Wilmington Healthcare Costed Integrated Patient Scenario:

Chronic Kidney Disease:

October 2020

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Wilmington Healthcare

Contents

Foreword

This fictional story of Sid is an amalgam of what really happens to people who develop kidney disease, and in truth people probably experience a combination of ideal and not so ideal treatment. However, for anyone who develops this long term and harmful condition we do rely on our healthcare system to guide us; most people have no idea how important the kidneys are in keeping us well, unless they go wrong. For Sid, there are some very important times when a flexible and sensitive system will shape his whole future.

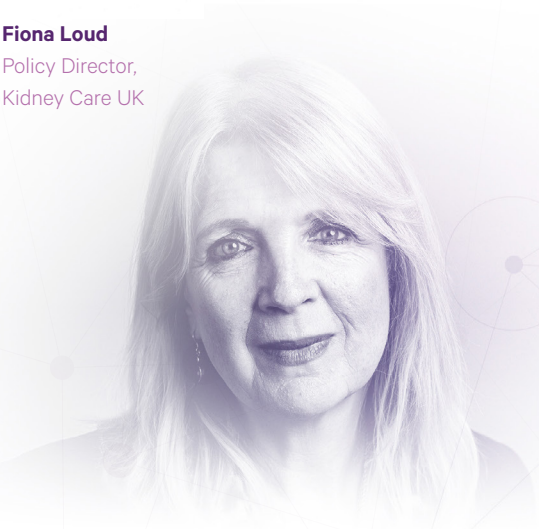
Firstly, when Sid had his annual health check and it was found that he had kidney disease as a result of his diabetes – he was told about it. Not everyone is told, which means the chance for him to do anything about it can easily be lost. The fact that he came to a health check and comes back for follow up appointments tells us that he is interested in his health and likely to be interested in the information he is being given. This sort of multidisciplinary (MDT) approach with joint management from his GP for blood tests and then a review by a kidney specialist is helpful. Writing this in the time of coronavirus I reflect that for someone at an early/moderate stage of kidney disease, having local blood tests and then some form of video or phone consultation with a specialist would be ideal in providing monitoring and limiting unnecessary travel.

The gold star treatment for Sid, and one which many patients would wish for if they could, is a kidney transplant. However, not everyone is able to have one either because their own health is not strong enough for surgery or because they have no donor and so wait on a list in case a match with a deceased donor is made. Unfortunately, Sid does not have a living donor and therefore is placed on the transplant waiting list. And he may wait longer for a transplant as he is from the BAME community and there are fewer donors.

So, dialysis is Sid's realistic treatment choice for the immediate future, and, with guidance and timely presentation of choices, dialysis at home can be planned. Kidney failure is not trivial, it is harmful and changes lives for ever. It is expensive for an individual as well as for our NHS. With about 8,000 people reaching kidney failure in the UK every year I cannot emphasise enough how important it is for people to have every chance to adapt, to have the time to think about it and be supported to live with kidney failure. To sustain treatment, emotional, financial and educational support is necessary.

For healthcare professionals reading this paper, please think how and where you would want treatment if this was you or a family member who had kidney failure when you are looking after someone who does.

Fiona Loud
Policy Director,
Kidney Care UK



Kidney Care UK

Introduction

NHS nephrology services are responsible for managing people with kidney failure which may occur as a result of chronic kidney disease (CKD) or acute kidney injury (AKI). Around 3 million people in the UK today have CKD with uncontrolled diabetes and high blood pressure the biggest causes of CKD. Currently 63,000 of these people are being treated for kidney failure (stage 5 CKD) and each day 20 individuals will develop kidney failure.

In England around 6,771 people start renal replacement therapy (RRT) each year; 9% will have a pre-emptive transplant, 20% will start on peritoneal dialysis (PD) and 71% will start on haemodialysis (HD), which is given in hospital at a satellite centre or at home.[1] Although the ideal situation would be for patients to be treated by having a kidney transplant this option is not suitable or available for everyone either because of a lack of available donors, medical complications or patient choice. There is evidence of huge variation in the recognition, treatment and management of kidney failure across the country and the need for focused improvements cannot be overestimated.

Early diagnosis and prompt treatment of CKD saves both lives and money. Management of kidney failure, like many other conditions requires collaborative working across all areas of the health economy so that that there can be a smooth, fast and efficient flow between health professionals to recognise kidney deterioration and ensure the 'critical window' for a solution is not missed and that the patient is provided with the right support and information to make the best choice.

This resource provides clarity on the issues faced in managing CKD when dialysis has to be the modality of choice by bringing the scenarios to life in a very realistic way. The resource also provides practical guidance on what we can all do to improve care and reduce the risks for patients in a systematic and efficient way.

Furthermore, the Covid-19 pandemic has also placed considerable pressure on renal services and dialysis delivery. NICE guideline NG160[2] identifies updated working practices at the patient, NHS organisation and system level that could support future service sustainability and capacity. Key measures include focussed MDT management, regional network planning to allocate resources effectively and ensuring transport, supply chain and capacity issues are addressed. Reviewing increased **home dialysis** provision is also suggested for new incident patients.

Analysis style

This case study utilises a Delphi style consensus process involving experts in this specialist field alongside an economic analysis methodology. This has been developed using fictitious, but realistic, patient journeys which are compared to highlight potential care improvement opportunities.

Use of behavioural methodology drives engagement through the combination of objective clinical data, clinical expertise and financial analysis wrapped in a journalistic style. The study includes prompts for commissioners and service transformation leads to consider when evaluating their local health economy.

The goal is to inspire more stakeholders to take note and act towards positive change by thinking strategically and collaboratively about engagement, education and designing optimal care for people with CKD.

Look out for red highlight boxes to see typical suboptimal / failure points in many pathways throughout the country.

Look out for green highlight boxes to see best practice points which are above and beyond the optimal pathway, which are already being trialled in some care pathways across the country.

The optimal story of Sid's experience

With choices and typical pathway failure points highlighted along the way

In this scenario using a fictional patient, we examine an optimal pathway for Sid who has CKD.

At each stage of his pathway we have modelled the costs of care, not only financial to the local health economy, but also the impact on the patient and their family's experience.

This document is intended to help commissioners and providers understand the implications, both in terms of quality of life and costs, of different care pathways for individual patient needs and expectations.

It demonstrates how changes in treatment and management can help clinicians and commissioners improve the value and outcomes of the care pathway.

Overview: Sid's CKD care pathway

The diagram below gives an overview of our fictitious patient Sid's journey with CKD. We have used this full journey to compare the typical features of an optimal and a suboptimal care pathway for a patient like Sid and give a comparison of the costs associated with these different scenarios. Figure 1 highlights the **critical window** at the start of his care journey.

