UNLOCKING THE UNTAPPED POTENTIAL: THE NEGLECTED HOME DIALYSIS ASSETS IN EUROPE

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Introduction

Historically, the provision of maintenance hemodialysis for advanced CKD predominantly occurred in a home setting, until the initiation of Medicare coverage in the US. This policy shift disincentivized home treatments in favor of large-scale in-center hemodialysis, consequently diminishing the proportion of dialysis patients treated at home to below 1.5%. Although peritoneal dialysis (PD) partially took over this role, the uptake of PD and home hemodialysis together has remained low, both in the US and in Europe, disregarding several inherent advantages of home dialysis. Despite initiatives in some countries to enhance uptake, utilization rate remains limited. This editorial endeavors to elucidate the benefits of home dialysis vis-à-vis the (limited) drawbacks (figure). A forthcoming editorial will review possible solutions.

Flexible time schedules

Home dialysis avoids time loss due to travel to and from the unit, as well as any delays within the unit. Moreover, nocturnal variants such as extended home hemodialysis and automated PD, allow more daytime flexibility compared to standard in-center hemodialysis. These flexible schedules not only provide more time to younger individuals for their studies, but also sustain professional engagement of adults. The latter is increasingly significant as the dialysis population comprises a growing number of ageing persons who wish to remain active at the workplace.

Particularly home hemodialysis excels in accommodating time schedules according to the patient's personal and clinical requirements, leading to improved solute removal and volume control and blood pressure regulation. Additionally, such schedules are better equipped to prevent complications like hyperkalemia and hypervolemia, which are associated with higher mortality rates following extended weekend intervals typical of traditional thrice weekly in-center hemodialysis.

Opinion of professionals and patients

In a recent European survey of health professionals engaged in kidney care, an overwhelming majority expressed dissatisfaction with the adoption rates of the two home dialysis strategies in their respective countries. This sentiment was particularly pronounced for home hemodialysis[2].

When dialysis patients were polled about their preferred treatment setting (home, satellite unit or in-hospital), the majority expressed a preference for home dialysis, regardless of their actual treatment location[3]. Overall, greater autonomy, flexibility, improved quality of life and strengthened relationships are referred to as key advantages.

Health-economic aspects

Most countries offer lower reimbursement rates for home dialysis compared to in-center dialysis[4], thus disincentivizing home dialysis. Higher resource constraints for in-center hemodialysis can be attributed to the amplified workforce demands, which emerge as a substantial cost contributor, particularly in higher income countries. Nevertheless, costs of in-center hemodialysis are often over-reimbursed. In home dialysis, medical staff are primarily needed for training and troubleshooting while patients and their caregivers perform the procedure themselves. Although some studies suggest that the *cost-effectiveness* of home hemodialysis is not different from that of in-center hemodialysis, this parity arises from the extended survival rates observed among home hemodialysis patients[5]. Consequently, when considering a lifelong perspective, the *cost-utility* of home hemodialysis surpasses that of in-center hemodialysis.

Analyses comparing the real costs of each strategy would be beneficial to allow precise fact-based cost-utility comparisons and accurate reimbursement.

Protection against hospital-related complications

Home dialysis may reduce the risk of expansion of highly contagious infectious diseases prevalent in centralized treatment facilities where patients and medical staff live in a closed community. Amid the COVID-19 pandemic, PD patients exhibited diminished susceptibility to infection compared to their counterparts receiving in-center care, albeit with a potential bias due to more frequent screening in the latter setting. Similar findings have been noted in previous studies for hepatitis B and C. While current control measures for COVID-19 may seem adequate, the looming threat of future severe pandemics underscores the ongoing significance of these observations.

Health workforce shortage

The shortage of physicians and nurses presents a growing global challenge, jeopardizing both the continuity and quality of healthcare provision. This predicament extends to in-center hemodialysis, given the need to involve skilled professionals, the considerable time commitment per treatment and the ongoing requirement for vigilant monitoring. The continual decline in staffing levels can be attributed to the ageing workforce and burnout among the existing personnel, coupled to an insufficient influx of younger staff members, due to inadequate remuneration, unappealing working conditions, and a lack of strategic foresight. Healthcare workforce deficits are even more pronounced in economically disadvantaged nations, albeit primarily due to underlying structural deficiencies. Home dialysis allows to alleviate this problem. Additionally, the opportunity to train a variety of home

dialysis candidates, may be more professionally attractive than routine in-center dialysis nursing, and increase interest for the job.

Environmental impact

Healthcare bears a substantial environmental burden, with dialysis standing out as a significant contributor due to greenhouse gas emission because of the therapeutic process, monitoring, transportation and various supportive activities. Moreover, dialysis also generates substantial amounts of water and plastic waste.

Home dialysis presents several environmental benefits compared to in-center hemodialysis. It eliminates the need for patient and personnel transportation as well as the maintenance and climate control demands of large-scale infrastructure.

Assessing the environmental impact disparities between hemodialysis and PD proves challenging. PD holds an advantage due to lower water consumption and in the case of continuous ambulatory peritoneal dialysis (CAPD) reduced energy usage per treatment. However, these benefits are outweighed by higher plastic consumption and resultant waste, as well as higher transportation volumes (16 liters or more of peritoneal dialysis bags for 48 hours of treatment versus a single hemodialyzer and tubing set), which is, however, offset by a lower need for transport of patients and personnel (see above). Similarly, home hemodialysis systems that necessitate smaller dialysate volumes mitigate water wastage, albeit partially offset by the use of plastic bags for dialysate delivery and the frequent need for daily treatment. Innovative compact systems designed for home dialysis that are under development, have the potential to reduce future environmental burden.

