

GFR, but also on muscle mass and metabolism, fluid balance and nutritional support. Previous studies have shown that GFR estimating equations could be predictive of severe renal failure, but Pelletier *et al.* have demonstrated that they cannot precisely estimate GFR in order to, for example, adapt drug dosage. In the future, we hope that a combination of tissue injury and functional biomarkers, or GFR estimation formulae, could better define a global phenotype of AKI, including its severity, prognosis and recovery (Figure 1).

Today, the direct measurement of GFR in AKI is performed in clinical research, not in routine practice, but in the future, if technically feasible, and if a therapeutic intervention becomes available, it may be required at the early infra-clinic phase.

CONFLICT OF INTEREST STATEMENT

The authors have declared no conflicts of interest.

(See related article by Pelletier *et al.* Estimating glomerular filtration rate in patients with acute kidney injury: a prospective multicenter study of diagnostic accuracy. *Nephrol Dial Transplant* 2020; 35: 1886–1893)

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Home based therapies: can wishes be realized?

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BACKGROUND

Since the first report on dialysis therapy for chronic kidney disease in 1960 [1], the number of treated patients on renal replacement therapies (RRTs) has increased exponentially (US Renal Data System, European Renal Association–European Dialysis and Transplant Association, Australia and New Zealand Dialysis and Transplant registry and Japanese data). In part due to available facilities not having the capacity to treat all the patients reaching end-stage renal disease (ESRD), home-related therapies have been developed from the very early times of dialysis. Merrill’s group in Boston [2] and Scribner’s group in Seattle [3] reported on home dialysis as early as 1964 and 1965.

In Europe, the first group to report on home dialysis was the Royal Free Hospital in London [4]. Home dialysis was defined as an ‘open system’, able to admit an unlimited number of patients, in contrast to facility dialysis with its limited number of available chairs and treatments [5], and the expansion of this modality had evident consequences for the financial burden of dialysis treatment [6]. However, difficulties in developing home treatment were also reported [7] and the late 1980s and early 1990s witnessed a clear decline in the proportion of patients on RRT that used home-based therapies. Many factors may have influenced this decline, including funding models for dialysis, the expansion of dialysis facilities beyond city centres, the

socio-economic and domestic status of the patient and, in particular, the nature of housing. Many facilities now provide only facility-based haemodialysis (HD), with no option for home-based therapy, despite initial intentions. The increased treatment possibilities in-centre and the observed growth in the incidence and prevalence of RRT patients has resulted in very high costs for RRT programmes, which have exploded the overall cost of providing RRT and significantly drained national health budgets.

The increase in the absolute and also relative budgets dedicated to RRT programmes has led governments to study more affordable techniques and propose them in order to handle the healthcare expenses in high-income countries. Home-related therapies, along with transplantation, have been supported by various governments. In Australia, with already a 'long' experience in home therapy, incentive measures were introduced to increase home-related therapies in 2005 [8]. In France, priority has been given to transplantation access and home-related RRT and a target for peritoneal dialysis (PD) fixed at 15% of RRT patients has been established following an analysis of the medical and financial burden of the different RRT modalities [9]. In the USA, the RRT programme was given high priority by the president in 2019 and measures to impose a target of 80% of ESRD patients treated by home therapies or transplantation by 2025 have recently been established.

However, will the wishes of the occidental countries' administrations become reality? Is the implementation of these governmental objectives feasible and safe for all the patients concerned?

In this issue of the journal, Ethier *et al.* [10] address the influence of patient-related factors as well as centre-related constraints on developing home care for ESRD patients. They analysed the records of the Australian and New Zealand registry (ANZDATA) on incident patients for a 21-year period and found that 24 399 of 54 773 (45%) incident patients had at least one report of home therapy within a 6-month period following their RRT onset. They noted a considerable centre effect, with the rates of home-based therapy ranging from 0 to 87% across centres, even in two countries with high rates of home-based dialysis. Then they analysed the factors limiting the uptake of home-related therapies according to those related to the patient and those related to the centre. They further observed that adjusting home uptake by those variables related to the patient status would increase it by 3%, while adjusting by those related to centre-level characteristics decreased home uptake by 24%.

THE BENEFITS OF HOME-RELATED THERAPIES

Before focusing on the limiting factors of home therapies, we will first stress their benefits. The first is proximity of the treatment to home, with its immediate consequences on saving time and travel costs, improving comfort and anxiety ('nothing can be as good as home') and avoiding many of the in-hospital medical complications, such as related infections. Also, importantly, flexibility of treatment time and schedule is a big advantage of home-related therapies. The rigidity of the healthcare

centres' processes with the organization of time of work, number of shifts and availability of treatments is overcome by home therapies. Patients on home dialysis (PD or HD) are free to organize the number of treatments per week, the duration of the dialysis sessions and the scheduling of those sessions according to their needs without the limits of working hours and clinic organization.

Both PD and HD have their advantages and limitations when performed at home, and their use is not mutually exclusive over time. Optimizing the uptake of home RRT is the main point, with the abovementioned advantages. It might be easier to learn PD, to organize one's life around dialysis and particularly to travel for those patients on PD; nevertheless, PD has its own limiting factors. The major one being difficulty in maintaining long-term sustained efficacy necessary for good-quality treatment due to a dependence on residual renal function. In the situation of PDs' efficacy decay, home HD would appear to be the best substitute, although the uptake of this transition (PD to home HD) is low in most countries. This possibly relates to late decisions on transition resulting in abrupt cessation of PD in situations of medical instability (e.g. peritonitis).