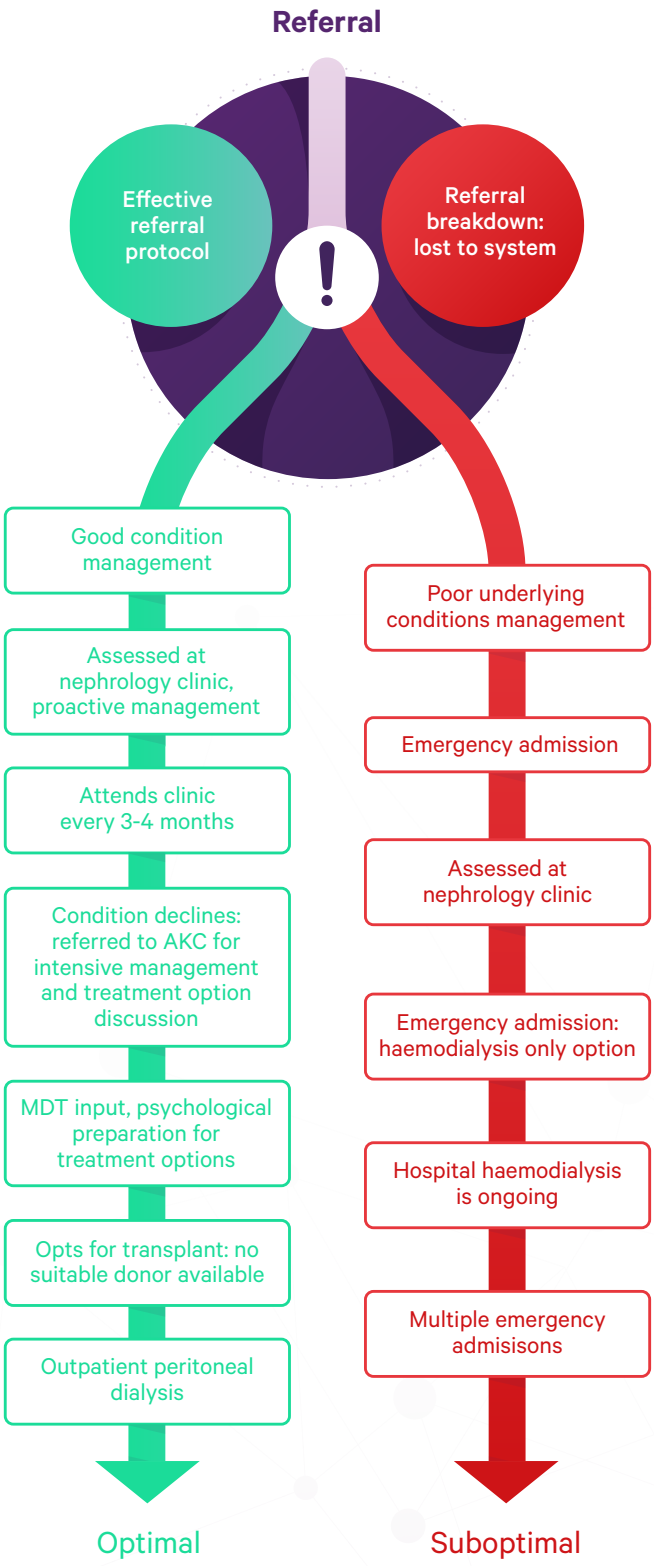


Figure 1
The critical window in the CKD care pathway

Meet Sid

Sid is a 65-year-old retail distribution security guard living in North Essex. He has been on his own since his divorce from his wife Debbie, due to worsening health condition. His children, Charlotte and Ben, both live far away so it's difficult to see them very often. He used to enjoy exercising regularly but increasingly finds this challenging.

A couple of years ago he was diagnosed with hypertension and type 2 diabetes; as a result, he is taking antihypertensive medication and metformin. He was recently diagnosed with stage 4 chronic kidney disease. See Appendices 1 and 2 for detailed information about events in Sid's journey.

Goals and values

Sid wants to:

- Feel better
- Enjoy life
- Be around for his children

Sid is committed to:

- His kids

Challenges & pain points

Sid is challenged with:

- Rising health needs
- Failing relationship with his wife
- Regularly seeing his children who do not live locally.

Sid's pain points are:

- Needs to keep working in order to pay his bills

Sources of information

- UK Renal Registry
- The Renal Association
- National Kidney Association
- Kidney Care UK

Engagement difficulties / objections

- N/A at this stage; good relationship with primary care physician
- Some uncertainty/anxiety delivering successful self-administered home PD

Sid's experience

At the age of 62, Sid visited his GP for an annual health check. He had multiple tests and was diagnosed with diabetes, high blood pressure and declining glomerular filtration rate (eGFR).[3] His estimated eGFR was low which indicated that his kidneys were not functioning well and he had chronic kidney disease (CKD). He went back in to discuss the results where he was prescribed metformin and an antihypertensive medication. He then came to the surgery every 3 months for a diabetes management check and blood pressure check to monitor these conditions. Two years later, at one of his regular checks, his eGFR had dropped below 30 ml/min which indicated significantly impaired kidney function.

Classification of chronic kidney disease using GFR and ACR categories

GFR and ACR categories and risk of adverse outcomes			ACR categories (mg/mmol) description and range		
			<3 Normal to mildly increased	3-30 Moderately increased	>30 Severely increased
			A1	A2	A3
GFR categories (ml/min/1.73m²), description and range	≥90 Normal and high	G1	No CKD in the absence of markers of kidney damage		
	60-89 Mild reduction related to normal range for a young adult	G2			
	45-59 Mild - moderate reduction	G3a[1]			
	30-44 Moderate - severe reduction	G3b			
	15-29 Severe reduction	G4			
	<15 Kidney failure	G5			

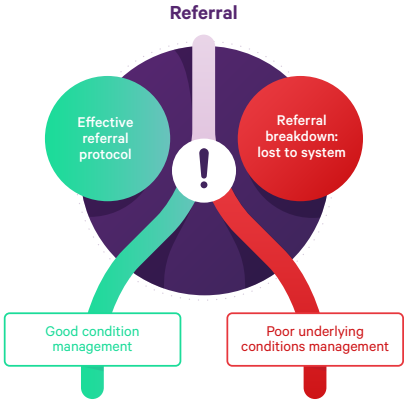
Increasing risk

Increasing risk

Figure 2 Classification of chronic kidney disease using GFR and ACR categories[3]

The critical window

This is the point in Sid's journey when he entered "the critical window". Intervention at this stage is what will determine events to follow. During the critical window, when he was found to have a low eGFR, this is the opportunity to improve his health outcome, quality of life and the cost of his care.



In Sid's optimal scenario this window was the opportunity to be quickly referred because there was a shared protocol between Sid's GP and the secondary care nephrology service. Digital records are shared between the teams, as well as referral guidelines and patient information so that Sid's GP was familiar with the issues and when to refer him (see **Learning Points**).

