

Improving and Simplifying Home-Based Peritoneal Dialysis

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Improving Access to Home Dialysis

Unlocking Peritoneal Dialysis

Closing the Gap: Promoting Home-Based Peritoneal Dialysis

The Future of Home Dialysis



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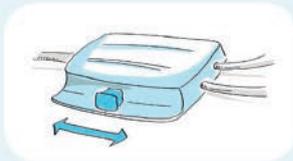
A BREAKTHROUGH IN PD CONNECTION

With the new PeriSafe® device, the connection of the transfer set and the dialysis bag system is now possible in a safe and easy way. All therapy steps are processed inside of a protected area, and by only pushing a button, the frangible is broken and the tubes are clamped.

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- Allowing patients to PD previously not eligible
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- Enabling assisted care models, relief of caregiver burden
- Standardizing training and reducing training times



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Foreword

If you've been in your local GP practice or hospital recently there's a good chance you've seen signs promoting the use of self-care. This is key to the NHS's forward strategy of saving money and promoting patient empowerment and it's happening almost everywhere including in the provision of dialysis.

Health services around the world, including the NHS, view home dialysis as offering a tremendous opportunity to improve treatment for patients with kidney disease while also saving money. As things stand, dialysis scores poorly in terms of quality of life and survivability – the hope is that by shifting treatment into the home, things can change.

Even so, there is work to be done. A combination of new thinking, processes and products will be needed to overcome obstacles to acceptance and improve the lives of patients around the world.

Our opening article comes from a new face on the block. Launched in 2015, Peripal has been making rapid progress. Its new product, PeriSafe®, simplifies the process of peritoneal dialysis giving patients

more confidence and opening up the treatment to more people.

Elsewhere in the Report, we'll see how this product, and others like it, are changing the face of home dialysis, reducing the risks, improving compliance monitoring and patient wellbeing. New products are coming to market creating exciting opportunities for development.

These products can increase the use of home dialysis, which can also offer huge benefits to patients and the health service. However, as Jo Roth finds out, there is still some way to go. He asks why home dialysis rates have fallen over the past few decades. James Butler follows this up with some measures which could close the gap.

The NHS faces challenges on multiple fronts. Measures which can improve the quality of care while also saving the NHS money will play an important role in how the health service meets those challenges.

Tom Cropper
Editor

Tom Cropper, has produced articles and reports on various aspects of global business over the past 15 years. He has also worked as a copywriter for some of the largest corporations in the world, including ANZ Bank, ING and KPMG.

Improving and Simplifying Home-Based Peritoneal Dialysis

Martin Dubach, Director Marketing & Sales, Peripal AG, Zurich, Switzerland

Dr. Sandra Neumann, CEO and Founder, Peripal AG, Zurich, Switzerland

VALERIE, A CKD patient, lives in a loving relationship with her partner. She independently runs the household, cooks and spends time with her grandchildren. Valerie has established a structured daily routine to successfully incorporate her PD treatment at home. In the last months, however, arthritis further reduced the mobility of her fingers and her manual strength. Now, Valerie has difficulties to break the pin in the y-tubing of the twin bag and connecting the transfer set. Rheumatic disease is common in renal patients^a and Valerie is offered a hospital-based therapy by her nephrologist. She would prefer to continue her therapy at home and needs assistance.

A safe and simple connection of the transfer set and the dialysis bag system is inevitable to ensure, that patients feel comfortable with the PD therapy, and that a larger number of patients can perform the dialysis at home.

Underutilized PD Therapy

Approximately 3 million people around the world suffer from end stage renal disease (ESRD) and are required to dialyze^b. The percentage of ESRD patients treated with peritoneal dialysis (PD) has declined in many developed countries since the mid-1990s^{c,d}. This decline has occurred despite the apparent cost advantages of PD and despite initiatives to grow the modality^{e,f}. Peritoneal dialysis enables the patients to keep their independence and increase the quality of life^g. Furthermore, the survival rate and clinical outcome of PD and HD are equal^h, and among informed patients, if given a choice of treatment modality, the majority will choose self-care dialysis including continuous ambulatory peritoneal dialysisⁱ. If one looks at all these benefits, it's quite astonishing to see, that the PD therapy is underutilized to such an extent.

Potential Infection and Complexity

There are numerous reasons why the PD penetration is at this low level. If we take a specific

look at the therapy handling, the most common complications that need to be addressed are certainly the potential risk of an infection and the complexity of the transfer set connection.

In recognition of this importance, Peripal AG, a start-up company based in Switzerland, has committed itself to face this challenge and make the PD process safer and easier. As a result, this would allow more patients to treat themselves at home and would result in considerable health care cost reduction worldwide.

A major reason for infections is the touch contamination of the transfer set. This most likely happens during the manual operation of the connection to the dialysis bag system. Patients that use twin bag systems have to perform multiple steps manually and with an open transfer set. This potentially leads to a Peritonitis episode and will unsettle the patient in the ongoing therapy process. If, due to one or multiple Peritonitis episodes, a patient is changing the therapy modality to HD, the overall cost exponentiate. Furthermore, the current PD therapy process is rather complex and can pose problems, especially for people with disabilities and older patients. Breaking the frangible of the twin bag and affixing the clamps to the tubes, requires a considerable degree of effort and is a possible reason why some patients might not be eligible for the PD therapy.

