



Oxford University Hospitals **NHS**  
NHS Foundation Trust



## Renal replacement therapy and the future of renal medicine

Dr Tom Connor  
Oxford Kidney Unit, UK

*thomas.connor@ouh.nhs.uk*

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## The origins of chronic renal replacement therapy (RRT)

The 'Lucky 13' in 1965



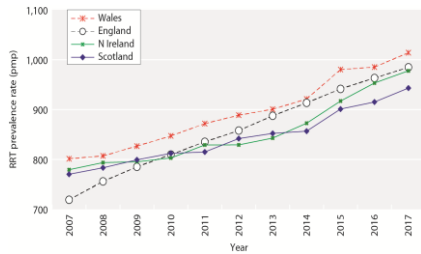
### Patient selection:

1. 'Mature and stable'; preferably married with children
2. Age 20-50
3. 'Able to perform a full week's work'
4. No comorbid disease (eg diabetes until 1987)
5. Those who would 'be thankful for the opportunity afterwards'

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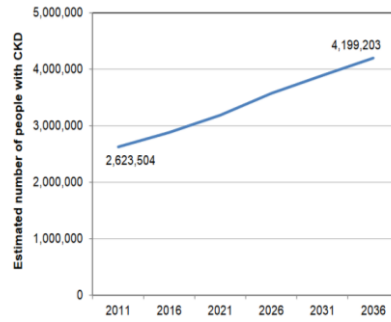
# Growth in Renal Replacement

**Figure 2.1.** Adult RRT prevalence rates between 2007 and 2017 – per million population



UK Renal Registry 21st Annual Report  
Data to 31/12/2017

**Figure 2.2.** Projections of growth in expected number of people in England with CKD stages 3-5, 2011 -2036



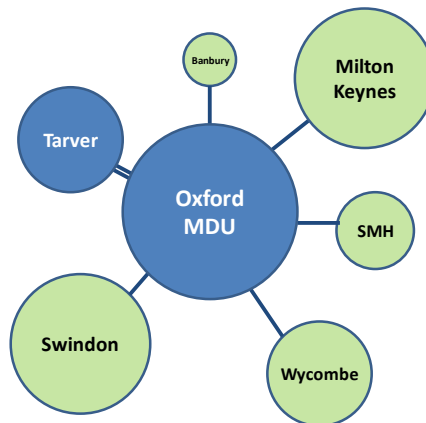
Source: Public Health England 2012-based  
Subnational Population Projections for England

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## Current status

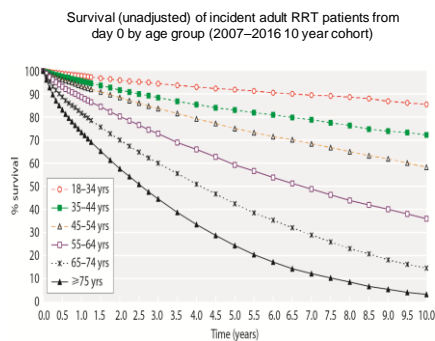


- Sidney Benjamin, from Finchley, celebrating his 104 th birthday.
- He was on dialysis for eight years after his kidneys deteriorated at the age of 96.

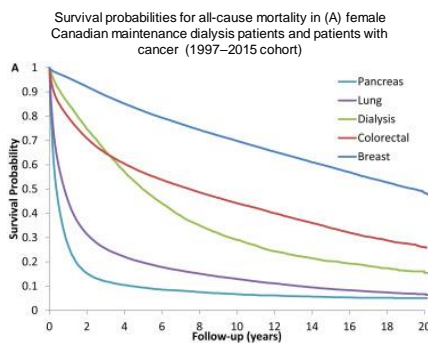


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# Outcome



UK Renal Registry 21st Annual Report  
Data to 31/12/2017



Naylor et al AJKD 2019

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## Mr JF

*'Many thanks for previously helping with my 88 year old gentleman, who has recently moved to a local nursing home...*

*In summary, this gentleman's kidney function is continuing to deteriorate made worse by episodes of acute kidney injury. I would like to try and forward plan with him. I am not sure if there has ever been a discussion about dialysis with him. I am not sure if you could advise further with regard to this. As mentioned he is now living in a nursing home due to increased care needs. He does spend a lot of the day in bed, and needs assistance with activities of daily living. I would be grateful for your advice as to whether he is/not a suitable candidate, so I can discuss future care with this patient and his niece.*