As a result of this coordinated care and prompt referral Sid was seen by the nephrology service where his risk factors were proactively assessed and he received support with his diabetes management, with signs and symptoms of CKD including renal anaemia proactively managed. As a result, his kidney function was well-controlled, and he stayed as well as he could be; he was still able to work and do his hobbies.

Meanwhile, in primary care Sid continued to see the GP or diabetes nurse specialist regularly and as a result he had a good understanding of his conditions and how best to manage them with his treatment tailored to his level of kidney function. He was also vaccinated against influenza and pneumonia. All of these factors helped to put Sid on a path that optimised his overall health and helped support the success of his kidney treatment (see **Learning Points**).

Optimal management pathway

By seizing the critical window for prompt referral to the nephrology service, Sid's GP sets him on the path for optimal management of his CKD. In this optimal scenario, he accessed the service quickly and received regular monitoring by the nephrology team. He attended the general nephrology clinic every 3 to 4 months, with bloods being taken at his GP's surgery prior to the hospital appointment and his blood pressure and diabetes well controlled.

These regular monitoring appointments identified that his eGFR had dropped to 20 ml/min and so he was immediately referred to the advanced kidney clinic (AKC) for more intensive management.

He attended the AKC for 18 months with regular input from the specialist MDT (see **Learning Points**). They discussed the different treatment options with Sid and prepared him psychologically for what his choices for a treatment plan could be; Sid was also provided decision and intervention support tools[4] for both peritoneal dialysis (PD) and haemodialysis (HD); summary options outlined below in Figure 3:

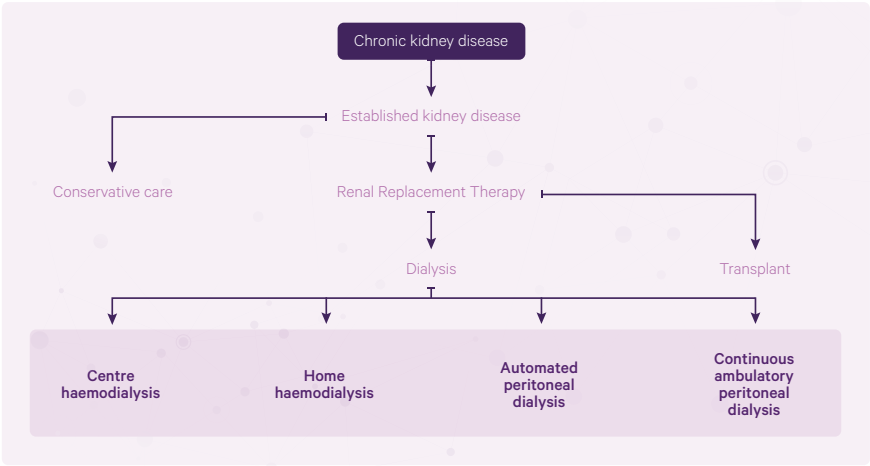


Figure 3 Decision map 1, chronic kidney disease[4]

He decided his preferred treatment plan was for a kidney transplant for which screening was undertaken[5]. Unfortunately, no suitable live donor was available, so he joined the waiting list.

Over next 12 months his eGFR dropped further to 8 ml/min. Over the course of his discussions with the AKC team, he understood that this meant that his kidneys were now failing, and he would need to start dialysis. He had already had plenty of time to weigh up the options for dialysis and he preferred PD at home, so he was proactively referred to the PD team.

Sid was offered a one-to-one session with the AKC nurse specialist, and was also booked into a group education session, peer support from a person already using PD. This explored the pros and cons of PD in more detail, as his treatment modality of choice,[6] as well as reaffirming the alternative options that were available (see **Learning Points**). Sid was introduced to a dedicated PD nurse, to whom he could address any individual or specific questions and/or concerns. The insertion of the PD catheter and booked and his pre-operative assessment undertaken at the same time.

Through attending peer-to-support groups and pre-operative assessment, Sid was able to allay his concerns and he attended hospital as a day case for PD catheter insertion. He returned a week later to check and flush the catheter and then underwent training to start home PD one week later (14 days post catheter insertion). He then started automated PD at home which he was able to do overnight to minimise impact on his day to day routines.

Overall, Sid coped well with the dialysis. And, although he was admitted to hospital twice with infections, the PD was convenient, and he was feeling much better. His anaemia and markers of renal bone disease had been well managed by the AKC team and because he was able to dialyse overnight at home, he was managing to keep working with good quality of life.

Figure 4 identifies the treatment modality distribution for prevalent adult RRT patients is further divided by treatment location for HD patients – hospital unit, satellite unit or home – and for PD patients by type of PD – automated PD (APD) and continuous ambulatory PD (CAPD).[6]

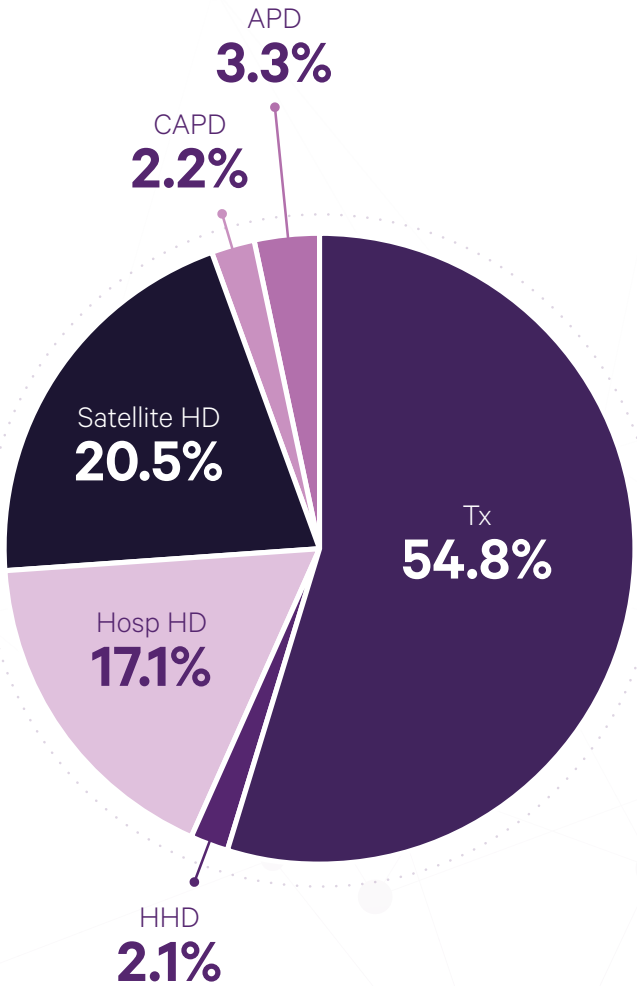


Figure 4
Detailed treatment modality of adult patients prevalent to RRT on 31.12.17
APD – automated PD; CAPD – continuous ambulatory PD[6]

What happens when the critical window is missed?