Perisafe® – A New Approach

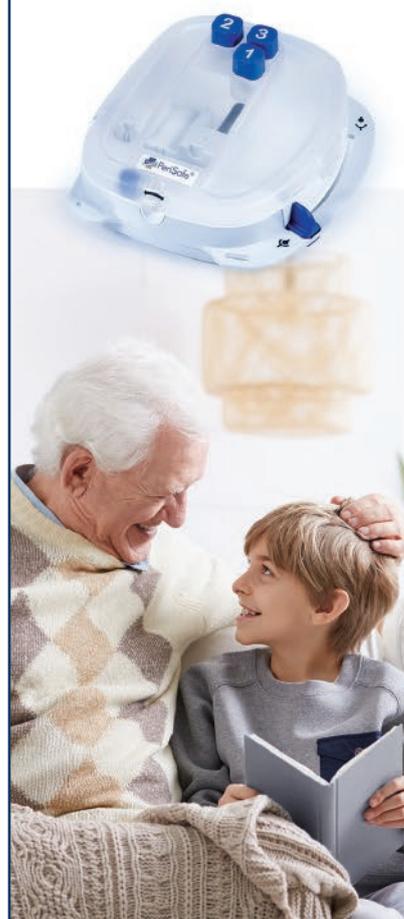
Peripal has extensively evaluated the current PD therapy process and has determined the key challenges. A first need finding suggested that there exists the requirement to develop a novel auto-connect device for PD patients to overcome current hurdles for PD use. The aim was to understand how such a device could support home care patients and what functionalities would be required to better standardize the therapy. PeriSafe® has been developed together with actual PD patients from the beginning to ensure that the needs of the patients are in focus. The help of the advanced eye tracking method (measurement of eye positions, eye



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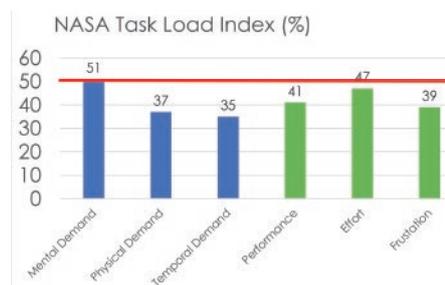
movement, and focus point of the user's eye) allowed us to develop the device through the eyes of the patient.

Peripal has pursued a new approach how to cope with the existing problems. With the well-engineered PeriSafe® device, all steps related to disconnecting and connecting the transfer set to the dialysis bag system are performed within a protected area and can be manipulated by only moving a lever up and down. The manual contact with the open transfer set is therefore no longer necessary. Instead of the cumbersome process to break the frangible and affix the clamps, the PeriSafe® device masters these steps by just pushing a button. This simplified handling and safe operation will empower patients with more self-confidence and the peace of mind to perform the therapy at home.

Perisafe® Successfully Validated

A recent human factors study (human factor validation testing) carried out at the Queen Elisabeth Hospital in Birmingham has substantiated the safe and easy handling of the PeriSafe® device. A culmination of 48 test persons (the majority being patients with some carers) took part in the study. The test persons who were involved in the study received a 90 minutes training session on the device, followed by a one-hour break and a handling test (incl. NASA TLX record).

The NASA Task Load Index is a subjective assessment widely used in medical tests. It is quoted in more than 4400 publications, and was developed to evaluate the perceptual mental workload of an activity. Eitheim and Fernandes state, workload levels below 50 were perceived as acceptable^l.



Benefits

Peripal's main objective is to make the PD therapy safer and less complex for the patient. This can increase the number of PD patients and offer the therapy also to those who are not eligible today. The device yields additional benefits also in many other areas, which will be further addressed below.

Reducing Early Dropout from PD Therapy

Studies have shown that the initial 6 months of a PD therapy is a period of vulnerability associated

with a higher rate of technique failure^k. The drop-off rate is 15% on average^l and thereof 35% Peritonitis related and 25% psychosocial related^m. This means, that the majority of the problems leading to an early drop-off, can be addressed by the PeriSafe® device. The period after the diagnosis of ESRD and before starting a therapy can be very challenging. PeriSafe® can help the patient to familiarize and feel comfortable with the therapy process very quickly.

Usable by Patients Previously Not Eligible for PD

Some patients battle with comorbidities like rheumatic disease and visual impairment etc. In many cases, an HD therapy is recommended by the nephrologist instead of a PD therapy, although the patient would prefer to dialyze at home. With PeriSafe®, certain comorbidities are no longer a handicap: the big buttons and the lever allow for an easy operation of the device and a secure placement of the transfer set. Patients are empowered and guided through the therapy.

Better Protecting Patients from Infections

Patients' compliance with proper dialysis technique decreases over time. This change in behavior is associated with increased risk of peritonitis^{n,o}. With PeriSafe®, the most delicate therapy step, the manual connection of the transfer set and the dialysis tubing is performed inside the protected device. PeriSafe® is easy to learn and will provide the patients with the ease of use and peace of mind to continue their therapy at home.