*Many thanks for your advice.'*

LS

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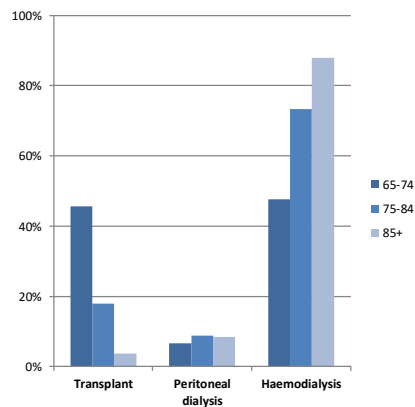
# Pre-dialysis education

- Benefits of education programmes to:
- Lacson 2011
  - Adjusted HR 0.61 for attendance at treatment options program (3165 of 30,217 incident patients in 2008)
- Devins 2003
  - Time to dialysis significantly longer in the intervention group (17.0 vs 14.2 months)
- **NICE guideline 107** published October 2018 on renal replacement therapy and conservative management with 47 recommendations
- Quality Statement 1
- *'Adults preparing for renal replacement therapy, and their family members or carers, undertake individualised education programs at specialist renal centers.'*
- Start assessment at least 1 year before therapy is likely to be needed
- Remember that some decisions must be made months before RRT is needed.
- Ensure that decisions about RRT modalities or conservative management are **made jointly**, taking into account:
  - predicted quality of life
  - predicted life expectancy
  - the person's preferences
  - other factors such as co-existing conditions.
- Involve the person and their family members or carers in **shared decision-making** over the course of assessment to include:
  - clinical preparation
  - psychosocial evaluation, preparation and support
  - the person's individual preferences for type of RRT and when to start
  - how decisions are likely to affect daily life.

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# Modality choice

- Preference for hospital-based dialysis in the elderly
- MDT view of suitability for home therapy 1.5-2x the rate judged by patients (Winterbottom 2016)
- Uptake of home therapies falls after declaration of modality choice and again after start of dialysis (Keating 2014, De Maar 2016)
- It is possible to increase the uptake of home therapies with targeted education & advocacy
- Adult learning principles
  - Decision aids
  - Values-based education
  - Information congruent with patients own beliefs/culture
- No evidence of how best to deliver pre-dialysis education

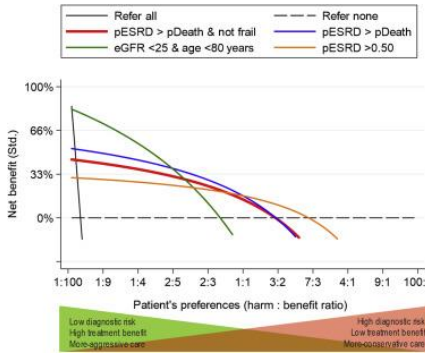


UK Renal Registry 21st Annual Report  
Data to 31/12/2017

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# Predicted start

- Competing risk of ESRD and death
- Kidney failure risk equation (Tangri 2011)
  - Age, sex, eGFR, urine ACR
- Mortality risk equation (Bansal 2015)
  - Age, sex, race, eGFR, urine ACR, smoking, DM, CCF, CVA

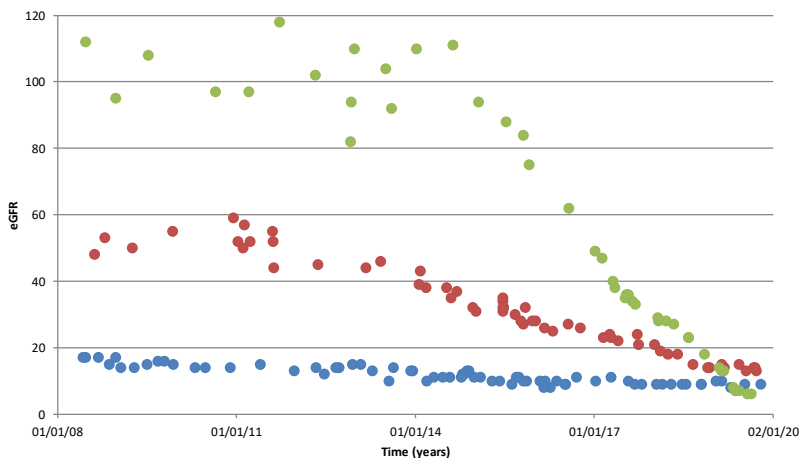


*“Past performance is no guarantee of future results...”*

Clinical utility of nephrology referral algorithms relative to patients’ valuation of harm versus benefit  
Hallan et al. Kidney Int. 2019 Sep;96(3):728-737

