare covers medically necessary laboratory tests but does not currently provide a dedicated reimbursement pathway for mobile phlebotomy collection fees. However, Health Savings Account (HSA) and Flexible Spending Account (FSA) payments are accepted by most providers, and the trajectory of reimbursement policy is favourable given the broader policy emphasis on home-based care.[40]

6.3 Clinical Rationale for Mobile Phlebotomy in PD Care

PD patients require regular laboratory monitoring to ensure dialysis adequacy, guide prescription adjustments, and detect complications early. Standard practice in the United States requires monthly clinic visits for blood draws, peritoneal fluid assessment, and physician review. These visits are burdensome: transportation to and from the clinic requires patient time and energy, may necessitate caregiver assistance, and generates out-of-pocket costs for non-ambulatory patients. For elderly, frail, or functionally impaired PD patients—precisely the population that would benefit most from AsPD—these monthly visits represent a significant and recurring barrier to PD continuation.

Mobile phlebotomy eliminates this barrier by bringing the blood draw directly to the patient's home. For PD patients, a monthly mobile phlebotomy visit could efficiently combine: (1) blood specimen collection for standard monthly labs (complete blood count, comprehensive metabolic panel, phosphorus, parathyroid hormone, dialysis adequacy indices); (2) exit-site inspection and photograph documentation for remote review by the PD nurse; (3) basic nursing assessment of the patient's self-care technique and cycler operation; and (4) patient education reinforcement. When conducted by a trained phlebotomist or home health aide working under nursing supervision, this combined visit addresses the full spectrum of tasks that currently drive patients to travel monthly to the dialysis clinic.

6.4 Exit-Site Infection Surveillance: A Critical Application

Exit-site infections (ESIs) are among the most important preventable causes of PD technique failure. The ISPD 2023 Catheter-Related Infection Guidelines establish an evidence-based target of no more than 0.40 ESI episodes per year at risk and emphasise the importance of regular, skilled exit-site assessment and early clinical monitoring to ascertain infection severity and guide antibiotic duration.[23] American Journal of Kidney Diseases Core Curriculum data indicate that peritonitis rates in US PD patients have fallen substantially—from 15.1 hospital admissions per 100 patient-years a decade ago to 5.9 per 100 patient-years in recent USRDS data—in large part due to improved exit-site care practices.[41]

Regular home visits incorporating exit-site inspection by trained personnel are fundamental to sustaining this progress and extending it to high-risk populations. A mobile phlebotomist or home health aide, trained in PD exit-site assessment protocols, can photograph the exit site, apply prescribed dressing materials, and flag early signs of infection—erythema, purulent discharge, induration—for immediate review by the home dialysis nursing team via secure telehealth platforms. This surveillance-and-escalation model aligns precisely with the ISPD recommendation for at least twice-weekly exit-site care and immediate clinical response to early infection signs.[23]

6.5 Mobile Phlebotomy as a Bridge to PD Eligibility Assessment

A novel and underexplored role for mobile phlebotomy services in the AsPD ecosystem is bridging the gap between nephrologist eligibility assessment and patient home circumstances. PD eligibility in the United States is currently assessed primarily in the clinic, where patients are evaluated for catheter candidacy, home suitability, and self-care capacity. This clinic-based assessment fails to capture critical home environment factors—storage space, hygiene, lighting, and available caregiver support—that are directly relevant to PD success.

Mobile phlebotomy personnel, conducting monthly home visits, are ideally positioned to serve as the 'eyes and ears' of the nephrology team in the home environment. With appropriate training and structured assessment tools, mobile phlebotomists or home health aides can document: (1) storage space adequacy for PD solution bags and equipment; (2) environmental hygiene and infection risk factors; (3) caregiver availability and health literacy; (4) patient cognitive and functional status; and (5) emerging psychosocial stressors. This information, transmitted electronically to the PD nurse or nephrologist, enables evidence-based PD eligibility reassessment and proactive intervention before crises develop—precisely the kind of integrated, continuous monitoring that is currently absent from most US PD programmes.