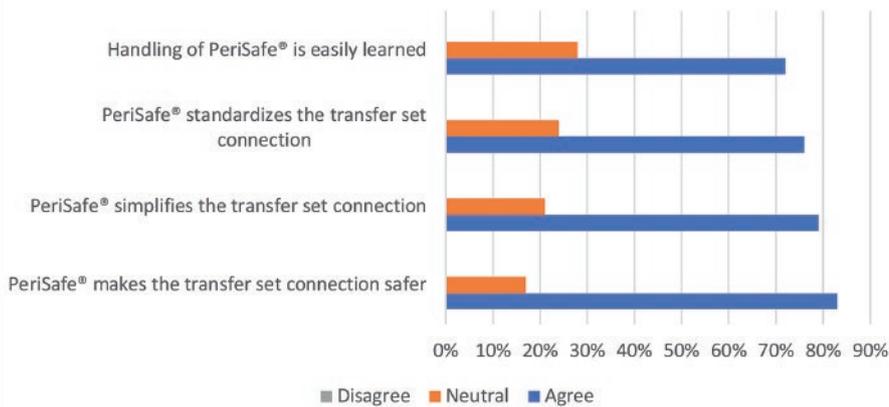
Enabling Assisted Care Models - Relief of Carer Burden

Not all patients might be capable of handling a home therapy on their own. The concept of an assisted PD therapy is working very well in France, where a large majority of patients older than 70 are on assisted PD^p. This can be a future model for various other countries. Elderly dialysis patients have significant comorbidities and complications such as problems with vascular access or poor tolerance of HD^q. Integration of assisted PD in nursing homes could, therefore, increase PD penetration in older patients and improve their quality of life^r. PeriSafe® standardizes the exchange procedure and could reduce the number of visits required per patient. Assisted PD in nursing homes becomes a feasible and time-saving technique to treat patients in their familiar setting.

Standardizing Training and Reducing Training Times

Due to progressing intoxication, dialysis patients

PeriSafe® device



often show reduced cognitive functions such as attention, orientation and executive function^{s,†}. The PeriSafe® device was developed with patients' feedback from the start. The use of PeriSafe® is easy to learn and follows a clear instruction guide through the procedure. PeriSafe® standardizes and simplifies handling and provides patients with peace of mind to start the therapy at home.

Experts Support Perisafe® Benefits

A complementary survey performed with 29 HCPs at EuroPD showed that the majority immediately recognized the potential of the device to protect from infections and appreciated its functional simplicity.

An estimate can be made that approximately 20% of current PD patients are eligible for the PeriSafe® system from the HCPs' perspective. Patients who do not principally require assistance in home dialysis, could nevertheless appreciate the added security and consider PeriSafe® in the future.

Conclusion

With the new PeriSafe® assistant device for Peritoneal dialysis, moderate dexterity impairment, and many other complications are no longer a handicap to perform PD. Therefore, patients like Valerie could continue their treatment at home, could spend more time with family and benefit from more independence and flexibility in their life. However, more data on use of the device will be gathered in post-market clinical surveys to measure the benefits of the device.

Contact

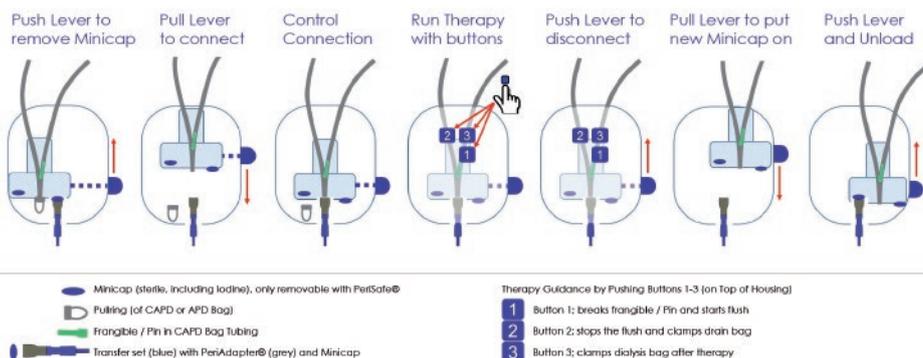
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Functionality of the Perisafe® Device

How does the PeriSafe® System work?

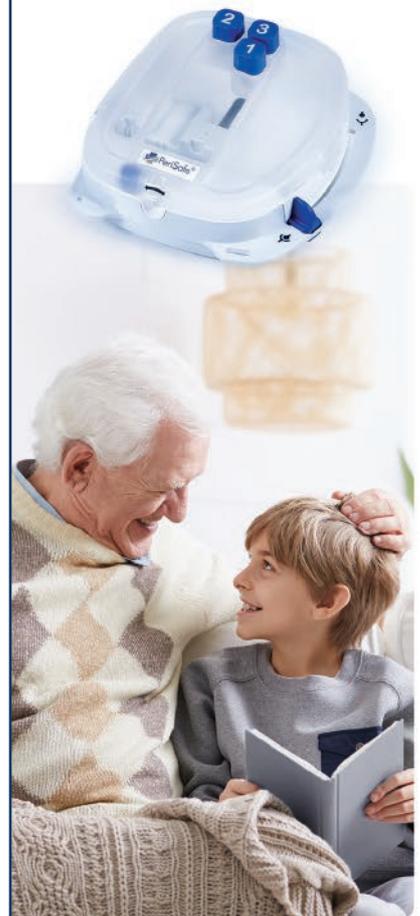
The PeriSafe® system removes the old minicap, connects the dialysis bag system to the transfer set, guides the patient through the therapy with buttons, disconnects, and puts a new minicap back on. Breaking the frangible and clamping the dialysis lines is replaced by simply pushing a button, the connection is established inside of the protected device.