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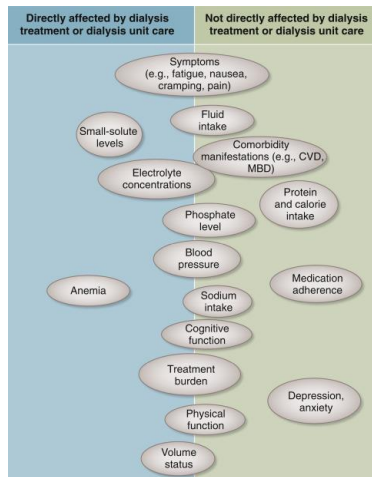
# Trajectories to ESRD



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## Initiation

- Patient-reported
  - Symptoms, nutritional status, functional capacity
- Clinical reported
  - Muscle strength, gait speed, BMI
- Biomarkers
  - eGFR, albumin, phosphate, haemoglobin

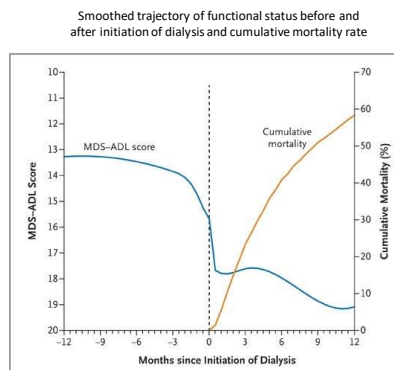


CT Chan et al.: Dialysis initiation: a KDIGO conference report  
Kidney Int. 2019 Jul;96(1):37-47.

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## Residual renal function

- Dialysis schedule is historic marriage of convenience – yet majority of patients started on this 3x/wk
- 40% patients starting dialysis in US in 2013 had eGFR >10 ml/min
- Haemodialysis itself promotes loss of residual renal function
- Residual renal function
  - Fluid balance (Rottembourg 1993)
  - LVH (Fagugli 2003)
  - Nutritional status (Rhee 2013)
  - Quality of life (Shafi 2010)
  - Survival (Obi 2016)

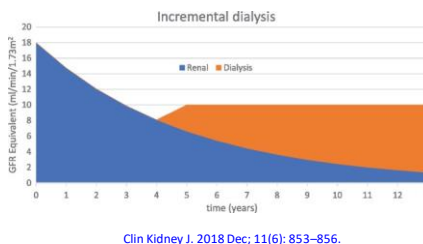


Tamura et al. Functional Status of Elderly Adults before and after Initiation of Dialysis; *NEJM* 2009

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## Incremental dialysis

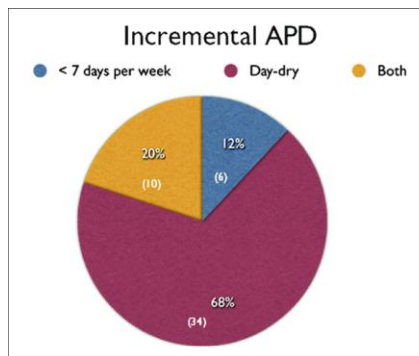
- Incremental haemodialysis
  - Slower decline in residual renal function (Lin 2009, Zhang 2014)
  - Lower mortality in prevalent patients (Hanson 1999)
  - Little take-up (<2% eligible pts Obi 2016)
  - Higher mortality if comorbid (Mathew 2016)
- Practicalities
  - Limited to most stable patients (fluid, potassium, anaemia, hospitalisations)
  - Detailed and recurrent reassessment of residual function



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## Assisted PD

- 6% of all patients are on peritoneal dialysis
  - Cf. 30% 1981
- Advantages
  - Home therapy
  - Preserved residual function
- Assisted automated PD
  - Equivalent cost to in-centre HD
  - Daily visit to set up machine, check weight & exit site
  - Patient/family does own connection & disconnection
- Assisted CAPD
  - 2 exchanges/day
  - Simple prescription
  - 5 days/week



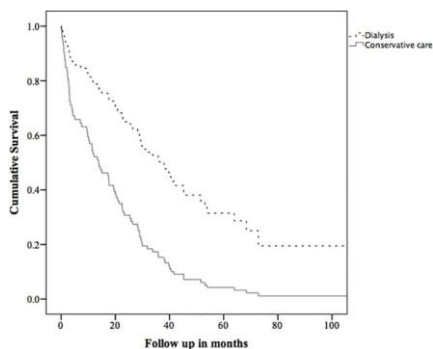
Ankawi et al CIKHD 2016

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## Assisted PD

- What to do with the well elderly?
- Community based
  - Better integration with social care
- Review at 3 months:
  - Is life better now?
- Person-centred care
  - Quality of life
  - Move away from Kt/V
- Transition to palliative care rather than to hospital-based haemodialysis

Survival curve comparing dialysis with conservative care from the date of first outpatient eGFR  $\leq 10$  mL/min/1.73m<sup>2</sup>.