In the suboptimal scenario the critical window for Sid's care was missed. When the GP referred him to the nephrology clinic there was a clash with the diabetes clinic and this administration error resulted in a rescheduled appointment for Sid. This breakdown between primary and secondary care meant that he never attended the nephrology appointment and as a result he became lost in the system and his CKD was deteriorating unchecked.

To make matters worse, at this critical stage for Sid, his diabetes and hypertension were not being well managed either. He was not receiving education or support for these conditions; he doesn't recognise when his symptoms are getting worse, nor the significance of medication adherence and diet and also wasn't familiar with the steps he could take to self-manage or when he ought to make an appointment to see the GP. Overall, this does not help his kidney condition.

This crucial missed opportunity in his care resulted in Sid ultimately receiving a very different type of treatment in the suboptimal scenario, detailed below.

Sid's suboptimal decline

After Sid missed his nephrology appointment, he became lost to the system, during which time his health declined significantly. One afternoon he started getting chest pain and went directly to A&E where he was seen by the on-call cardiology team. He had had a myocardial infarction (although did not receive an angiogram at this stage) and tests revealed that his eGFR was now 15 ml/min, the threshold for kidney failure. When he was discharged 48 hours later, his eGFR had dropped further to 13 ml/min and he was referred to the kidney clinic with an appointment in two weeks' time. Meanwhile his medication remained unchanged.

By the time he attended his first nephrology appointment two weeks later he was feeling achy and nauseous. His bloods were taken at the clinic – his eGFR was seriously low at 8 ml/min; however, these results were not available immediately and so an opportunity for earlier intervention was missed. Instead he is left to wait for a reassessment appointment to discuss the results which was booked for seven days later.

Opportunity windows

- Proactive management of underlying conditions, self-management knowledge.
- Angiogram.
- Earlier kidney intervention at discharge.
- Reassessment of his medication.

Opportunity windows

- Blood results immediately available gives an opportunity for earlier intervention.
- Discussion about treatment options, possibility of PD.

Limited options

During that week he was seriously unwell and called an ambulance to take him to A&E where he was treated for hyperkalemia. He was admitted to the local district general hospital and as they were unable to provide ward based haemodialysis, he was taken to the intensive care unit (ITU) for 48 hours. At this stage peritoneal dialysis was not an option and he had a neckline inserted for haemofiltration. His ACE inhibitor medication was finally stopped.

Sid then spent seven days on the acute medical ward awaiting transfer to the renal unit, where he received IV diuretics. His eGFR continued to reduce and he was not eating, drinking or mobilising. His condition became so severe that he was transferred to a specialist renal unit by ambulance (eGFR 5-6 ml/min; creatine 700 µmol/L). There were not any real treatment options presented to Sid at this stage: he was acutely unwell, and the decision was made to commence haemodialysis. His neck was very bruised and painful from the original neckline, so a second line was inserted in a new site.

Sid continued on inpatient hospital dialysis for 10 days. An arterio-venous fistula was also created for long-term access during this admission – but there were not any opportunities to discuss the various treatment options with the clinical team (i.e. PD); he neither had any choice about haemodialysis, nor indeed the location in which he would receive the treatment. A full physiotherapy and occupational therapy assessment was requested as Sid was still not mobilising. He had a bedside assessment within 72 hours and was discharged with an appointment for ongoing hospital-delivered HD.

Opportunity windows

- Eating, drinking, mobilising – proactive OT/physio.
- Treatment discussions.
- **The window for PD has been missed, he is too unwell.**

Opportunity windows

- Patient education about condition, how to self-manage.

Ongoing outpatient hospital hemodialysis

Sid remained on hospital haemodialysis three times a week. He was referred for a full nephrology review; however, the appointment was delayed so he had to wait longer for a consultant review and to start on erythropoietin and iron treatment. He did not have any further opportunity to discuss his treatment options with the consultant or to receive further education and training about his condition. Sid continued to receive dialysis via the fistula once this was fully formed five weeks later.

Opportunity windows

- EPO.
- Discussions about treatment plan.
- Nurse (specialist) available to discuss other treatment options and/or referral to the specialist team

Poor health, more emergency admissions

Sid continued with satellite unit HD during which time two further emergency hospital admissions occurred because of infections. At no time throughout all these contacts was he provided with an opportunity to discuss or reverse the treatment plan he was receiving.

During the 4.5 years that he was on haemodialysis, Sid was unable to maintain employment and had a very poor quality of life.

Patients on both haemodialysis and peritoneal dialysis will still experience comorbidity issues aside from their need for dialysis. Tables 1 and 2 show the most common reasons for non-elective spells among patients who are on haemodialysis and peritoneal dialysis respectively. It is important that these patients are proactively monitored to limit unnecessary admissions and the potential of exacerbation of either CKD and/or underlying conditions (see **Learning Points**).

Diagnosis description	Spell count	Spell cost	Bad days	Cost per spell	MLOS
[A419] Sepsis, unspecified	1,605	£11,389,222	28,665	£7,096	17.9
[T828] Other specified complications of cardiac and vascular prosthetic devices, implants and grafts	1,350	£5,419,669	8,140	£4,015	6.0
[J181] Lobar pneumonia, unspecified	1,105	£6,639,949	16,460	£6,009	14.9
[E877] Fluid overload	850	£3,363,180	7,570	£3,957	8.9
[J189] Pneumonia, unspecified	695	£3,909,338	9,860	£5,625	14.2
[E875] Hyperkalaemia	590	£1,917,957	3,310	£3,251	5.6
[T827] Infection and inflammatory reaction due to other cardiac and vascular devices, implants and grafts	495	£2,689,830	5,250	£5,434	10.6
[I214] Acute subendocardial myocardial infarction	430	£3,107,743	6,095	£7,227	14.2
[A415] Sepsis due to other Gram-negative organisms	360	£2,705,595	6,775	£7,516	18.8
[J22X] Unspecified acute lower respiratory infection	340	£1,339,673	3,160	£3,940	9.3
[N390] Urinary tract infection, site not specified	300	£1,482,148	4,230	£4,940	14.1
[A099] Gastroenteritis and colitis of unspecified origin	290	£1,504,804	3,530	£5,189	12.2
[I501] Left ventricular failure	290	£1,654,060	3,265	£5,704	11.3
[I500] Congestive heart failure	265	£1,811,330	4,825	£6,835	18.2
[T824] Mechanical complication of vascular dialysis catheter	240	£824,579	1,185	£3,436	4.9

Table 1
Top 15 most common primary diagnosis codes for non-elective spells with a haemodialysis procedure at national level, England 2019/2020