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Improving Access to Home Dialysis

Tom Cropper, Editor

End stage renal disease represents a major health problem in the developed world. Improving access to home dialysis can improve patient outcomes and reduce costs.

AS THE NHS comes under pressure from several quarters, the health service is seeking new ways to reduce the strain on resources. Methods such as home dialysis, and particularly peritoneal dialysis (PD), offer attractive benefits to patients and hospitals by reducing costs and improving the quality of care. However, adoption of PD has been falling for the last two decades. Despite attempts to reverse that trend, access is still sporadic across the NHS estate.

Growth Rates

According to the Kidney Project, an estimated three million people around the world suffer from end stage renal disease (ESRD)¹. Advances in healthcare are enabling people to live longer and healthier lives, but that also means more people with long term and complicated conditions such as ESRD. A poor diet and a lack of exercise is also contributing to an increase in the number of people living with diabetes² which can be a causation factor for ESRD. Inevitably, this means more pressures coming to bear on the NHS as it attempts to ensure that patients receive the best possible standards of care.

The pressures are two-fold. On the one hand the NHS is seeing budgets shrink, while demand increases. According to NHS England, the health services faces a £30bn funding gap over the next five years³. It comes at a time when staffing levels are, in some places, critical. According to reports last year, some hospitals have been forced to offer doctors rates of more than £90 per hour to take additional shifts⁴. This problem is far from unique to the UK. As Medscape reports, California is taking action to address a crisis of dialysis staffing⁵. In Canada, the *Guardian* reports that rising demand for dialysis is placing the P.I.E system under pressure⁶.

Short-handed medical staff are being asked to handle greater workloads and work longer hours. An NHS survey released in 2017 found that over half of doctors were working unpaid overtime⁷. The inevitable result of these longer working hours

is an increased risk of clinical error. NHS figures reveal that the number of cases in which patients received sub-optimal care doubled between 2015 and 2016 from 260 to 588. The number of diagnostic errors had increased from 654 to 923⁸.

At the same time, the NHS is working hard to improve the experience of patients and a key part of that is the level of independence they can retain during treatment. The ability to become more actively involved in their own care, and to receive treatment at home or in the community does much to improve wellbeing and reduce the impact of ongoing treatment on lifestyles.

It also has benefits for hospitals. As Ewan King writes in the *Guardian*, there is a host of evidence which shows that shifting care closer to home will ease the pressures on hospitals. After a winter in which many hospitals were operating at capacity, moving care away from the hospital environment into the home will not only benefit patients but also the NHS.

"For some time, health and care reforms have been about shifting care closer to home," he writes. "The programme of vanguards and sustainability and transformation plans was intended to herald a greater focus on prevention and self-care to reduce pressure on hospitals⁹."

Moving to Peritoneal Dialysis

Dialysis is one method of treatment which could potentially benefit from being moved closer to home. Few treatments have as large an impact on quality of life as dialysis. The need to travel to hospital three times a week for a total of 12 hours of treatment makes it difficult to enjoy a regular lifestyle.

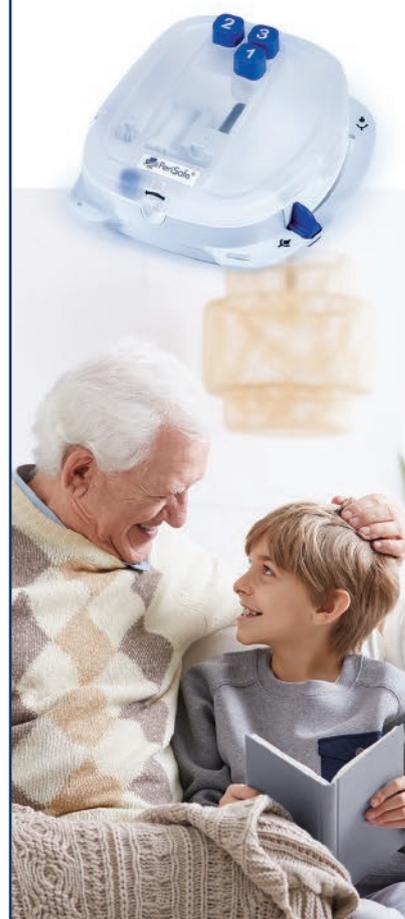
Peritoneal dialysis, which enables patients to manage their dialysis in the comfort of their own homes, can alleviate the strain on hospitals while also ensuring patients can enjoy greater independence and a higher quality of life. However, since the nineties, PD has been falling. According to a 2015 study from the NCBI, PD uptake had declined significantly across the developed world¹⁰.



