Optimal Start of ESRD

- Why Optimal Start
- Measuring Optimal Start
- Excuses for Non-Optimal Start
- Achieving Optimal Starts

Why Optimal Start of ESRD?

If you wait until you have symptoms to prepare for dialysis you will have a crash start!

Crash start of dialysis

- No preparation for dialysis = an extra procedure = temporary tube in neck vein
- Crash start = emergency dialysis
- Crash start = complications & hospitalization

Crash start = much less chance of living your life on your own terms with type of dialysis that fits your lifestyle.
Why Optimal Start of ESRD?

1. Central venous catheter ills
   • Risk of death 2-3 fold
   • Risk serious infection 5-10 fold
   • Risk of AVF fistula failure greater if already dialyzing with catheter


Start of HD with AV access

Start of HD with central venous catheter


Why Optimal Start of ESRD?

2. Risk of crash start of dialysis

Hospital day by first modality/access ESRD +/− 90 days from CKD 4/5  2009 SCKP

<table>
<thead>
<tr>
<th></th>
<th># hospital days per patient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peritoneal dialysis</td>
<td>132</td>
</tr>
<tr>
<td>Home hemodialysis</td>
<td>2</td>
</tr>
<tr>
<td>AVF</td>
<td>296</td>
</tr>
<tr>
<td>AVG</td>
<td>35</td>
</tr>
<tr>
<td>Central venous catheter</td>
<td>365</td>
</tr>
</tbody>
</table>

Variation by medical center suggests not entirely patient-specific factors
for home dialysis starts 2%-63% (pearson correlation 0.6 with hospital days)
for Optimal starts 27%-90% (pearson correlation 0.5 with hospital days)
Why Optimal Start of ESRD?

2. Active choice

*Crash start = much less chance of living your life on your own terms with type of dialysis that fits your lifestyle.*

Patient viewpoint

What suggestions do you have for how the kidney team can improve preparing patients for kidney treatment?

"Well the actual procedure or protocol... I was prepared for. I didn't realize, I was afraid of how much, um, limiting it would be; it's a very limiting treatment. You know when you wanna travel or something you have to plan everything pretty detailed, you lose the spontaneous."

Why Optimal Start of ESRD?

3. PD first?
   - survival advantage
   - preservation of residual renal function
   - prevention of central venous catheter for semi-urgent or urgent starts
   - Less exposure time to adverse effects of an AV access—
     - steal, cardiac strain, pulmonary hypertension
   - preservation of future vascular access
   - no AV access after transplant
Survival advantage of PD over HD in first year related to lack of central venous catheter

Adjusted on the basis of a stratified Cox proportional hazards model stratified by HD-CVC, PD, and HD-AV/AVG and adjusted for age, race, gender, era of dialysis initiation, end-stage renal disease comorbidity index, primary renal diagnosis, serum albumin, eGFR, province of treatment, and late referral.


Relative Contribution of Residual Renal Function and Peritoneal Clearance to Adequacy of Dialysis: A Reanalysis of the CANUSA Study

<table>
<thead>
<tr>
<th>Time</th>
<th>0</th>
<th>6</th>
<th>12</th>
<th>18</th>
<th>24</th>
<th>36</th>
</tr>
</thead>
<tbody>
<tr>
<td>GFR</td>
<td>3.7</td>
<td>2.8</td>
<td>2.1</td>
<td>1.9</td>
<td>1.5</td>
<td>1.0</td>
</tr>
</tbody>
</table>

- GFR 0.5 ml/min higher $\rightarrow$ 12% lower relative risk of death (95% CI, 0.83 to 0.94).
- Each 250 ml of urine per day $\rightarrow$ 36% lower relative risk of death (RR, 0.64; 95% CI, 0.51 to 0.80).


PD advantage—residual renal function

- PD vs HD = 65% lower risk to lose residual renal function (<200 ml/day at 1 year) in 1843 new dialysis patients in Canada.


PD advantage? Less exposure time to adverse effects of an AV access

steal, cardiac strain, pulmonary hypertension

Arteriovenous Fistula Toxicity

Richard Armstrong, Claudia Fonseca, Martin Kucharski, James E. Winters.
Selective placement of AVF’s

<table>
<thead>
<tr>
<th>SCAL</th>
<th>% possibly with AV access excluding those known to have chosen PD or no FRR</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>SCAL total</td>
<td>15%</td>
</tr>
</tbody>
</table>

IDEAL STUDY

Editorial:

“Given the results of the study, the use of temporary catheters, with their high risks of infection and stenosis, can probably be avoided, and patients willing to start peritoneal dialysis can avoid temporary hemodialysis.”