Diagnosis description	Spell count	Spell cost	Bad days	Cost per spell	MLOS
[T857] Infection and inflammatory reaction due to other internal prosthetic devices, implants and grafts	135	£538,722	1030	£3,991	7.6
[K659] Peritonitis, unspecified	95	£437,078	790	£4,601	8.3
[E877] Fluid overload	80	£299,907	760	£3,749	9.5
[J181] Lobar pneumonia, unspecified	40	£273,954	520	£6,849	13.0
[T856] Mechanical complication of other specified internal prosthetic devices, implants and grafts	40	£122,357	250	£3,059	6.3
[A419] Sepsis, unspecified	40	£262,860	565	£6,572	14.1
[K650] Acute peritonitis	35	£151,304	250	£4,323	7.1
[T858] Other complications of internal prosthetic devices, implants and grafts, not elsewhere classified	30	£37,207	45	£1,240	1.5
[J189] Pneumonia, unspecified	30	£150,089	375	£5,003	12.5
[I214] Acute subendocardial myocardial infarction	20	£174,832	315	£8,742	15.8
[T814] Infection following a procedure, not elsewhere classified	20	£86,849	160	£4,342	8.0
[A099] Gastroenteritis and colitis of unspecified origin	20	£69,336	135	£3,467	6.8
[K658] Other peritonitis	20	£74,880	135	£3,744	6.8
[T828] Other specified complications of cardiac and vascular prosthetic devices, implants and grafts	20	£86,998	120	£4,350	6.0
[I10X] Essential (primary) hypertension	20	£81,628	140	£4,081	7.0
[E875] Hyperkalaemia	20	£40,290	80	£2,014	4.0
[J22X] Unspecified acute lower respiratory infection	20	£75,352	120	£3,768	6.0
[R104] Other and unspecified abdominal pain	20	£55,931	115	£2,797	5.8
[N390] Urinary tract infection, site not specified	20	£69,547	235	£3,477	11.8

Table 2
Top 15 most common primary diagnosis codes for non-elective spells with a peritoneal dialysis procedure at national level, England 2019/2020

Learning points

For clinicians and GPs

1. Identify individuals with CKD early and introduce self-management strategies to better deal with the challenges of worsening CKD.

2. Preventative monitoring and timely planning interventions to reduce the progression of the CKD and underlying disease should be undertaken – the **critical window** of opportunity should not be missed.

3. Full **multidisciplinary team** deployment in CKD diagnosis pathway to ensure appropriate care is delivered and ensure the patient is educated on their condition and supported to make informed decisions on future care options.

4. Further training and development of staff treating CKD to identify and treat any existing comorbidities preventatively to limit potential of exacerbation of either CKD and/or underlying condition.

5. Maintenance of regular and continuous assessment of the patient's CKD in conjunction with the hospital consultant, the primary care GP, the patient themselves and where relevant, the patient's primary carer.

6. Extended use of available and shared technology where relevant to support expedited diagnosis, continued treatment and onward education of both staff involved in giving care and the patient's own understanding of CKD prognosis.

For service providers and healthcare professionals

1. Service providers (specialist renal centres) ensure that systems are in place to offer home-based dialysis to adults on long-term dialysis.

   Figure 5 shows the percentage of late (≥90 days) and early presenters (≤90 days) with access to PD and HD by centre. It shows wide variation in access across the UK and that there is poorer access to PD compared with HD in most centres.

2. Healthcare professionals ensure that they review people on long-term dialysis, offer them home-based dialysis and provide support to help them make an informed decision.

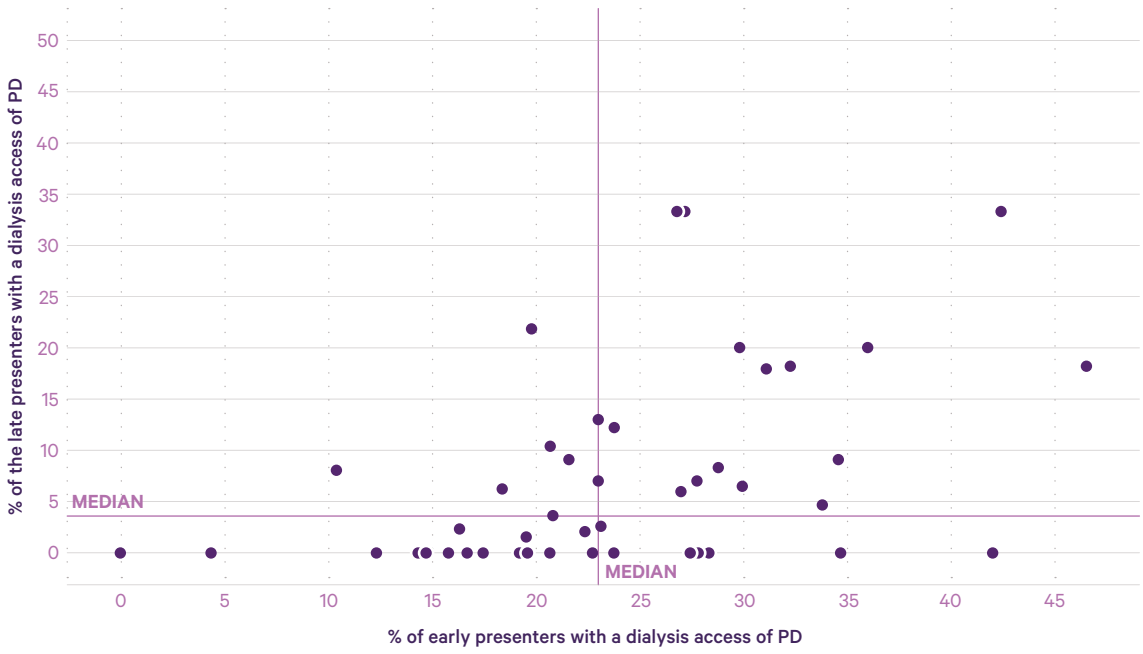


Figure 5
UK renal centre data analysis

Average of Value (SiteDataset1) vs average of Value. Details are shown for Site, Attribute and Attribute (SiteDataset1). The view is filtered on Attribute and Attribute (SiteDataset1). The Attribute filter keeps % of later presenters with a dialysis access of PD. The Attribute (SiteDataset1) filter keeps % of early presenters with a dialysis access of PD.

For commissioners and finance managers

1. In line with evolving national guidance, to promote CKD as a long-term condition, which must be systematically identified in order for timely and targeted intervention to be planned and delivered effectively.

2. CCG and ICS level commissioners should adopt a system-wide approach to population segmentation and risk stratification [in consultation with specialised commissioning] to ensure targeted CKD management in areas of high prevalence.

3. Planning care models need to address the key stages of CKD (diagnosis, progressive disease, pre-end stage and RRT) to support people living and ageing well in their communities.

4. Ensure communication about CKD, related comorbidities, frailty and cognitive status occurs between health and social care sectors and is further integrated between primary, secondary and community health organisations.