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The NHS is working hard to improve the experience of patients and a key part of that is the level of independence they can retain during treatment



The decline is due to fears over adherence, training monitoring and prevention of complications among both patients and staff. While it is possible to provide comprehensive training to patients in the use of PD, it has traditionally been difficult to monitor compliance and take preventative measures as and when they become necessary.

Changing that narrative presents a rare opportunity for the NHS to improve patient care and cost management in a single stroke.

Key Performance Indicators

There is evidence to suggest PD can not only improve patient happiness but offer improved outcomes. A 2008 study compared high PD rates in Hong Kong with declining rates in Europe. It found that survival rates were typically higher in Hong Kong at 83%, compared to two and three-year survival rates of 79% and 68% respectively in Europe¹¹.

In 2010, NHS Kidney Care initiated a program to support initiatives focused on increasing the uptake of home dialysis and reduce the variation of access among different NHS Trusts. Its aim was to “ensure that all clinically suitable patients are offered an informed choice of where they wish to dialyse including at home, enabling kidney patients to lead their lives with greater freedom and control¹².”

The project has enjoyed some success, but there is still a lot of work to do. The good news is that new treatments and technologies can offer a range of options for patients who want to conduct dialysis at home. They offer greater guidance and monitoring and can connect patients with their care providers and make it easier to monitor compliance. By facilitating PD adoption, the NHS can go a long way towards improving the quality of life for people living with ESRD and reducing the strain on health services.

Peritoneal dialysis, which enables patients to manage their dialysis in the comfort of their own homes, can alleviate the strain on hospitals while also ensuring patients can enjoy greater independence and a higher quality of life

Unlocking Peritoneal Dialysis

Jo Roth, Medical Correspondent

Peritoneal dialysis can offer enormous benefits to the health service, but it is under-utilised. How can the health service unlock its full potential?

IT'S NO secret that the NHS is under pressure. Its continuing mission to improve the patient experience and deliver world-class healthcare faces headwinds of tight budgets and limited resources. Solutions which can either save money or deliver an affordable way to improve treatment are valuable: those which can manage both at the same time are like gold dust.

That's what peritoneal dialysis (PD) can offer. Allowing patients to take charge of their care in the comfort of their own home gives them greater autonomy and independence. By alleviating the pressures on hospitals, higher rates of home dialysis could save money.

Advantages of PD

PD offers many advantages. While hemodialysis requires blood to be pumped out of the body into a dialysis machine where it is cleansed, PD uses the inside of the belly as a natural filter. A fluid called dialysate is washed in and out of the body and removes wastes. It is less intrusive and enables patients to have the treatment at home.

Patients can either use a machine which performs the dialysis at night while they sleep or continuous ambulatory peritoneal dialysis (CAPD) which can be done while they go about their day to day activities.

A 2009 report showed that patients receiving PD tend to report higher satisfaction levels, in surveys which study quality of life treatment¹³.

Studies have also suggested the total cost of treatment can be lower using PD than HD. A study by the NCBI found that over a five-year period PD was significantly more cost-effective than HD. They found that a shift from HD to PD could save between €32 and €10,623 million. The study also found no difference in mortality rates between HD and PD¹⁴.

Obstacles to PD

So, what's standing in the way? In part it's a question of education. Writing on Kidney News.

org, Jennifer Fillaus and Troy Plumb explain the importance of patients having more choice.

"There is no clear difference in mortality among patients on in-centre HD, peritoneal dialysis (PD), and home HD, so patient preference should dictate the modality of treatment," they write.

When given that choice, they argue, most patients who are informed about their options choose PD¹⁵. The difficult part is delivering information to patients. The popular view of dialysis still focuses on the traditional hospital-based model in which patients must spend 12 hours a week hooked up to a machine. It is incredibly inflexible and has a massive impact on people's quality of life. During that time, they cannot work, care for children or sick relatives. They have difficulty arranging holidays or travelling for more than a few days at a time. Everything becomes difficult.

Many may not know peritoneal dialysis exists, and if they do, they may not fully understand it. The lack of understanding leads to a loss of confidence in the process, a fear of making mistakes and of being left alone without medical support.

Doctors often share that lack of confidence. They fear that patients may not take the medication correctly, fail to follow guidelines or make basic mistakes.

That fear is not unfounded. Medication compliance is one of the biggest drawbacks of PD. Patients require education and training in order to manage PD themselves. The transfer set can be complicated and, if not performed correctly, the results can be serious.

Poor adherence will reduce the effectiveness of treatment and can lead to infection or other complications. Because treatment is home-based, doctors often have little oversight over medication use. Details of the treatment compiled by patients is often hard to organize, inaccurate or incomplete.