“In our view, the IDEAL trial supports the currently recommended practice, in which most nephrologists start patients on renal-replacement therapy on the basis of clinical factors rather than numerical criteria such as the estimated GFR alone.”

“Early referral to a nephrologist, a well-organized patient-education program, and careful planning before dialysis is initiated are the cornerstones of such a strategy.”

Your kidney treatment may change over time...

- Peritoneal Dialysis
- Hemodialysis
- Transplant
- Stop treatment Hospice—allow natural death

*Peritoneal dialysis as a first treatment saves your own partial kidney function longer compared to hemodialysis.
Pre-emptive renal transplant

Waiting time on dialysis as the strongest modifiable risk factor for renal transplant outcomes: a paired donor kidney analysis.

"ESRD time is arguably the strongest independent modifiable risk factor for renal transplant outcomes. Part of the advantage of living-donor versus cadaveric-donor transplantation may be explained by waiting time. This effect is dominant enough that a cadaveric renal transplant recipient with an ESRD time less than 6 months has the equivalent graft survival of living donor transplant recipients who wait on dialysis for more than 2 years."


Optimal Start of ESRD

- Why Optimal Start
- Measuring Optimal Start
- Excuses for Non-Optimal Start
- Achieving Optimal Starts

Optimal Start of ESRD

<table>
<thead>
<tr>
<th>New ESRD Patients</th>
<th>HOME DIALYSIS STARTS</th>
<th>IN-CENTER HEMODIALYSIS STARTS</th>
<th>PREEMPTIVE TRANSPLANTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>% Home Dialysis Starts</td>
<td>% Starting with AV Fistula</td>
<td>% Allowable with AV Graft</td>
<td>% Pre-emptive Transplant</td>
</tr>
</tbody>
</table>
Optimal Start of ESRD

**Metric Details**

Denominator = new ESRD patients during the measurement period previously in CKD Stage 4 or Stage 5 as identified by POINT.

Denominator exclusions: recovered GFR by 3 months after the first dialysis, restarted dialysis after kidney transplant.

Numerator = initial modality
- pre-emptive kidney transplant,
- peritoneal dialysis (or home hemodialysis)
- in-center hemodialysis with an optimal vascular access
  1st HD via AV fistula
  1st HD via AVG (max allowed AVG 5% of Hemo starts)

---

Decision support→data accuracy

GFR race adjustment example

SCKP GFR implementation 2003

---

GFR Results and Race

**Ambulatory key Messages**

September 26, 2008

Updating the Race field within the Demographics activity in KP HealthConnect now triggers adjustment of estimated Glomerular Filtration Rate (GFR) results by race.

- If the field is entered, the race previously recorded in the Foundation System will be used.
- If the field is not filled in, the patient's race recorded in the Demographics activity will be used.
- Future serum creatinine results will be adjusted and will display with a 'R' beside the result; the GFR estimate will be 21% higher.
- Lab will not change past GFR results after updating race in the patient chart; however, POINT stays as the Chronic Kidney Disease variable on the Preventive Care tab in KP HealthConnect. Will incorporate this race adjustment to past results in the near future.
Decision support—>data accuracy
GFR race adjustment example

Bring in estimated GFR from the SCAL lab directly into the Progress Note by using the link(GFR).
Results will display in this format: GFR 37-NB 07/26/2008
GFR 37-NB 08/20/2008
GFR 40-NB 07/26/2008

Avoid using lastGFR which is a generic link in KPIC.
- This link shows GFR estimates for both black and non-black so it will skew the data.
- Also this link uses only the generic GFR equation whereas our lab uses the DMS+GFR formula
  if applicable to that particular lab’s resistance assay.
- See lab-technical bulletin for more details:
  http://fnpk.info/igs/clinical-laboratory/docs/GFR/resolution_3800071.pdf

Decision support—>data consistency
CKD Staging Algorithm SCKP 2003
Overcoming problem of last GFR

- Compares recent GFR to GFR >=3 months
- Locks in chronic stage until recent GFR and GFR >=3 months both out of range in same direction
- Lags behind current GFR and provides 'baseline'

In a review of 100 patients with CKD over 5 years the algorithm reduced stage changes by from 342 to 72.