5. Area teams should ensure that they commission services that offer adults on long-term dialysis the opportunity to choose home-based dialysis.

6. Clear KPIs (including timely referral to secondary care services) should identify and report on measurable positive/negative CKD associated outcomes and be used to inform future planning of services.

Patients

1. Support patients with self-assessment of early indications of CKD through healthcare professional education[4,6].

2. Extend the use of Patient Activation Measures (PAMs) as identified in Figure 6 to further support both the patient's own knowledge and self-management of their CKD[7] and to promote a positive experience of their care; knowing when and how to access further support when needed.

3. Further adoption of personalised care protocols to enable patients to have control and choice over how their care is planned and delivered.

4. Unified approach across the local health system to ensure the patient has access to best practice CKD management guidelines and information about patient organisations.

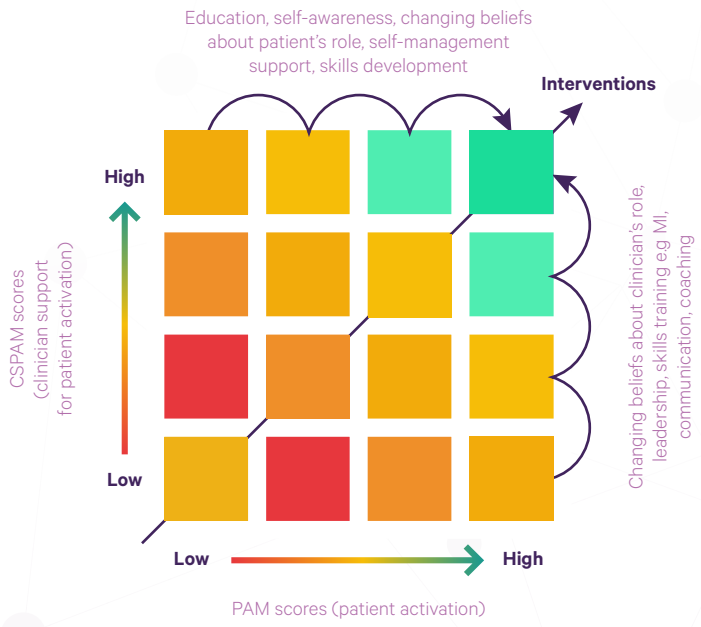


Figure 6 Knowledge, skills and confidence cube[7]

The 'bills' and how they compare

For the financial evaluation a detailed analysis was performed by mapping the lifecycle of the pathway. Through this process it is possible to identify the cost drivers that would be incurred in primary and hospital care using, where appropriate, the NHS National Tariff Payment System[8] and NHS reference costs[9].

We have included the wider social and economic impacts in the story but not the cost outside of the health remit or the social, emotional, physical and financial costs to the patient and family members.

The key difference between the suboptimal and optimal pathways is a shift from costly unplanned reactive care to more proactive care and treatment. This more proactive approach leads to a very significant reduction both in overall cost and a shift from expensive and avoidable secondary care management to less expensive early identification and monitoring in primary care. This shift represents improved value for money, better use of healthcare resources and most importantly a significant improvement in Sid's clinical outcome and quality of life.

Table 3 presents financial costs in two formats as a comparison of dialysis between peritoneal dialysis and hospital haemodialysis (the treatments used in the current pathway) and as full financial costs for the total pathway.

Costs	Haemodialysis (main unit)	Automated PD	Variance	% variance
Direct nursing	£8,447	£393	£8,054	95.3%
Other nursing	£2,260	£2,115	£145	6.4%
Disposables	£11,609	£15,001	-£3,392	-29.2%
Medical supervision	£1,184	£955	£229	19.3%
Dialysis machines	£763	£979	-£216	-28.3%
Machine maintenance	£812	£812	£0	0.0%
Anaemia therapy	£3,964	£2,268	£1,696	42.8%
Hospital transport	£2,584	£121	£2,463	95.3%
Overheads	£5,499	£307	£5,192	94.4%
Total	**£37,122**	**£22,951**	**£14,171**	**38.2%**

Table 3
Financial costs for dialysis[10]

The cost of dialysis is however only a small part of the care that patients like Sid will receive. In an integrated care service and with integrated budgets there is a need to understand the overall cost of the total patient journey. By identifying all elements of the journey this could enable greater investment to be made earlier in the journey to ensure that patient choice of modality for renal replacement therapy is considered.

Table 4 clearly highlights a summary of the total financial costs of not proactively managing CKD – a difference of over £150,000 for the total patient journey over the years we have documented.

More importantly however is that proactively managing Sid's progression to renal failure improved the overall experience of the hospital admission and his after care.

Cost driver activities	Suboptimal	Optimal
Acute	£220,185	£64,736
Ambulance service	£444	£0
Community teams	£0	£1,250
Primary care	£4,026	£3,328
Total	**£224,655**	**£69,314**

Table 4
Full financial summary of NHS costs

Table 5 gives a full breakdown of all costs related to this total patient journey over the period.

Costs	Suboptimal	Optimal	Variance
A&E visit	£224	£0	£224
Actual or suspected myocardial infarction with CC score 4–6	£1,820	£0	£1,820
Acute kidney injury with interventions, with CC score 0-5	£8,180	£0	£8,180
Ambulance call out	£252	£0	£252
Ambulance transfer	£192	£0	£192
Automated peritoneal dialysis	£0	£22,951	-£22,951
Bowel preparation medication	£0	£5	-£5
Cellulitis admission	£1,694	£0	£1,694
Clinical psychologist	£0	£38	-£38
Counsellor	£0	£350	-£350
Decolonisation - prevention of HCAI	£0	£20	-£20
Dialysis training	£0	£1,250	£-1,250
Dietician	£0	£45	-£45
Drugs - EPO for patient on hospital haemodialysis	£69,061	£34,085	£34,976
Local infection - admission	£0	£614	-£614
MDT discussion	£0	£75	-£75
Medical consultant review - clinic	£496	£0	£496
Medical review - consultant renal (nephrologist)	£342	£513	-£171
Medical review - consultant renal (nephrologist) follow up	£0	£1,116	-£1,116
Medical review - GP practice	£306	£476	-£170
Medical review - specialist renal nurse	£0	£27	-£27
Medication review	£0	£396	-£396
Multidisciplinary assessment (MDT)	£0	£303	-£303
Nephrology outpatient appointment non-consultant 361	£476	£0	£476
Nurse / allied health professional review - specialist clinic	£0	£70	-£70
Open arteriovenous fistula, graft or shunt procedures	£1,860	£0	£1,860
Other acquired cardiac conditions with CC Score 3–5	£1,941	£0	£1,941
Peritonitis admission	£0	£831	-£831
Pharmacist	£0	£289	-£289
Pre-operative assessment outpatient - nurse	£0	£96	-£96
Prescription - ACE inhibitor	£187	£0	£187
Prescription - aspirin	£197	£0	£197
Prescription - atorvastatin	£238	£40	£198
Prescription - bisoprolol	£85	£0	£85
Prescription - clopidogrel	£165	£0	£165
Prescription - iron & vitamin D tablet supplements	£223	£0	£223
Prescription - laxatives	£0	£7	-£7
Prescription - linagliptin	£2,071	£2,071	£0
Prescription – metformin (standard)	£261	£143	£118
Prescription - ramipril	£262	£206	£56
Referral to specialist clinic	£248	£0	£248
Hospital haemodialysis	£123,740	£0	£123,740
Renal outpatient appointment - post PD insertion	£0	£248	-£248
Sepsis admission	£8,486	£0	£8,486
Surgery – day case medical insertion of PD catheter	£0	£1,048	-£1,048
Test - investigation – bloods	£31	£83	-£52
Transplant co-ordinator	£0	£248	-£248
Transplant work up tests	£1,617	£1,617	£0
Vaccinations - flu	£0	£10	-£10
Vaccinations - pneumovax / flu / hep B	£0	£43	-£43
Total	**£224,655**	**£69,314**	**£155,341**