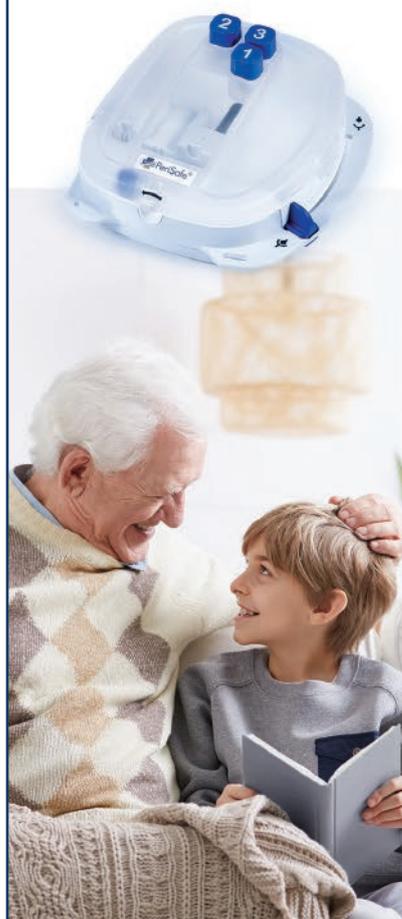
Others will not be suitable for PD. Older or infirm patients may not be able to carry out their own treatment without substantial support. They may feel like HD is the only option. But by providing



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greater levels of support in the community it may be possible to ensure vulnerable patients such as these can continue to receive care at home for longer. This can be particularly useful for people who have difficulty moving about and may postpone the point at which they must move into long-term residential care.

Improving Access to PD

To close the potential gap of PD treatment, the NHS must address each of these obstacles. Health services are assessing various methods to reduce the risk of infection. For example, educating patients on how to avoid exit site infection – such as by avoiding fresh water – can reduce the risk of complications. Also, administering antibiotics can fight infection at source.

Better education can inform patients about their options regarding PD as well as improving training in medication use. Thanks to the rise of online and mobile technology, it is easier to provide patients with access to support, guidance and other tools which can help to maintain compliance.

Technology can also help to connect care providers and receivers. Apps can help patients to access support and online platforms can allow doctors to monitor the results of treatment in real time. It's a great way to track progress and check that patients are using their treatments at the right time and in the right way.

An evolution in the design of PD provision can also do much to help patients manage their own care. By reducing the complexity of the treatment process, it is possible to reduce the risk of error and make the entire process of self-administration more straightforward. Innovative products are coming to market to make PD more accessible and lower risk.

Evidence is growing that the benefits of PD outweigh the risks and, as methods become refined, the calculation is becoming more positive. By adopting a proactive attitude towards informing and educating patients, and by offering greater levels of support and compliance monitoring, NHS Trusts can achieve that ambitious goal of balancing the books while also dramatically improving the provision of care.

Health services are assessing various methods to reduce the risk of infection. For example, educating patients on how to avoid exit site infection – such as by avoiding fresh water – can reduce the risk of complications

Closing the Gap: Promoting Home-Based Peritoneal Dialysis

James Butler, Medical Correspondent

Giving patients greater choice in how they treat renal conditions can improve satisfaction, reduce costs and improve outcomes.

CHOICE. THAT'S the watchword of the NHS at the moment. One of the key goals of the NHS Forward View is to give patients greater choice and involvement in the way they receive their care¹⁶. Peritoneal dialysis would seem to be an ideal component – a treatment which puts patients in control and allows them to have the treatment in the comfort of their own home in a way which is convenient for them.

Over the past few decades, though, adoption of PD has fallen. Hemodialysis remains the first choice for dialysis patients, but there are signs that things may soon change. A collection of initiatives, fresh thinking and new products, all create the potential for considerable growth.

Market Share

The global Dialysis Market Report (2017 to 2023) released by KBV Research predicts the market to reach \$124bn by 2023, growing at a CAGR of 5.3%. The Peritoneal market, it says, is likely to grow significantly thanks to its advantages of minimal clinical visits, ease of use and negligible use of needles. As machines become easier to use, the report predicts, growth will accelerate¹⁷.

Another report from Grand View Research backs this up. Hemodialysis still dominates the market accounting for 80% of the overall market share, but the report's authors believe that share may start to fall. It says there is scope for enormous growth within the home-based market¹⁸. Expansion will be fueled by the development of small, more portable and automated products, a rise in the number of people who require daily procedures, initiatives from healthcare providers and growing enthusiasm among patients.

The NHS is making a concerted push to encourage greater use of home dialysis. In 2012 it introduced its End Stage Renal Failure (ESRF) Decision Aid, designed to inform patients about whether or not they should have renal

replacement therapy, what kind to have and where to have it¹⁹.

In 2010, NHS Kidney Care launched a program to encourage NHS trusts to support those people who wanted to carry out their care at home. As it stated in its report:

"There is also strong evidence that more frequent daily hemodialysis, especially nocturnal hemodialysis, offers better quality of life, morbidity and mortality benefits versus three times weekly hemodialysis."

Its program sought to develop a nationwide action plan to improve current provision levels and ensure more patients across the NHS were informed about their options and had the opportunity to choose home dialysis if they wanted to²⁰.

Making Progress

There are some signs of progress. Those trusts which have embraced the program report significant improvements in the delivery of their care. Analyzing those and the steps they have taken offers insight into how PD can be successfully encouraged and adopted.