Decision support—>data specificity
CKD stage modifications for algorithm
SCKP implementation 2003

Proteinuria, Not Microalbuminuria, for CKD Stages 1 and 2

Additional Risk Factors for CKD Stages 1 and 2

POINT CKD staging algorithm

The Care Management Summary Sheet (CMSS) from POINT takes the work out of finding the CKD stages by using an algorithm with these features:
- Assign or reassign CKD stage only if ≥2 GFRs separated by ≥3 months are in given range.
- Searches for proteinuria results (2 consecutive measurements with urine microscopy <100 mg/dl or protein 300 mg/dl in assigning CKD staging excluding results obtained during pregnancy). Impacts additional requirements of high risk status for stage 3 assignment of either (1) persistent proteinuria or (2) GFR < 60 or (3) age < 85 or (4) a mean of 2 standard deviations < the mean for age) or (5) diabetes mellitus (DM) diagnosis.
**Table 3: CKD Stage Denominator**

<table>
<thead>
<tr>
<th>Area</th>
<th>Stage 1</th>
<th>Stage 2</th>
<th>Stage 3</th>
<th>Stage 4</th>
<th>Stage 5</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>AV</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>15</td>
</tr>
<tr>
<td>BA</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>15</td>
</tr>
<tr>
<td>BE</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>15</td>
</tr>
<tr>
<td>BP</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>15</td>
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<tr>
<td>PO</td>
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<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>15</td>
</tr>
<tr>
<td>HC</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>9</td>
<td>15</td>
</tr>
<tr>
<td>LA</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>9</td>
<td>10</td>
<td>15</td>
</tr>
<tr>
<td>OC</td>
<td>7</td>
<td>8</td>
<td>9</td>
<td>10</td>
<td>11</td>
<td>15</td>
</tr>
<tr>
<td>PC</td>
<td>8</td>
<td>9</td>
<td>10</td>
<td>11</td>
<td>12</td>
<td>15</td>
</tr>
<tr>
<td>MI</td>
<td>9</td>
<td>10</td>
<td>11</td>
<td>12</td>
<td>13</td>
<td>15</td>
</tr>
<tr>
<td>SD</td>
<td>10</td>
<td>11</td>
<td>12</td>
<td>13</td>
<td>14</td>
<td>15</td>
</tr>
<tr>
<td>WH</td>
<td>11</td>
<td>12</td>
<td>13</td>
<td>14</td>
<td>15</td>
<td>15</td>
</tr>
</tbody>
</table>

Grand Total: 15

**CKD 4/5 consistent and actionable denominator**

**Diagram**

**3rd Qtr, 2010 and 4th Qtr, 2010**

<table>
<thead>
<tr>
<th>Count of MRN</th>
<th>Area 1</th>
<th>Area 2</th>
<th>Area 3</th>
<th>Area 4</th>
<th>Area 5</th>
<th>Area 6</th>
<th>Area 7</th>
<th>Area 8</th>
<th>Area 9</th>
<th>Area 10</th>
<th>Area 11</th>
<th>Area 12</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stages</td>
<td>5%</td>
<td>5%</td>
<td>5%</td>
<td>5%</td>
<td>5%</td>
<td>5%</td>
<td>5%</td>
<td>5%</td>
<td>5%</td>
<td>5%</td>
<td>5%</td>
<td>5%</td>
<td>5%</td>
</tr>
</tbody>
</table>

**Diagram**

**Legend**

- AV: AV
- BA: BA
- BE: BE
- BP: BP
- FO: FO
- HC: HC
- LA: LA
- OC: OC
- PC: PC
- RI: RI
- SD: SD
- WH: WH
- WL: WL
CKD 4c/5 subset—chronic, actionable, consistent

- 2008 region new ESRD patients
- \( \rightarrow 1,092 \) total
- \( \rightarrow 809 \) from CKD stage 4 or 5 prior
- \( \rightarrow 629 \) from CKD 4c or 5 = persistent GFR <20

CKD 4c/5 subset

- CKD 4+5 \( \rightarrow \) ESRD
  - \( \sim 16\% \) in 1 year

- CKD 4c+5 \( \rightarrow \) ESRD
  - \( \sim 70\% \) in 1 year

There is time:
Length of time with GFR in given range for CKD 5 FRR who started ESRD with catheter in 1st half 2007

GFR was < 15 in
- 44 of 49 patients for > 90 days (90%)
- 31 of 49 patients for > 180 days (63%)
- 11 of 49 patients for > 365 days (22%)

GFR was < 20 in
- 47 of 49 patients for > 90 days (96%)
- 41 of 49 patients for > 180 days (84%)
- 26 of 49 patients for > 365 days (53%)
A difference of 59 vs 50% Optimal start for a 6 month period during which ~500 patients start ESRD represents cost savings of ~$0.5 million.* National rate of Optimal Start estimated at 25% compared to 44% for all ESRD starts (i.e. not limited to ckd 4/5).