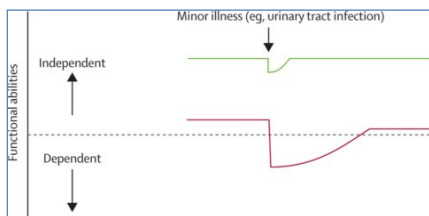


Outcomes in dialysis versus conservative care for older patients: A prospective cohort analysis of stage 5 Chronic Kidney Disease.

Raman et al.: PLoS One. 2018 Oct 26;13(10)

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## Frailty



- Multidimensional loss of homeostatic reserve
- Many definitions
  - Accumulated deficits
  - Phenotypic criteria
- Prevention
  - Screening in UK primary care (eFI since 2017)
- Complex intervention
  - Comprehensive geriatric assessment
  - Sarcopenia (physical frailty)
  - Systems level programs

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# Frailty in advanced CKD

- The dialysis population is older
- 50% frailty (Goto 2019) in patients >65 starting dialysis
  - 77% had ≥2 geriatric impairments
  - 80% help with ADLs
  - 67% cognitive deficit
- Falls in 33% (Iyasere 2016)
- Associated with worse quality of life
- Comprehensive Geriatric Assessment
  - Medical
  - Psychosocial
  - Functional
  - Environmental
- Evidence from acute hospital care (acute admissions, perioperative medicine)
- Time-consuming
- Risk of using frailty to deny patients appropriate treatment

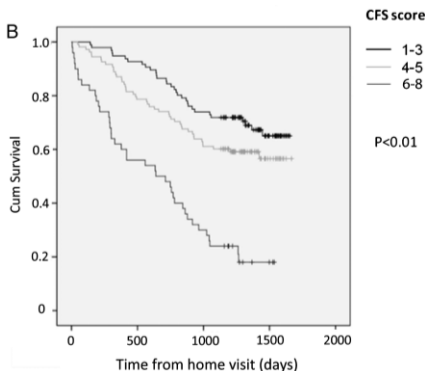
**Clinical Frailty Scale\***

- 1 Very Fit** – People who are robust, active, energetic and motivated. These people commonly exercise regularly. They are among the fittest for their age.
- 2 Well** – People who have **no active disease symptoms** but are less fit than category 1. Often, they exercise or are very **active occasionally**, e.g. seasonally.
- 3 Managing Well** – People whose **medical problems are well controlled**, but are **not regularly active** beyond routine walking.
- 4 Vulnerable** – While **not dependent** on others for daily help, often **symptoms limit activities**. A common complaint is being "slowed up", and/or being tired during the day.
- 5 Mildly Frail** – These people often have **more evident slowing**, and need help in **high order IADLs** (finances, transportation, heavy housework, medications). Typically, mild frailty progressively impairs shopping and walking outside alone, meal preparation and housework.
- 6 Moderately Frail** – People need help with **all outside activities** and with **keeping house**. Inside, they often have problems with stairs and need **help with bathing** and might need minimal assistance (cuing, standby) with dressing.

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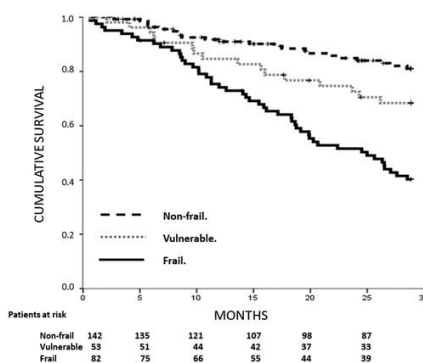
# Frailty outcomes

Kaplan–Meier survival curves for (B) frailty subgroup in 283 patients referred for pre-dialysis education 2010–2012 to single center



Pugh CKJ 2016 2016 Apr;9(2):324-9

Kaplan–Meier survival curves by frailty status (EFS) in 277 prevalent hemodialysis patients recruited in 2016 from a single center



Garcia-Canton, [Ren Fail](#), 2019 Nov;41(11):567-575

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## Location

- 50% of all non-emergency patient transport paid for by the NHS is for dialysis patients
- 25,000 people have haemodialysis treatment in hospitals or satellite units
- Patients average over 300 journeys every year to and from their dialysis
- Costs up to £250m per year
- Impact on carers, physio, rehab etc