6.6 The Integrated Assisted PD and Mobile Phlebotomy Model: A Conceptual Framework

Building on the foregoing analysis, we propose a conceptual framework for an integrated AsPD and mobile phlebotomy service delivery model for the United States, structured around three tiers of intervention intensity:

Tier 1 — Monthly Mobile Phlebotomy (Universal for All Home PD Patients): All patients on home PD receive a monthly visit from a trained mobile phlebotomist or home health aide. Visit components include blood specimen collection, exit-site inspection and dressing, basic technique observation, weight measurement, and standardised home environment assessment. Findings are transmitted digitally to the PD nursing team within 24 hours. This tier replaces the monthly clinic visit for blood draws and exit-site checks, reducing patient burden without increasing infection risk.

Tier 2 — Periodic PCT-Assisted PD (For Patients with Moderate Barriers): Patients identified as having moderate self-care barriers—recovering from illness, experiencing temporary caregiver absence, undergoing PD technique retraining—receive additional PCT home visits two to five times per week for defined, time-limited periods (typically two to six weeks). PCTs, working under nursing supervision, assist with cycler set-up, connection, and disconnection as clinically indicated. This tier mirrors the model validated by Hussein et al.[30,22] in the Satellite Healthcare programme.

Tier 3 — Long-Term Nurse-Assisted PD (For Patients with Permanent Barriers): Patients with permanent barriers to self-care—severe frailty, advanced cognitive impairment, complete caregiver absence—receive daily or twice-daily nurse or advanced PCT visits on a long-term basis, enabling them to remain on PD who would otherwise require in-centre HD. This tier aligns with the French and Danish community nurse models but is adapted to the US regulatory and reimbursement context.

Central to this framework is a digital connectivity layer: a remote patient monitoring platform through which mobile phlebotomists, PCTs, and nurses document visit findings in a shared electronic record accessible to the nephrologist and PD nurse in real time. Automated alerts for abnormal laboratory results, photodocumented exit-site changes, or patient-reported symptoms enable rapid clinical response without the patient leaving home.

7. OPERATIONAL AND REGULATORY CONSIDERATIONS

7.1 Workforce Requirements and Training

Implementation of the proposed integrated model requires clear role definition and competency-based training for mobile phlebotomists, PCTs, and nursing supervisors. Mobile phlebotomists require supplementary training in: PD exit-site assessment using a standardised photographic protocol; basic home environment assessment using a structured tool; escalation pathways for infection signs; and documentation in digital health platforms. PCTs require training in PD treatment set-up and troubleshooting aligned with the Satellite Healthcare model, which demonstrated that a structured PCT training programme can be implemented without increasing peritonitis risk or technique failure rates.[30]

Nursing supervisors retain clinical authority over all PD-related decisions and are responsible for daily review of mobile visit documentation, laboratory results, and exit-site photographs. Tele-nephrology consultations can efficiently replace monthly in-person clinic visits for stable patients, reducing facility operating costs while maintaining clinical oversight. The 2018 Bipartisan Budget Act telehealth provisions for home dialysis patients directly enable this model by permitting two monthly telehealth visits per in-person quarterly visit.[35]

7.2 Regulatory Pathways

In the United States, mobile phlebotomists must be licensed or certified in the state(s) in which they operate, meeting requirements from certifying bodies such as the American Society for Clinical Pathology (ASCP), the National Credentialing Agency (NCA), or the American Medical Technologists (AMT). State regulations governing the scope of practice of PCTs in home settings vary and must be reviewed on a state-by-state basis before programme implementation. Several states have developed explicit provisions for PCT-delivered home dialysis assistance under nursing supervision, providing a regulatory pathway for Tier 2 and Tier 3 services.

HIPAA compliance requirements apply to all digital transmission of patient health information between mobile visit personnel and the nephrology team. Mobile phlebotomy providers and dialysis facilities contracting for integrated services must establish Business Associate Agreements and ensure that all communication platforms meet HIPAA security standards. Specimen transport must comply with OSHA bloodborne pathogen standards and DOT infectious substance transport regulations.

7.3 Economic Viability and the Reimbursement Imperative

The economic viability of the integrated model is contingent on reimbursement reform. Three pathways merit consideration. First, the integration of mobile phlebotomy specimen collection into the Medicare ESKD bundled payment would provide a clear reimbursement mechanism for monthly home blood draws in PD patients—an incremental policy change consistent with the AAKH's home dialysis promotion goals. Second, the creation of a specific AsPD reimbursement code (CPT or HCPCS Level II) for PCT and nurse home assistance visits would enable dialysis facilities to recover the direct costs of Tier 2 and Tier 3 assistance, removing the primary financial disincentive to programme implementation. Third, value-based care arrangements—including the ESRD Treatment Choices (ETC) model and Comprehensive Kidney Care Contracting (CKCC) models—can accommodate assisted PD costs as part of a shared savings calculation, making AsPD investment financially rational for participating organisations even in the absence of dedicated fee-for-service codes.

