

End Stage Renal Disease

December 2025



Information contained in the Care Guide is not a substitute for a health care professional's clinical judgment. Evaluation and treatment should be tailored to the individual patient and the clinical circumstances. Furthermore, using this information will not guarantee a specific outcome for each patient. Refer to "Disclaimer Regarding Care Guides" for further clarification.

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GOALS

- Appropriately refer to Nephrologist and for Dialysis Access
- Recognize End Stage Renal Disease (ESRD) as a strong risk factor for Atherosclerotic Cardiovascular Disease (ASCVD)
- Preserve residual renal function as long as possible on hemodialysis (HD)
- Assess for transplant candidacy
- Recognize and promptly refer HD access complications
- Understand management of HD complications
- Coordinate palliative and end-of-life care

ALERTS

- If signs/symptoms of uremia present, refer to higher level of care (HLOC) for HD start
- If hyperkalemia, decompensated or new onset congestive heart failure (CHF/dyspnea/fluid overload), refer to HLOC, HD start imminent
- Alert nephrologist for clinical or radiographic evidence for volume overload/depletion, inability to control hypertension (HTN) or metabolic issues
- Avoid Tunneled Dialysis Catheters - high mortality and morbidity
- ESRD with microhematuria needs cystoscopy and ultrasound (US) to rule out renal cell carcinoma (RCC) or other uroepithelial carcinomas
- Refer to HLOC promptly for symptoms of Steal or High Output Heart Failure from arteriovenous fistula (AVF) or arteriovenous graft (AVG), also vigilance for sepsis
- Estimated glomerular filtration rate (GFR) < 20 ml/min can be considered for a referral for transplant evaluation

DIAGNOSTIC CRITERIA

- **ESRD** is a progressive disease defined as: kidney failure and GFR < 15*. When **uremia**[†] presents, long-term dialysis or kidney transplant is ultimately necessary to sustain life. ESRD = stage 5 chronic kidney disease (CKD 5), which may be further classified as non-dialysis (5ND), dialysis (5D), and transplant (5T).
- Patients in earlier stages (CKD 3-4), if associated with albuminuria, are at very high risk of progression, and that risk is directly proportional to the degree of albuminuria.
- Obtain renal function labs and urine albumin to creatinine ratio (UACR) at presentation and quarterly. Frank proteinuria: Use the protein-creatinine (UPCR).

* **GFR** is measured in mL/min/1.73 m².

[†] **Uremia**: a clinical syndrome produced by the toxic effects of abnormally high concentrations of nitrogenous substances in the blood as a result of the kidney's failure to expel waste products by way of the urine.

Stage	GFR value ml/min/1.73m ²	Classification
1	> 90	Normal or high
2	60-89	Slightly decreased
3a	45-59	Mild to moderately decreased
3b	30-44	Moderately to severely decreased
4	15-29	Severely decreased
5	< 15	Kidney Failure

EVALUATION

- **History:** Symptoms of uremia are non-specific and may include one or more of the following: weakness, anorexia, fatigue, nausea and vomiting (N/V), reversal of sleep patterns and fluid retention/dyspnea. Advanced disease may be associated with chest pain, mental status changes, paresthesias, and seizures. Urine volume.
- **Physical:** Assess volume status (jugular vein distension [JVD], pulmonary, cardiac, edema, skin turgor), evidence for serositis (rub) and evaluate vascular access (if present). See detailed vascular access exam page 5 and Attachment B.
- **Labs:** CBC and CMP are the most critical to obtain immediately. Human Immunodeficiency Virus (HIV), Hepatitis B surface antigen (HBsAg), and Hepatitis C Virus (HCV) studies are needed for acceptance by the HD provider. Other studies (phosphate, iPTH) will not affect immediate management. See pages 7 and 14.
- **Diagnostics:** Electrocardiogram (EKG) for electrolyte abnormalities and chest X-ray (CXR) for shortness of breath/concern for effusions. See page 18.

TREATMENT

- Identify and mitigate factors which may cause a more rapid decline in renal function. Delay HD start as long as possible as there is no benefit to “early start of dialysis.” See pages 9 and 10.
- Treatment is renal replacement therapy (RRT): HD and/or renal transplant (RT). Peritoneal dialysis is not an option in the California Department of Corrections and Rehabilitation (CDCR).
- Nephrologist generally manages: anemia, hyperkalemia, hyperparathyroidism, metabolic bone disease (MBD), and metabolic acidosis. Primary Care Providers (PCPs) will manage underlying co-morbidities such as HTN, lipids, diabetes, and ASCVD.
- When HD recommended, the dialysis nephrologist and PCP manage graft complications. Keep communication lines open.
- Administer recommended immunizations, especially if under RT evaluation. See Attachment A.
- Central transplant team will automatically screen all ESRD patients for referral to transplant center. A Request for Service (RFS) is not required.
- End of life care (see page 24). Engage in a frank discussion regarding dialysis as a choice, especially for elderly patients with conditions which affect both quality as well as anticipated quantity of life.