Table 5 Financial costs – detailed analysis

The optimal and suboptimal costings both stop at the same point for a clear comparison; the financial costs are rounded to the nearest pound, are indicative and calculated on a cost per patient basis. Local decisions to transform care pathways would need to take a population view of costs and improvement.

Financial calculation notes

- As noted above, the financial calculation presented here represents an indicative level of efficiency potential of the case only. Firstly, as the case is an example pathway, differential pathways for other patients may increase or reduce the potential benefit. Secondly, the potential releasing of resource associated with implementing the optimal pathway across a larger cohort of patients will be subject to the overarching contractual arrangements in place between providers and commissioners, which may differ across the country. For example, some of the financial benefits identified in the case may not be fully realisable where the elements of the pathway are subject to block contracts or risk/gain shares in place between contracting parties. Equally, the release of resource may only be realised should there be a critical mass from within the targeted patient population.
- It should also be noted that the financial calculation is considered from a commissioner perspective. The impact on income and costs (including capacity management) for provider organisations will require consideration in the implementation of the optimal pathway.
- Each healthcare organisation and system will need to assess the potential for realising the financial benefits identified within the case.

Appendix 1:
Comparing all four dialysis treatments

Example RRT decision aid[4]

	Haemodialysis (HD)		Peritoneal Dialysis (PD)	
	Haemodialysis at a hospital or centre (CHD)	**Haemodialysis at home (HHD)**	**Peritoneal Dialysis Continuous Ambulatory (CAPD)**	**Peritoneal Dialysis Automated (APD)**
Place of dialysis care	People travel to a hospital or specialist centres for dialysis session	People have dialysis sessions at home.	Most people choose dialysis sessions at home or work. Can be any clean place.	Most people choose dialysis sessions at home. Can be any clean place.
How dialysis works	Attaching to a machine for 4 hours per session by the arm or the leg	Attaching to a machine for 4 hours per session by the arm or the leg	Attaching to a bag for about 40 minutes per session by the belly.	Attaching to a machine for about 9 hours per session by the belly.
Usual number of sessions in a week	3 days in the week	At least 3 times a week (night or day)	Every day	Every night
Usual number of sessions in a day	1 session per day	1 session per day	4 sessions per day (exchanges)	A1 session per day
People carrying out dialysis	Staff at the hospital carry out the session	The person is trained to carry out the session	The person is trained to carry out the exchange	The person is trianed to carry out the exhcange
Assisted and shared dialysis	In some centres, people may be trained to self-manage aspects of the dialysis session. (Shared CHD)	A carer can be trained to carry it out. A carer may be family or friend, or nursing assistant. (assisted HHD)	A carer can be trained to carry it out. A carer may be family or friend, or nursing assistant. (assisted CAPD)	A carer can be trained to carry it out. A carer may be family or friend, or nursing assistant. (Assisted APD)
Usual time of dialysis	Most sessions are during the day; a few offer night sessions. Most people site or lie on a couch or bed. Most read, listen to music, watch TV or sleep in sessions	Most people usually choose daytime. Most people sit or lie on a couch or bed. They tend to read, listen to music, watch TV or sleep during sessions.	Most people choose to have exchanges int he morning, and before lunch and evening meal, and bed. Most people sit or stand during the exchanges.	Most people usually choose night time. Most people are asleep.
Equipment needed	A machine outside the body. The machines are set-up next to patient beds or reclining chairs all the time.	A machine outside the body and dialysate fluid. The machine is usually the size of a large chest of drawers	Bags to take away the used dialysate and bags with the clean fluid. A hook to hang the bag of fluid during an exchange.	A machine outside the body and dialysate fluid. The machine is usaually the size of a small suitcase.
Changes to the home	The hospita or specialist centres have dialysis machines plumbed in, next to beds or reclining chairs.	The machine is plumbed into a person's home. Storage is needed to keep the machine, bed, or reclining chair and supplies.	Storage is needed at home to keep the bags of dialysate fluid, like a cupboard or clean space in a shed, basement, or garage	Storage is needed at home to keep the machine and supplies, like a cupboard or clean space in a shed, basement or garage.
Kidney Service Support for dialysis	They organise transport for people to get to ialysis sessions and help plan care when people have trips away from home.	They organise the machine delivery, changes to the home, and plan care for whenpeople ahve trips away from home.	They organise bag deliveries, changes to the home and plan care when people have trips away from home.	They organise equipment deliveries, changes to the home and plan care when people have trips away from home.

Appendix 2:
Tables of coding scenarios

Suboptimal

Suboptimal management pathway		
In this scenario there would be an emergency admission for an acute myocardial infarction.		
ICD10 code	**Condition**	
I219	Acute myocardial infarction	
N185	Chronic renal failure CKD5	
E119	Type 2 diabetes mellitus	
I10X	Hypertension	
OPCS4.9 code	**Intervention**	
-	-	
HRG	**Description**	**Tariff**
EB10D	Actual or Suspected Myocardial Infarction with CC score 4-6	£1,820

Suboptimal management pathway		
In this scenario there would be a further emergency admission for acute on chronic renal failure.		
ICD10 code	**Condition**	
N179	Acute renal failure	
N185	Chronic renal failure CKD5	
E875	Hyperkalaemia	
E119	Type 2 diabetes mellitus	
I10X	Hypertension	
I249	Acute ischaemic heart disease	
OPCS4.9 code	**Intervention**	
L912	Insertion of central venous catheter	
Y532	Ultrasound guidance	
Z917	Jugular vein	
Z942	Right	
X404	Haemofiltration	
HRG	**Description**	**Tariff**
LA07K	Acute Kidney Injury with Interventions, with CC Score 0-5	£4,090

This admission would probably have more than one episode but the HRG is likely to remain the same. There would be an additional tariff for the critical care days.