Dialysis Transport Working Group (UK) 2019  
Comprehensive kidney patient transport guidance

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## Location



1966



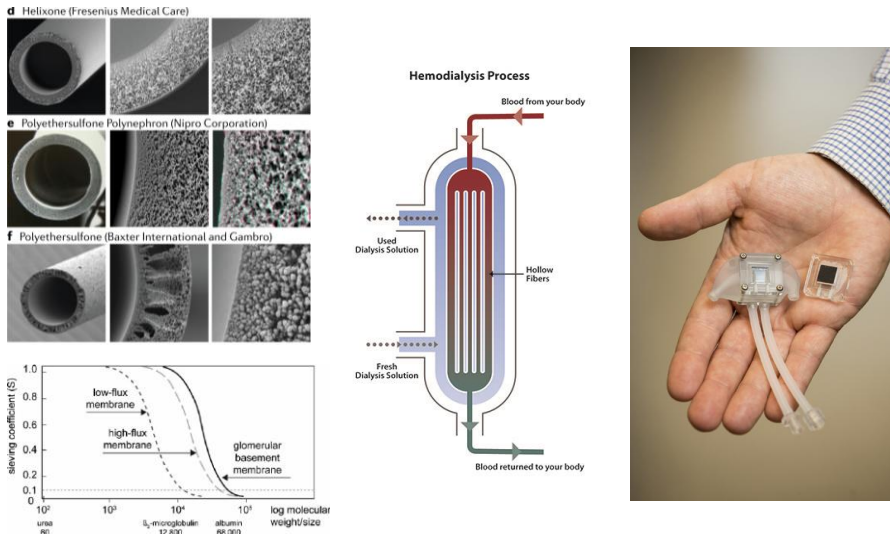
2004



2020

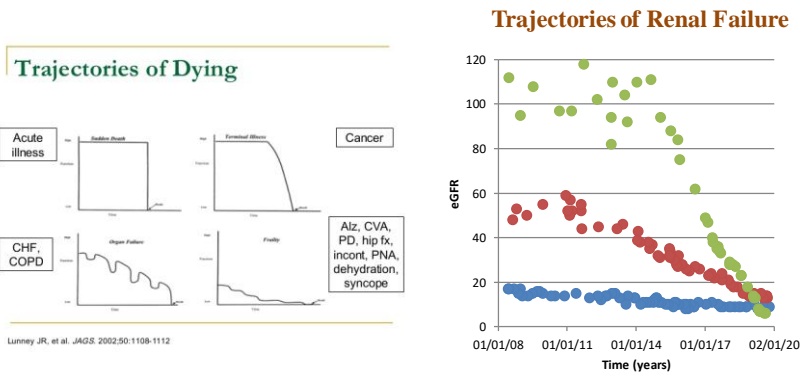
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# Technology



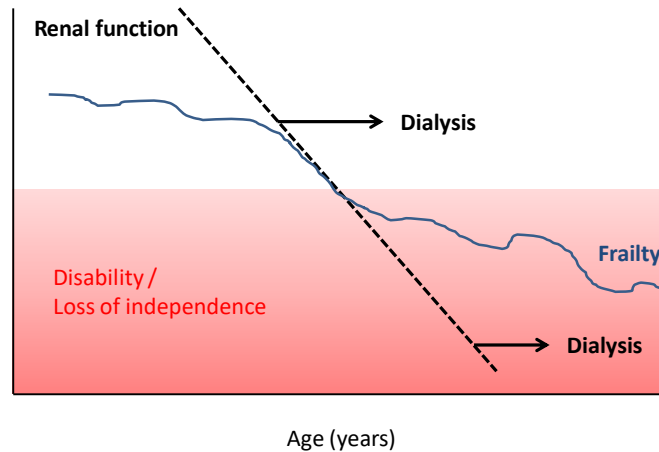
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# Prediction



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## Trajectory of illness



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## Future challenges

- Optimisation of referral & management of patients with advanced CKD
- Design of CKD frailty index for more accurate risk prediction
  - Based on IPOS renal
  - Combined with (novel) biomarkers
- Optimal content/format for patient education
  - Aim for >30% home therapies
- Can dialysis start be delayed safely with aggressive medical symptom control?
- What is the best dialysis modality (for frail elderly)?
  - PD/HD, duration/frequency, location, membrane
  - Prospective trial of incremental dialysis
  - Adequacy measures & symptom control
- How to track multi-dimensional outcomes in dialysis population?
  - Track symptoms & frailty with early review
  - Transition to palliative care

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