*U.S. Renal Data System, USRDS 2009 Annual Data Report: central venous catheter for 6 months rather than arteriovenous fistula represents incremental cost of ~$10,000. Savings is higher if Optimal Start of ESRD is peritoneal or renal transplant (amortized for initial cost of surgery).

OPTIMAL START of ESRD From CKD Stage 4 & 5

Auditing process of list with care managers before release of data.
Optimal Start of ESRD

• Why Optimal Start
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Key facts regarding non-optimal starts of ESRD

• 74% saw nephrologist starting at least 1 year prior to start of ESRD
• 70% attended Choices class prior to start of ESRD
• By both survey & vascular access data only 20-25% have an AV access in place at the time of starting ESRD with catheter.
Dispelling myths/excuses about non-optimal starts

- AVF or PD not possible in many of these non-optimal starts.
- See next 3 slides to dispel these myths.

Time tells us what is achievable at 6 months after starting dialysis.

- In 2008, 404 CKD 4/5 patients began ESRD via a central venous catheter
- Catheter rate of 50%.
- At 6 months after starting dialysis at least 82 of these patients using AVF, 18 are now using AVG, and 16 are on PD
- If we could warp time so these patients had AV access or PD at the start of ESRD instead of 6 months later, catheter rate would be down to 36%.

Are non-optimal starts of ESRD disproportionately elderly diabetics who could not get an AVF?

![Age and Diabetic status distribution graph]

- CKD 4/5 ESRD STARTS: 2006-MAY, 2009
- Age and Diabetic status distribution
- Preemptive txp
CKD 4/5 starting Hemodialysis
Age>=70 and DM vs others

- 42% AVF starts (329 of 785)
- Whereas those <age 70 or non-DM 40% AVF starts (419 of 1,052).
- AVG 7% versus 4%

Do we need to bother discussing renal replacement in the elderly? 40% of non-optimal starts were age >=70

Variation suggest what is possible
Patient Viewpoint

### All CKD 5 Patients Starting Dialysis in 2008

<table>
<thead>
<tr>
<th></th>
<th>Catheter</th>
<th>Fistula</th>
<th>PD</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Numbers</td>
<td>82</td>
<td>123</td>
<td>51</td>
<td>256</td>
</tr>
<tr>
<td>Percentages</td>
<td>32%</td>
<td>48%</td>
<td>20%</td>
<td>100%</td>
</tr>
</tbody>
</table>

Patients who were interviewed. The list of 256 CKD 5 patients was sent to a market research firm that conducted the phone interviews. A total of 167 of the 256 patients were interviewed – a 65% response rate.

<table>
<thead>
<tr>
<th></th>
<th>Catheter</th>
<th>Fistula</th>
<th>PD</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Numbers</td>
<td>48</td>
<td>89</td>
<td>30</td>
<td>167</td>
</tr>
<tr>
<td>Percentages</td>
<td>29%</td>
<td>53%</td>
<td>18%</td>
<td>100%</td>
</tr>
</tbody>
</table>

- **Demographics:** There is a higher percentage of catheter patients...
  - At some medical centers than at others
  - In African Americans than in Whites or Hispanics
  - In Spanish speakers than in English speakers

- **Patient-specific barriers:** A higher percentage of catheter patients than fistula or peritoneal dialysis (PD) patients agreed with each of the following:
  - Hard to get to the kidney clinic for appointments
  - Medical information was confusing and hard to understand
  - Didn’t think their kidney disease was that bad
  - Were focused on other medical problems
  - Did not have a nurse or social worker to help them through all the steps of starting dialysis

Catheter patients, who have Non-Optimal Starts, differ from Optimal Start patients (fistula and peritoneal dialysis patients) in a number of ways.

- **Information and support:** Relative to fistula or PD patients...
  - A higher percentage of catheter patients said they knew “nothing” about the different methods of kidney treatment.
  - Smaller percentages of catheter patients said they got “quite a bit” or “a lot” of information about replacing kidney functioning from: a kidney doctor, a nurse or other staff in the kidney clinic, their personal doctor, the Choices class, or from family and friends.
  - For catheter patients who started to prepare for an Optimal Start, a smaller percentage said the Choices class helped them decide to prepare for dialysis.