Baerman et al.[3] estimated that the annual Medicare cost of in-centre HD is approximately $91,000 per patient compared to $76,000 for PD, suggesting a direct cost saving of $15,000 per patient per year for each patient converted from in-centre HD to PD. Even if monthly mobile phlebotomy visits added $1,200–1,800 per patient per year in service costs, and periodic PCT assistance added a further $3,000–5,000, the net cost saving of PD versus HD would remain substantial—and would be amplified by reduced hospitalisation rates in the AsPD cohort.

8. IMPLICATIONS FOR RACIAL AND SOCIOECONOMIC EQUITY

The integration of mobile phlebotomy services into AsPD delivery has significant implications for racial and socioeconomic equity in access to home dialysis. Rizzolo et al.[15] documented substantial racial and ethnic disparities in home dialysis use in the United States, noting that Black, Hispanic, and socioeconomically disadvantaged patients are systematically underrepresented in home dialysis despite equivalent or greater clinical need. These disparities are driven by structural factors, including lower access to predialysis education, higher rates of urgent-start dialysis (which defaults to in-centre HD), caregiver unavailability, inadequate home environments, and provider biases—all of which AsPD directly addresses.

Mobile phlebotomy services are geographically deployable in precisely the communities where clinic access is most limited. Quest Mobile's coverage of 44 states and NPPN's network of independent phlebotomists can reach rural and inner-city communities that lack convenient access to dialysis clinic laboratory services. The combination of home specimen collection, exit-site monitoring, and home environment assessment by trained mobile health workers—who can be recruited from and reflect the demographics of the communities they serve—represents an equity-oriented care model that could meaningfully narrow current disparities in home dialysis access.

9. TECHNOLOGY INTEGRATION: ENABLING THE DIGITAL BACKBONE

Effective implementation of the integrated AsPD and mobile phlebotomy model requires a robust digital infrastructure connecting mobile health workers, dialysis facilities, laboratories, and nephrology teams. Several technology components are critical.

Remote patient monitoring (RPM) platforms, such as those developed for PD cyclers by Baxter (Claria APD system) and Fresenius, transmit automated cycler data, including fill volumes, drain volumes, ultrafiltration, and dwell times, to the PD nursing team in near real-time. Integration of mobile visit documentation—exit-site photographs, patient weight, blood pressure, and assessment findings—into these platforms creates a comprehensive home monitoring dashboard that supports proactive clinical management.[36]

Digital laboratory ordering and result routing enable mobile phlebotomists operating under nephrologist-issued standing orders to collect specimens and route them directly to contracted laboratories, with results returned electronically to the prescribing physician within 24–48 hours. Quest Mobile's specimen transport chain—using the same specimen handling protocols and quality standards as fixed patient service centres—ensures that laboratory result integrity is not compromised by the mobile collection context.[37]

Telehealth platforms enable nephrologists and PD nurses to conduct virtual clinical assessments that replace the majority of in-person clinic visits for stable patients. The 2018 Bipartisan Budget Act provisions, extended through the COVID-19 PHE period, established the precedent and Medicare billing pathways for telenephrology visits for home dialysis patients.[35] Combined with monthly home visit documentation from mobile phlebotomists and PCTs, telehealth consultations provide clinicians with the clinical data required to manage PD patients safely without requiring patient travel.

10. DISCUSSION

This review has synthesised a substantial and converging body of evidence demonstrating that assisted peritoneal dialysis expands access, improves outcomes, and is cost-effective across diverse healthcare systems. The consistent finding across France, Denmark, the United Kingdom, Canada, Australia, and—most recently—the United States is that the availability of professional home assistance transforms PD from a therapy accessible only to patients with intact self-care capacity into a modality available to the full spectrum of patients with kidney failure. The implication is profound: a substantial proportion of the hundreds of thousands of patients currently receiving in-centre HD in the United States could be on home PD if structured assistance were available, accessible, and reimbursed.