Quality of life

A comprehensive meta-analysis of 46 articles underscored the overall superiority of quality of life indicators associated with home dialysis compared to in-center hemodialysis, particularly demonstrating enhancements in physical aspects[1]. Superior outcomes were notably more prevalent in Western Europe, although the results might have been influenced by confounding factors such as selection bias. Consequently, there is a need for well-designed prospective quality of life studies, that facilitate an objective comparison among dialysis modalities by evaluating an extensive array of contributive factors.

Survival

Survival rates are comparable for PD and in-center hemodialysis[6], and after adjusting for confounding variables also across home hemodialysis, automated PD (APD) and continuous ambulatory peritoneal

dialysis (CAPD)[7]. Extended home hemodialysis, in comparison to standard in-center hemodialysis, exhibits more favorable survival and surrogate markers such as serum phosphate levels, inflammatory parameters, hospitalization rates and blood pressure[8]. Nonetheless, despite adjustments made for confounding factors in observational studies, it is crucial to consider the potential impact of selection bias on these favorable outcomes. In addition, survival may be less crucial for dialyzed people than quality of life.

Drawbacks and solutions (figure)

Despite prior safety concerns, particularly regarding home hemodialysis, there is now sufficient data to affirm the safety of all home dialysis strategies, including home hemodialysis[9].

The time and productivity loss experienced during training is offset by the time gained once home treatment commences, eliminating waiting times in-center and time losses due to travel.

While medical isolation can be addressed by telemedicine, it does not eliminate social isolation. However, in-center hemodialysis offers poor relief for loneliness. Structural interventions by communities, neighborhood, or families provide the only sustainable solutions in this regard.

Additional personal expenses warrant special mention as home hemodialysis patients may face charges for electricity and water usage, which are subject to fluctuations depending on economical and political circumstances, occasionally resulting in additional fees such as environmental taxes for high water consumption. Policy measures are essential to address these injustices.

If, against their preference, patients are not enrolled in home programs, this is often due to practical obstacles like lack of a supportive partner or insufficient space. Additional concerns, particularly for home hemodialysis, may arise regarding responsibility and caregiver burden. However, many of those drawbacks can be mitigated through education, information, assisted home dialysis and/or policy measures, as will be elaborated in an upcoming editorial.

Indications

Currently, there remain very few contra-indications against home dialysis[10]. Accordingly, every well-informed individual without contra-indications should be deemed eligible for home dialysis. Various patient profiles are particularly suited, such as active or working people, individuals seeking flexibility or autonomy, and pediatric patients. Home hemodialysis is particularly suited for those compelled to discontinue PD due to complications, or individuals wishing home dialysis who are less suitable for PD due to factors like high body weight or insufficient residual kidney function.

Conclusions

This editorial outlines the numerous benefits for patients and society of home dialysis compared to in-center hemodialysis (figure). While there are some drawbacks, most can be addressed by education, information, or policy measures. Despite the advantages, the adoption of home dialysis among dialysis patients in Europe stagnates around 10%. Given the quickly evolving global environmental, economic and political landscape, there is an urgent necessity for a paradigm shift to ensure safe, affordable and sustainable care for all eligible candidates with advanced CKD. Home dialysis should be an integral component of this transformation.

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CONFLICT OF INTEREST STATEMENT

RV is advisor to AstraZeneca, Glaxo Smith Kline, Fresenius Kabi, Novartis, Kibow, Baxter, Nipro, Fresenius Medical Care and Nextkidney.

SD has previously received lecture fees from Baxter HealthCare and Fresenius Medical Care and is on the advisory board for Ellen Medical. His Home Dialysis research is funded by the National Institute for Health and Care Research Health Services Health and Social Care Delivery Research programme.

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The other authors had nothing to declare.

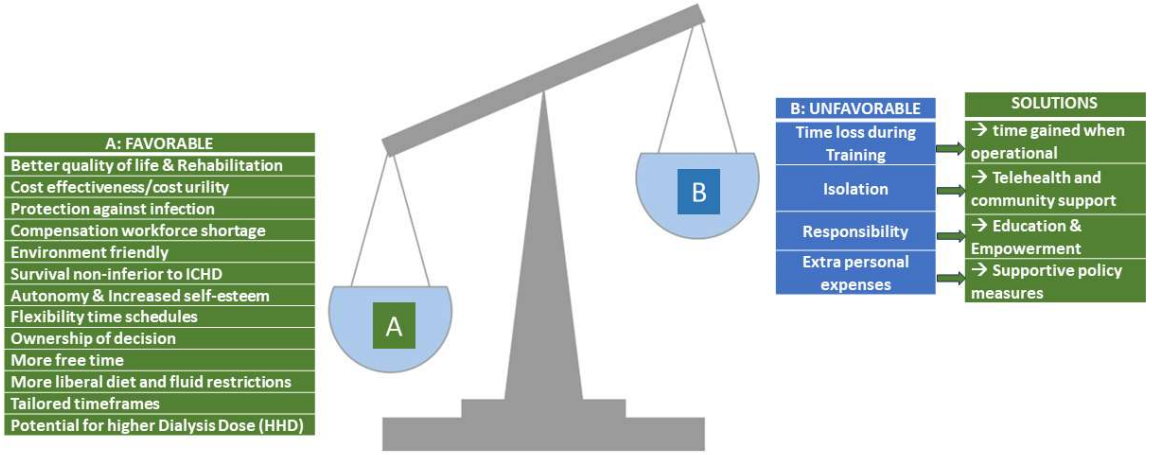

Figure caption: Balance between the favorable (left side of the balance, green background) and unfavorable characteristics (right side of the balance, blue background) of home dialysis. For all unfavorable characteristics, there are solutions for all unfavorable characteristics (right side of the balance, blue to green background - arrows). ICHD: in-center hemodialysis.

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