- **Opinions about the kidney team:** Compared with fistula or PD patients...
  - Catheter patients rated the kidney team less positively on preparing them for kidney treatment.

### CKD 5 Optimal Start Interviews

Report Vivian Nagy, Ph.D. Clinical Analysis SCPMG
Optimal Start of ESRD

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My Next Steps after the Choices Workshop

For ALL:
- Discuss my choice and plans for kidney failure treatment with my family and friends.
- Make an appointment with my kidney doctor (nephrologist) within 2 months.
- Discuss my choice with my kidney doctor.
- Review section “WHY AVOID CRASH START OF DIALYSIS”.
- Sign up for the Healthy Living with Chronic Disease Workshop.

PLUS:

My Next Steps after the Choices Workshop

PLUS:

Because I have chosen hemodialysis:
- Visit a hemodialysis unit. My care manager can arrange a tour.
- Discuss with my kidney doctor the timing of surgery for fistula (connection of the blood vessels under the skin in my arm).

Because I have chosen peritoneal dialysis:
- Meet with peritoneal dialysis nurses.
- Discuss with my kidney doctor the timing of surgery for peritoneal dialysis catheter (tube in belly).

Because I am still choosing between peritoneal and hemodialysis:
- Meet with peritoneal dialysis nurses.
- Visit a hemodialysis unit. My care manager can arrange a tour.
- Attend this Choices Workshop again.
My Next Steps after the Choices Workshop

Because I am choosing NO FUTURE DIALYSIS for kidney failure:

- Meet with my kidney social worker.
- Review section "CHOOSING NO FUTURE DIALYSIS".
- Make my wish for No Future Dialysis clear to my family and friends.
- Complete advance directive and physician’s order for life-sustaining treatment.

Decision support → data specificity
point of care data entry
no future renal replacement/no dialysis therapy

CKD 4/5 with ‘no future renal replacement’ and with POLST

<table>
<thead>
<tr>
<th>PCP AREA</th>
<th>CKD 4/5</th>
<th>No FRR by flag or problem list</th>
<th>POLST</th>
<th>Both No FRR and POLST</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANIV-S*</td>
<td>501</td>
<td>23</td>
<td>12</td>
<td>2</td>
</tr>
<tr>
<td>AV-S*</td>
<td>38</td>
<td>5</td>
<td>7</td>
<td>0</td>
</tr>
<tr>
<td>BAK-S*</td>
<td>130</td>
<td>6</td>
<td>8</td>
<td>0</td>
</tr>
<tr>
<td>BEL-S*</td>
<td>464</td>
<td>4</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>BPK-S*</td>
<td>365</td>
<td>14</td>
<td>16</td>
<td>7</td>
</tr>
<tr>
<td>FON-S*</td>
<td>516</td>
<td>42</td>
<td>14</td>
<td>7</td>
</tr>
<tr>
<td>HAR-S*</td>
<td>371</td>
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<td>12</td>
<td>4</td>
</tr>
<tr>
<td>NA</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
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<tr>
<td>PAN-S*</td>
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<td>15</td>
<td>11</td>
<td>1</td>
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<tr>
<td>RIV-S*</td>
<td>413</td>
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<td>24</td>
<td>5</td>
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<td>SD-S*</td>
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<tr>
<td>SUN-S*</td>
<td>488</td>
<td>18</td>
<td>6</td>
<td>3</td>
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<tr>
<td>WLA-S*</td>
<td>297</td>
<td>8</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>WOD-S*</td>
<td>374</td>
<td>25</td>
<td>13</td>
<td>1</td>
</tr>
<tr>
<td>TOTAL</td>
<td>3708</td>
<td>207</td>
<td>146</td>
<td>24</td>
</tr>
</tbody>
</table>
CHOOSING NO FUTURE DIALYSIS

Some people choose not to have any dialysis treatments in the future when needed. This is a serious choice. This is a very personal choice that we encourage you to discuss with your loved ones and with your kidney doctor and social worker. When your kidneys fail to the point of needing dialysis, your life will be shortened without dialysis treatments.

You can change your mind at any time and start dialysis. However, there may be permanent consequences if you wait too long before you start dialysis:

- Your health may deteriorate permanently.
- Your body may have permanent damage.
- Your life on dialysis may never be as good as it could have been. (See section “WHY AVOID A CRASH START OF DIALYSIS.”)