A report entitled 'No Place Like Home' identifies the experience of several Trusts which decided to embrace the opportunity including: Yorkshire and the Humber Renal Network, the West Midlands Renal Network, Epsom and St Helier University Hospitals NHS Trust, Sussex Kidney Unit, Royal Berkshire Foundation Trust, Reading, Oxford University Hospitals and Queen Alexandra Hospital, Portsmouth²¹.

The report highlights some of the early successes the program enjoyed. By 2011, the number of people receiving home dialysis had increased by 5% while the number of people receiving dialysis in hospitals reduced by 6%.

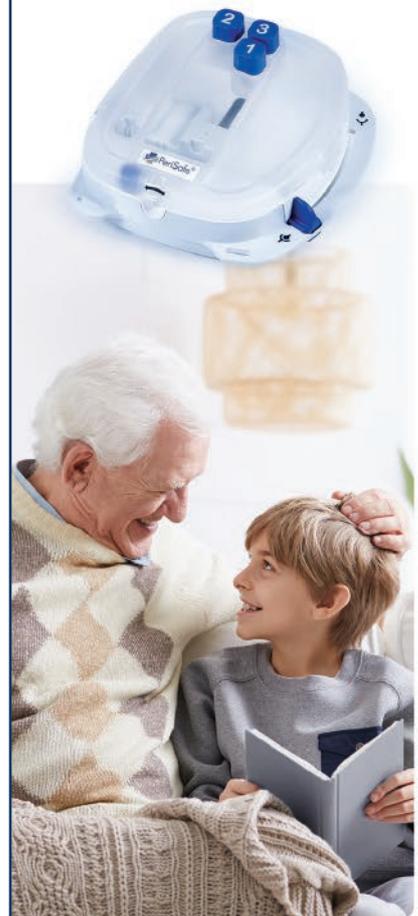
Many of the hospitals which had implemented the changes saw a swift and significant



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increase in the number of people receiving home dialysis. Sussex increased numbers from 25.5% to 36%. Coventry grew from 22% to 28%. They also successfully improved self-care among hemodialysis patients as well as the identification of those patients who could benefit from home dialysis.

So how did they do it? Several key themes which contributed to success emerged from across those trusts. They included:

- **Planning and engagement:** Trusts should spend time planning projects.
- **Get patients and carers involved:** Involving patients and carers at every stage was identified as being crucial to success.
- **Use local and national support:** Help from organizations such as NHS Kidney Care has a major impact on success.
- **Flexibility:** To accommodate any patients with special needs.
- **Consider data collection:** Trusts need to think about how data will be collated and how success can be measured.

Although not every patient will be suitable for home dialysis, all patients should be given the choice. That means making them aware of their options, educating them on how it works and helping them to make an informed decision about the best path forward for their requirements.

New Products

Initiatives such as these help to improve education and widen awareness about key issues, but there will still be plenty of obstacles to overcome to improve uptake. The first of these is culture and inertia. Some services dislike the perceived lack of control they have over home dialysis patients. Because they cannot see it taking place and manage it themselves, it is more difficult to monitor patient compliance and measure success.

Financial considerations will also be very much to the fore. Any move to increase the adoption of PD will involve a certain level of investment in equipment, staff, processes and documentation.

Those holding the purse strings will need to see a clear return on investment.

There is some evidence to suggest that savings can be considerable. The 'No Place Like Home' Report references 2011 guidance from NICE, which suggested that, if the number of people receiving peritoneal dialysis rose from the current level (15% at the time) to the optimal level of 39%, as set down by NHS Kidney Care, there may be savings of £20 million annually. Analyzing data from other projects can also provide guidance about what return on investment should be expected.

The key to success could be the role of next generation projects. Raising awareness, changing processes and engaging with staff can do a great deal to increase attention, while advances in treatment methods and products are making them more accessible, reducing risks and improving outcomes. These products offer a range of improvements including:

- **Greater portability:** They are becoming smaller, lighter and more compact enabling greater flexibility for home use and ambulatory use.
- **Ease of use:** Simplifying the operation reduces the scope for error and the risk of infection.
- **Improved performance:** More sophisticated products enhance the speed and effectiveness of treatment.
- **Connectivity:** Digital technology makes it easier to collect and share information about the treatment with the care provider. It eases one of the principal concerns for doctors: the question of whether patients are adhering to their treatment patterns and how successful they are being.

A key part of success, therefore, will be to understand what is available on the market and to work with providers to ensure the successful implementation of any new equipment. Technology plays an important role and – as with many areas of the NHS – it is moving quickly. Understanding how it is moving and identifying opportunities for improvement has the potential to unlock sizeable gains.

The Future of Home Dialysis

Tom Cropper, Editor

How a new generation of products are making it easier to perform dialysis in the home.

THE NEXT few decades provide some interesting challenges for health services around the world. The emphasis will be on solutions which are cost effective while also offering the best quality care and a positive patient experience.

Home dialysis represents a perfect example. It takes less time, consumes fewer resources, and enables patients to enjoy a fuller quality of life. It can also enable those patients who may require more regular treatment than is practical in a hospital setting to get the care they need. The only problem is that, as things stand, many of the benefits are little more than potential. Home dialysis rates are much lower than they could be, so the challenge is to turn that potential into reality.