FOLLOW-UP AND MONITORING

Monitor for:

- **Symptoms which may indicate need for HD. See page 6.**
- Medications which should be avoided, used with caution/require dose adjustments. See pages 30-32.
- Acute and chronic complications of ESRD. See pages 18-23.
- Factors which may affect residual renal function. See page 17.
- Vascular access complications. See Attachment B.
- Control of underlying conditions: HTN (goal BP < 130/80 if tolerated, otherwise < 140/90), DM (7-8% or set target, see precautions on over-aggressive DM control, page 20), autoimmune disorders, etc.
- Contraindications/concerns or sentinel events that may impact a patient’s suitability for renal transplant please contact the RT team (CPHCSTransplantProgramCoordinator@cdcr.ca.gov).

CKD 5-HEMODIALYSIS ALGORITHM

- Patient presents with known CKD 4.
- Begin to prepare for hemodialysis.
- If not yet seen by nephrology, establish patient with nephrologist.
- Watch for s/s of CKD progression and signs of uremia*.
- Place vascular access referrals at least 6 months before anticipated hemodialysis.
- Ensure patient is on pre-renal diet (usually start at CKD 3).
- Preserve the vascular system, by avoiding blood withdrawals or IV infusions from the anticipated arm and forearm (usually non-dominant UE), and to use the veins of the hands for these purposes.

If signs of shortness of breath (SOB)/volume overload/hyperkalemia ($K^+ > 6$) and/or uremia* present

Transfer immediately to Emergency Department (ED)/HLOC

Indications for Dialysis

Patient will typically be CKD Stage 5 with eGFR < 15 with:

- Unmanageable hyperkalemia
- Uremia hospitalization
- Uremic peripheral neuropathies
- Protein wasting/anorexia
- Uncontrollable metabolic abnormalities
- Uncontrollable volume overload
- Uncontrollable HTN
- Nephrologist recommendation

*Signs and Symptoms (s/s) of Uremia

Anorexia, N/V, Pericarditis (sharp chest pain, worse with inspiration, supine SOB, palpitations, low grade fever, malaise, peripheral edema, auscultation of pericardial rub, EKG/CXR, ECHO), peripheral neuropathy (uremic), and central nervous system (CNS) abnormalities-continuum: decreased concentration, lethargy, seizures, coma, and death

Vascular access:

- First line is **AV Fistula** - but this takes several months to mature
- If unexpected need for Hemodialysis, the patient will need to have an **AV Graft** (which does not last as long and has increased risk of infection)
- If emergent need for hemodialysis and no vascular access, the patient will need **Central Venous Catheter** which is temporary and carries high risk for infection and risk for venous stenosis and other complications

PCP will co-manage with HD nephrologist to:

- **Preserve residual renal function**
- **Preserve vascular access**
- **Ongoing management**- address acute and chronic complications and manage co-morbidities

Preserve Residual Function

HD Begins

Ongoing Management

- Discuss continuation of Angiotensin-converting-enzyme inhibitors (ACEI)/ angiotensin receptor blocker (ARB) with nephrologist
- Avoid:
 - Over-diuresis/hypotension with ↓ renal perfusion
 - Nonsteroidal anti-inflammatory drugs (NSAIDs), especially in the first 6-8 months of starting HD
 - Iodinated radiocontrast agents
 - Aminoglycosides
 - Other nephrotoxic agents

Preserve Venous Access

Patient Education for Preserving Access:

- No BP on access arm
- Check vibration (thrill) routinely, alert care team immediately if not present/changed
- Any new redness, pain or swelling of the arm immediately alert care team
- No venipuncture for blood draws on access arm
- No intravenous (IV) access on access arm
- Teach patients to monitor HD technicians for rotating sites of needle insertion to prevent pseudoaneurysms and to speak up
- Apply only gentle pressure to access site after needle removed to avoid clotting
- If bleeding does not stop with gentle pressure within 30 minutes, seek help
- Bathing and other activities as normally tolerated (See Patient Education pages)

Physician Monitoring for Preserving Access:

- Check thrill:
 - Should feel like purr or vibration
 - Pulse soft and easy to compress
 - Auscultate Access:
 - Whoosh of the bruit should be continuous
 - Rumbling and low pitch (can hear high pitch at the site of stenosis)
- To preserve future vascular access sites, avoid peripherally inserted central catheter (PICC) lines; use peripheral IV