WHY AVOID A CRASH START OF DIALYSIS

Almost everyone with stage 4 or 5 kidney disease at some point asks himself or herself this question: “If I am going to be on dialysis anyway, why not delay until it is absolutely necessary? What have I got to lose by waiting until the last minute to start dialysis?”

The answer is that you have a lot to lose if you do not prepare. Many studies have shown that people who have a crash start of dialysis are more likely to die or have complications or never regain the life and strength they had before dialysis. They are also less likely to choose the type of dialysis that best fits their lifestyle. Also they end up getting the same surgeries they would have had anyway plus an additional procedure called a central vein catheter (large tube in vein in neck) in order to get immediate dialysis.

CKD 4/5 = GFR <30 more than 3 months by algorithm
CKD 4c/5 = GFR <20 more than 3 months by algorithm
*excludes no future renal replacement

% CKD 4/5 or 4c/5 not seen in nephrology as outpatient in 12 months*
CKD 4/5 = GFR <30 more than 3 months by algorithm
CKD 4c/5 = GFR <20 more than 3 months by algorithm
*excludes no future renal replacement
Processes to support Optimal Start ESRD

- CKD 4c/5 (chronic GFR <20) capture
  - Never seen by nephrology → PCM DA → Direct review by PCP for referral or for formal labeling of no future renal replacement
  - Seen by nephrology but not in 12 months → Nephrology DA → Appointment
  - Choices class attendance 90% goal for 4c/5 → Currently only achieving 76%
  - Monthly list to nephrology teams/nephrologists (available anytime directly via CKD 4/5 database)

Processes to support Optimal Start ESRD

- For purposes of determination of responsibility of Optimal Start metric and CKD 4/5 care management, patient belongs to medical center of PCP unless last outpatient nephrology visit was at another medical center within 12 months.
  - Bottom line is that we all should live with this simple rule, it will make us more efficient (without care managers having to do extra work contacting other medical centers) and most importantly it will ensure that we have a process such that no patient is missed: patient is responsibility of current medical center by PCP unless last outpatient nephrology visit was at another medical center within 12 months.

Decision support metrics

OPTIMAL START of ESRD nephrologist report
Decision support → actionable report
CKD 4c/5 optimal start preparation summary

Future Dialysis Modality
1.0-needs decision
2.0-peritoneal dialysis choice
2.1-peritoneal dialysis education with PD nurses
2.2-peritoneal dialysis choice confirmed by nephrologist
2.3-peritoneal dialysis home visit
2.4-accepted into peritoneal dialysis
2.5-peritoneal dialysis referral for buried catheter
2.6-peritoneal dialysis for direct catheter
2.7-has buried peritoneal dialysis catheter
2.8-has direct peritoneal dialysis catheter

3.0-hemodialysis choice
3.1-hemodialysis choice confirmed by nephrologist
3.2-hemodialysis referred for arteriovenous access
3.3-hemodialysis seen by vascular surgeon
3.4-hemodialysis AV access surgery
3.5-hemodialysis AV access mature

4.0-No Dialysis Therapy choice
4.1-No Dialysis Therapy confirmed by nephrologist
4.2-No Dialysis Therapy referred to social worker
4.3-No Dialysis Therapy seen by social worker
4.4-No Dialysis Therapy by Problem List and POLST
4.5-No Dialysis Therapy palliative care
4.6-No Dialysis Therapy hospice care

Decision support → actionable report
CKD 4c/5 optimal start patient-level data

Categorical data entry at point of care to feed back to population data base, (not active yet)
Patient viewpoint

**AVF**

Before I started dialysis, my greatest fear about starting dialysis was:

"Actually I don't have greatest fear because I expected it and in fact, I really wanted to have it because of my experience with the heaviness of my body and the limitations that I cannot do things so much, that's why I really expected it. I don't have greatest fear because I'm aware of the situation and also I was educated about it."

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Patient viewpoint

**PD**

**Timing of start of dialysis:**

"Because it was time for me to get started, all my vitals were indicating I needed to be on dialysis. Counts were low and toxins were building up in my system. Upon recommendation from my doctor, we went on with it."

**Condition at start of dialysis:**

"Really the only thing I had was high blood pressure and problems with my cholesterol and basically that's it. I didn't get sick or anything and the toxins were building, and my creatinine reading was high... All I can say is, I never was in any pain or got really ill. It was through my blood work, that was my indication that I was going through the different stages of kidney problems, a lot of other people had a lot of pain, and they were really sick."