Suboptimal management pathway – Version 1		
In this scenario the patient has now been transferred to a hospital with a specialist renal facility. The coding reflects the scenario with CKD5 as the main condition treated.		
ICD10 code	**Condition**	
N185	Chronic renal failure CKD5	
N179	Acute renal failure	
E119	Type 2 diabetes mellitus	
I10X	Hypertension	
I252	Old MI	
Z501	Physiotherapy	
Z507	Occupational therapy	
Z921	Use of anticoagulants	
Z922	Use of aspirin	
OPCS4.9 code	**Intervention**	
L915	Insertion of tunnelled central venous catheter	
Y539	Image guidance	
Z917	Jugular vein	
Z943	Left	
L912	Insertion of central venous catheter	
Y539	Image guidance	
Z981	Common femoral vein	
Z942	Right	
X403	Haemodialysis	
X603	Rehabilitation assessment	
HRG	**Description**	**Tariff**
LA08J	Chronic Kidney Disease with Interventions, with CC Score 0-2	£2,662 planned
		£4,035 emergency
LE01A	Haemodialysis for Acute Kidney Injury, 19 years and over	Local price
VC01Z	Assessment for Rehabilitation, Unidisciplinary	Local price

The haemodialysis is coded every time it is given and creates an unbundled HRG each time.

Suboptimal

Suboptimal management pathway – Version 2		
In this scenario the patient has now been transferred to a hospital with a specialist renal facility. The coding reflects the scenario with acute kidney injury remaining as the main condition treated.		
ICD10 code	**Condition**	
N179	Acute renal failure	
N185	Chronic renal failure CKD5	
E119	Type 2 diabetes mellitus	
I10X	Hypertension	
I252	Old MI	
Z501	Physiotherapy	
Z507	Occupational therapy	
Z921	Use of anticoagulants	
Z922	Use of aspirin	
OPCS4.9 code	**Intervention**	
L915	Insertion of tunnelled central venous catheter	
Y539	Image guidance	
Z917	Jugular vein	
Z943	Left	
L912	Insertion of central venous catheter	
Y539	Image guidance	
Z981	Common femoral vein	
Z942	Right	
X403	Haemodialysis	
X603	Rehabilitation assessment	
HRG	**Description**	**Tariff**
LA07K	Acute Kidney Injury with Interventions, with CC Score 0-5	£3,820 planned
		£4,090 emergency
LE01A	Haemodialysis for Acute Kidney Injury, 19 years and over	Local price
VC01Z	Assessment for Rehabilitation, Unidisciplinary	Local price

Optimal

Optimal management pathway		
In this scenario there would be a planned day case attendance for placement of a peritoneal dialysis catheter.		
ICD10 code	**Condition**	
N185	Chronic renal failure CKD5	
Z490	Preparatory care for dialysis	
E119	Type 2 diabetes mellitus	
I10X	Hypertension	
OPCS4.9 code	**Intervention**	
X411	Placement of ambulatory peritoneal dialysis catheter	
HRG	**Description**	**Tariff**
LA05Z	Renal Replacement Peritoneal Dialysis Associated Procedures	£1,104

Optimal management pathway		
In this scenario there would be a planned day case attendance for flushing of a peritoneal dialysis catheter and training.		
ICD10 code	**Condition**	
N185	Chronic renal failure CKD5	
Z490	Preparatory care for dialysis	
E119	Type 2 diabetes mellitus	
I10X	Hypertension	
OPCS4.9 code	**Intervention**	
X418	Placement of ambulatory peritoneal dialysis catheter other specified	
Y031	Flushing of catheter NOC	
HRG	**Description**	**Tariff**
LA05Z	Renal Replacement Peritoneal Dialysis Associated Procedures	£1,104

The follow up for check and flush of catheter and training would have the same HRG if done as a day case.
If done as an outpatient, then there is not an outpatient tariff for the HRG so it would be costed as a normal outpatient attendance.

Appendix 3:
Chronic Kidney Disease (CKD) 'Day case' Proforma

Exemplar CKD 'Day Case' Coding Pro-forma St. Elsewhere's NHS Foundation Trust

Surname:
Consultant:
D.O.B:
NHS Number:

Forename:
Patient ID:
Postcode:

Diagnosis Code:

- ☐ Chronic Renal Failure, Stage 5; N18.5
- ☐ Chronic Renal Failure, Stage 4; N18.4
- ☐ Chronic Renal Failure, Stage 3; N18.3
- ☐ Chronic Renal Failure, unspecified; N18.9
- ☐ Acute Kidney Injury, unspecified; N17.9
- ☐ Chronic Pain Syndrome; G89.4*

Co-morbidities:

- ☐ Hypertension
- ☐ Obesity
- ☐ Ischaemic Heart Disease
- ☐ Anxiety disorders
- ☐ COPD
- ☐ Depressive episodes
- ☐ Asthma
- ☐ Tendency to fall
- ☐ Peripheral vascular disease
- ☐ Osteoporosis/Osteoarthritis
- ☐ Cerebrovascular event/disease
- ☐ Difficulty walking
- ☐ Long Term Oxygen dependant
- ☐ Diabetes Type 1
- ☐ Cancer – state site:
- ☐ AF
- ☐ History of Cancer – state site:
- ☐ Diabetes Type 2
- ☐ Anaemia
- ☐ Thyroid disorder

Procedure Code:

- ☐ Creation of arteriovenous fistula for dialysis; L74.6
- ☐ Placement of ambulatory peritoneal dialysis catheter; X411

RTT Status:

- ☐ 1st Treatment given (30)
- ☐ DNA and Discharge (33)
- ☐ Patient watchful wait (31)
- ☐ Decision not to treat (34)
- ☐ Consultant watchful wait (32)
- ☐ Treatment not commenced – further investigation (20)

Follow-up Instructions:

- ☐ Clinic Appointment:
- ☐ Timescale:

Adapted from: Fraser et al (2015), The burden of comorbidity in people with chronic kidney disease stage 3: a cohort study, BMC Nephrology, 16, 193 https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4666158/
*ICD10 2020; New diagnosis code for chronic pain syndrome.

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Resources

Kidney Care UK;
https://www.kidneycareuk.org/

National Kidney Federation;
https://www.kidney.org.uk/

The Renal Association;
https://renal.org/

British Renal Society;
https://britishrenal.org/

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  Wilmington Healthcare

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Notes

Wilmington Healthcare
Beechwood House
2–3 Commercial Way,
Christy Close, Southfields
Basildon, Essex
SS15 6EF

T +44 (0)1268 495 600
E info@wilmingtonhealthcare.com
W www.wilmingtonhealthcare.com

Wilmington Healthcare