Rising to meet the task is a new generation of products which offer improvements to the home dialysis experience. They aim to simplify the process, reduce risks, improve outcomes and make it easier for doctors to maintain oversight. It sounds simple, but these new products must overcome many hurdles.

Practical Design

The first is the difficulty of designing a product with practical use in mind. To do so, the makers of one of these new products, Perisafe®, enlisted the help of actual patients²². Using advanced eye tracking methods, they followed the movement and focus of the eye as patients performed dialysis. They took the notion of designing a device through the eyes of the user to the extreme, using it to see where they were looking, what challenges they faced and what features would make the task easier.

The result is a one of its kind product which connects the transfer set and dialysis bag system within one closed device – all without manual contact from the patient. Instead of the cumbersome process of handling clamps and breaking the frangible, patients can just press a button.

It makes treatment easier and more intuitive by creating a simplified and standardized procedure. By being visibly compact and easy to use, it is designed to dispel the doubts of users, which can lead to early abandonment of home dialysis. Users can familiarize themselves with the process

easily giving them more confidence as they move forward with the product.

It comes with a 'Perisafe® Assistance' device which guides patients through the therapy. By doing so, it hopes to make PD therapy available to those users who, until now, would not have been able to use it – such as those who are visually impaired.

Furthermore, because the transfer set is performed inside a protected device, it can reduce the risk of infection. The ability to use it several times a day offers a much more effective treatment for those patients who may require more regular dialysis than a hospital can provide.

The Perisafe® device does a lot to make PD accessible to a wider group of patients. Simplifying the process means more people can use it, and patients will get up to speed more quickly. This should reduce the rates of early abandonment in which patients have difficulty performing home dialysis or feel intimidated by the thought of taking control of their own treatment.

Home Hemodialysis

For those patients who would like to conduct home hemodialysis, smaller and more portable machines could help them to break away from the hospital ward and spend more time at home.

In 2016, Nottingham Hospital conducted a trial of a new, smaller HD machine which could boost the low rates of home dialysis. The *Guardian* reported on the story of Ian Hichens who had to dialyse five times a week at his home. However, if he wanted to travel, he would have to arrange appointments in local hospitals, as his dialysis equipment was too large and bulky to take with him.

The impact on his quality of life – as for all HD patients – was extreme. The new, smaller dialysis machine is a third of the size of a conventional dialysis machine and enables him to take it with him when he travels. It also saves 30 minutes per cycle compared to conventional machines²³.

Mobile Apps

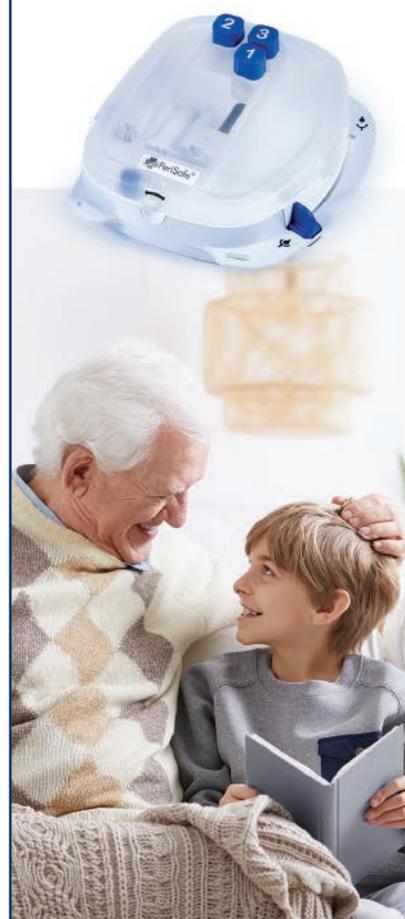
Another key obstacle has been the inconvenience of recording information and ensuring compliance. Doctors who tend to avoid



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recommending peritoneal and home dialysis often do so because they worry about monitoring the use and effectiveness of the medication. It is one thing to provide adequate training to patients, but quite another to ensure compliance is maintained and that records are accurately kept.

Patients would record information such as weight, blood pressure, ultra-filtration and the type of PD used in a simple notebook. It's not hard to see how this makes it difficult for both patients and doctors to keep track of progress and develop an optimal treatment plan.

In Queensland, Logan Hospital has been developing and trialing a new mobile app and web portal which allows patients to record their key information and input it into a web portal which can then be monitored by their care team. The team can then see the latest information, monitor how the treatment is being used and make any adjustments as and when they are needed. It also incorporates an alert system to encourage better medication compliance²⁴.

The Future

Looking ahead, the prospects for home dialysis remain uncertain. There is considerable appetite for it from patients, especially peritoneal dialysis. It has the potential to save money and improve patient experience and outcomes. But fears over compliance, infection risk and contact between doctors and patients persist.

As they look to the future, health services can improve services by learning from existing and past projects. They can work with patients to find out what works, what doesn't and what they need, and they can use technology to improve compliance, monitoring and the recording of data. At the same time, they must improve standardization to ensure that all patients have access to the same products, choices and services. There is much to do, but the technology is there, the demand is there and so to – increasingly – is the will.

For those patients who would like to conduct home hemodialysis, smaller and more portable machines could help them to break away from the hospital ward and spend more time at home

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