The mobile phlebotomy integration proposed in this framework addresses a gap that has not previously been explicitly theorised in the nephrology literature: the structural disconnect between the clinical monitoring requirements of home PD and the service delivery infrastructure necessary to meet those requirements at home. Monthly blood draws represent the minimum monitoring standard for PD patients, yet there has been no systematic proposal to leverage the rapidly maturing mobile phlebotomy infrastructure to eliminate the requirement for patients to travel to a clinic for specimen collection. The author's advisory engagement with myOnsite Healthcare has provided direct insight into the operational capabilities, scheduling logistics, specimen-chain integrity standards, and chronic disease population experience of a leading US mobile phlebotomy provider—informing the practical recommendations advanced in this paper. The availability of Quest Mobile's 5,000-phlebotomist national network, alongside providers such as myOnsite Healthcare and NPPN, creates an immediately deployable infrastructure capable of reaching PD patients across 44 states without the need for new capital investment.

The combination of monthly mobile phlebotomy visits with exit-site inspection and surveillance, patient assessment, and home environment monitoring creates a care touchpoint that serves multiple clinical functions simultaneously. This multi-tasking efficiency is important both for cost management and for patient acceptability: a single monthly home visit that accomplishes blood draws, exit-site care, and patient assessment is far less burdensome than three separate care interactions, and generates a richly documented clinical record that supports remote physician management.

Several limitations and areas of uncertainty must be acknowledged. The evidence base for AsPD comes predominantly from observational studies and programme evaluations rather than randomised controlled trials. While ethical constraints on randomising patients away from effective assistance make formal RCTs unlikely, comparative effectiveness studies using propensity-matched designs and real-world data from national registries represent a viable and high-priority research agenda. The economic modelling presented is based on published cost estimates and requires prospective validation in an integrated AsPD and mobile phlebotomy programme. Regulatory pathways for PCT-delivered home assistance and mobile phlebotomy reimbursement within the Medicare ESKD framework require legislative and regulatory action and cannot be assumed without further policy development.

11. CONCLUSIONS AND RECOMMENDATIONS

This paper has advanced the case that a comprehensive, integrated model combining nurse and PCT-assisted PD with mobile phlebotomy as the last-mile care delivery mechanism represents the most pragmatic and scalable pathway to realising the ambitions of the Advancing American Kidney Health initiative in the United States. The evidence base is clear: assisted PD expands eligibility, improves technique survival, reduces hospitalisation, and enhances quality of life for populations who would otherwise be excluded from home therapy. The operational feasibility of PCT-led assisted PD in the US has been established by Hussein et al.[30,22] The mobile phlebotomy infrastructure for nationwide home specimen collection is already deployed at scale.

The following recommendations are addressed to key stakeholders:

To CMS and Congress: Create dedicated reimbursement pathways for (1) assisted PD visits by PCTs and nurses under nephrologist supervision, through an appropriate HCPCS Level II or CPT code; and (2) mobile phlebotomy specimen collection for PD patients with documented self-care limitations, as an additional covered benefit within the ESKD bundled payment. Expand the ETC model's financial incentives to explicitly reward AsPD programme development.

To dialysis organisations and nephrology practices: Develop AsPD programmes following the Satellite Healthcare/Hussein et al. model, contracting with existing mobile phlebotomy networks for monthly home specimen collection and exit-site surveillance. Establish training programmes for PCTs in PD home assistance and for mobile phlebotomists in exit-site assessment. Implement digital platforms for secure documentation and result routing.

To payers and managed care organisations: Develop value-based care contracts that include AsPD as a covered service, recognising the cost-savings generated by reduced in-centre HD utilisation and hospitalisation rates. Negotiate bulk contracts with mobile phlebotomy providers to provide at-home specimen collection for all enrolled PD patients as a standard benefit.

To the research community: Conduct prospective comparative effectiveness studies of AsPD versus standard care in the United States using USRDS and programme-level data. Evaluate the clinical and economic impact of mobile phlebotomy integration in PD care. Develop and validate standardised training curricula for PCTs and mobile phlebotomists in PD-specific home care tasks. Prioritise equity-focused research on the differential impact of AsPD on racial, ethnic, and socioeconomic disparities in home dialysis access.

The integration of assisted peritoneal dialysis with mobile phlebotomy as a last-mile delivery mechanism is not a distant aspiration—it is an operationally viable, evidence-based strategy that requires primarily a policy decision and the will to implement it. For the hundreds of thousands of Americans with kidney failure who might be living at home on peritoneal dialysis, that decision matters enormously.

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