Concerning the duration of HD treatment schedules, it has greatly evolved since the first reported treatment of Clyde Shields that lasted 72 h [1]. In 1975, Cambi *et al.* [11] proposed 3-h treatments three times per week and a third shift could be scheduled in many of the dialysis centres, increasing the availability of in-centre treatment. The inclusion of such a schedule in dialysis centres was so convenient that no one was ready to accept any danger linked to the short-duration treatments. As early as 1984, in a limited population of 54 patients, it was noted that the reduction in time from 3 times for 6–8 h/week to 3 times for 3 and sometimes 4 h/week resulted in a significant increase in blood pressure that was related to overestimation of the dry weight. The overestimation was the consequence of the reduction in treatment time and the consequent increase in ultrafiltration rate [12]. It was not until 1992 that Charra *et al.* [13] confirmed that dialysis treatment time was linked to blood pressure control and that survival improved with longer dialysis schedules. The effect of time and frequency on outcome has been reviewed by Sarafidis *et al.* [14]. Home-related therapies probably represent the best option to profit from the time- and frequency-linked benefits in outcome as recognized by nephrologists [15].

THE LIMITS OF HOME-RELATED THERAPIES

The limits of home-related therapies in the case of dialysis separate into two different aspects: those particularly relating to stress on the patient and family and those preventing the uptake of home dialysis. Among the first, we want to cite the risks of misadventure, and especially needle dislodgement, technical mishaps and poor compliance/adherence to the treatment regimen. Ethier *et al.* [10] identified and quantified several factors linked to the patient and also others linked to the centre that inhibit the uptake of home dialysis. The patient-related factors have been well recognized. Increasing age and comorbidities are known to be limiting factors for home therapies. Indeed, other personal, non-medical factors, such as personal stability

in couple or single situations, comfort and quality of life, wealth, home environment and perception of personal involvement in self-care versus social expectations, influence the uptake of home therapies. However, starting with the wide variation in uptake of home dialysis, Ethier *et al.* [10] show that centre characteristics are also important in determining the uptake of home therapies, an aspect that has not attracted as much attention and is far less reported. We cannot always blame it on the patients! Medical and nursing staffs need to be invested in home dialysis for it to work and for patients to be directed to its advantages. Smaller units had lower rates of home-based dialysis, perhaps finding it difficult to gather momentum in these approaches. Initiating and maintaining a home HD programme, in particular, requires an investment of time and energy from the medical and nursing staff.

An extension of this concept is the requirement for commitment to home therapies by the renal community, especially recognizing the treatment time-related benefits on outcome for RRT patients. The report by Ludlow *et al.* [16] shows that Australian physicians believe that 'more dialysis is better', as opposed to the interpreted results of the National Cooperative Dialysis Study, the very first relevant trial on dialysis efficacy. Precisely, this conviction may explain the good figures for uptake of home-related therapies displayed by the ANZDATA registry when compared with other registries.

The other particular factors that were considered centre related (proportion of patients with permanent access at dialysis initiation and number of hours of HD prescribed per week) possibly reflect overall attitudes towards HD provision and attention to detail, with units paying greater attention to dialysis provision also having higher proportions of home dialysis. This serves as a reminder to all nephrologists that dialysis provision requires as much attention as the more 'exciting' aspects, such as acute glomerulonephritis or transplantation.

MAY THESE LIMITATIONS BE OVERCOME?

- a. Acknowledge the nurses and physicians (through work conditions and wages)

If one is to improve the participation of nursing staff and physicians in home-related therapies, then it might be foreseen that in addition to the natural commitment of healthcare workers to patient's well-being, the work conditions and acknowledgement (including through labour advantages and wages) must be improved and looked after. Among the incentive measures for clinics, those directed towards healthcare workers should also be guaranteed. For example, reimbursement for supervision of home dialysis by nephrologists, as already exists in Australia, should be considered to remove any disincentive on the part of the physician to direct patients to home dialysis.

- b. Strive to influence the stakeholders, particularly industry, to support home therapy

Industry has been providing technology, equipment and consumables necessary for dialysis treatments from the very beginning. However, it has also entered into the financial

world of dialysis with a new role as a dialysis treatment provider. This same industry is presently the owner of the largest corporations driving dialysis clinics around the world, thereby supporting significant financial enterprises by completing the chain from material production to offering their own products in their clinics. Redirecting their focus to home therapies will be a challenge, but it remains important not only by way of political imperative, but also for the clinical benefit of those who receiving RRT at home. In that respect, supporting those facilities independent of industry may be a way to re-equilibrate the control and management of RRT options offered to patients.

Ethier *et al.* [10] also contribute with a first evaluation of the effectiveness of the already applied incentive measures established in Australia supporting home-related therapies in 2005, as they analysed the ANZDATA separately before and after the application of such measures (what they call the 'ERA' variable). Similar reports from other countries (e.g. France and the USA once they have undertaken the measures proposed by the presidential report) may shed light on the rate of success in reaching the targeted objectives. The expansion of home RRT options takes political will as well as medical decision making. With escalating healthcare costs around the world, the need to contain these costs yet still provide optimal therapy is an equation that rests comfortably with home dialysis when possible. However, we are yet to see whether the administrations' wishes become reality.

CONFLICT OF INTEREST STATEMENT

The authors declare no conflicts of interest related to this manuscript.

(See related article by Ethier *et al.* Effect of patient- and center-level characteristics on uptake of home dialysis in Australia and New Zealand: a multicenter registry analysis. *Nephrol Dial Transplant* 2020; 35: 1938–1949)

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