ESRD Patient Management and Monitoring

- **BP goal** < 130/80 if tolerated, otherwise < 140/90
- Diuretic usually required early in course
- Dietary sodium < 2000mg/day
- Manage **ASCVD risk factors**:
 - DM target hemoglobin A1c 7-8% if tolerated (not as reliable due to shortened RBC survival)
 - Lipid recommendations (See page 20)
 - ASA for secondary prevention unless bleeding risk outweighs benefits
- CKD complications (nephrology typically manages) (See page 19 and 22)
 - **Anemia**: Evaluation if Hgb < 13.0 for men and < 12.0 for women. If iron deficiency will typically get IV iron in HD. Nephrology will use erythropoietin stimulating agent (ESA) to treat Hgb 9-10 g/dl in order to avoid transfusion.
 - **CKD-Metabolic Bone Disease** (See page 22)
 - **Hyperkalemia**: Treatment by dialysis or potassium reduction medications per nephrology
- **Vaccines** for COVID-19, influenza, pneumococcus, and HBV and Hepatitis A. No live influenza vaccine, rest are per general population (See Attachment A)
- Closely monitor time in therapeutic range (TTR) and prothrombin time and internationalized ration (PT/ INR) for patients on warfarin: ↑ risk of bleeding in HD patients

EVALUATION

This Care Guide addresses the management of patients with ESRD and the transition to Renal Replacement Therapy (RRT)/HD. Details of how to preserve renal function in patients with advanced CKD, including detail on the importance of managing the patient's co-existing conditions is addressed in other care guides.

Evaluation of CKD 5/ESRD Patients

HISTORY:

Etiology of CKD and CKD progression rate

Be vigilant for symptoms of ASCVD. ESRD patients with CKD have an adjusted mortality rate, adjusted hospitalization rate and rate of cardiovascular disease (CVD) more than double that as for those without CKD. Those with CKD and ASCVD have worsened short- and long-term prognoses for survival after MI and heart failure compared to patients with CVD without CKD.

- Document cause of kidney failure if new to CDCR and add ESRD to the problem list if new to stage 5 or not previously added
- Review the patient's most recent specialty notes for Nephrology-managed complications
- Document First Day of Dialysis (FDOD) (regular/ongoing, not acute kidney failure [AKI] needing HD or episodic HD)-important date needed for transplant listing
- Identify and stop possible nephrotoxic agents (see preservation of residual renal function despite HD, page 15)
- Consult with nephrologist regarding type and timing of vascular access, if a vascular access has not already been established
- Control of underlying and co-morbid conditions (HTN, diabetes mellitus [DM], lipids, autoimmune disease, ASCVD, etc.)
- Inquire about depression and coping with chronic illness, especially if HD initiation is imminent
- Inquire about symptoms of ASCVD (angina, unexplained dyspnea, claudication) and assess cardiovascular (CV) risk annually for patients with DM, and at least every 4 years for patients without diabetes
- Document use of nephrotoxic medications, including NSAIDs, chemotherapeutic agents and lithium
- If on HD – Inquire about common HD problems such as paresthesias, cramps, wounds that won't heal, sleep disturbances, blood transfusions, AV access, and problems with access extremity (see page 18)

Signs and Symptoms:

- **Weakness, anorexia, fatigue, nausea and vomiting, mental status changes, seizures, paresthesias**
- Fluid retention/dyspnea and edema, palpitations, sleep disruption, inability to make urine, gross hematuria
- Postural hypotension symptoms if on anti-hypertensive agents
- Cardiovascular manifestations—dyspnea, angina, claudication, etc.
- Severity of cystic enlargement/history of cystic rupture in Polycystic Kidney Disease (PCKD)
- Hypoglycemic episodes if on anti-hyperglycemic agents
- If on dialysis: symptoms of common side effects of HD – such as N/V, muscle cramps, pleuritic chest pain (pericarditis) and evidence of AV access problems

PHYSICAL:

- Overall unhealthy or toxic appearance, changes in mental status, blood pressure control and changes and stability of other vitals, JVD, cardiac rubs, pleural rubs, lower extremity edema, pulses, if known neuropathy, check feet for wounds and vascular access check (below)
 - Palpate for presence of thrill:
 - Should feel like purr or vibration
 - Pulse soft and easy to compress
 - Auscultate Access:
 - Whoosh of the bruit should be continuous
- Check for edema, obvious collaterals and signs of steal indicating stenosis (page 45)

LABS and DIAGNOSTICS:

- CBC, CMP, phosphorus, iPTH
- HIV, HBsAg, HBsAb, HBcAb, HCV Ab, purified protein derivative (PPD) required for dialysis facility acceptance
- EKG, CXR
- Renal ultrasound if acute decline in GFR, to rule out obstructive uropathy
- 2D echocardiogram if pericardial rub present or CXR demonstrates globular cardiac silhouette

TREATMENT

ESRD Management that Affects Mortality

- The survival rate of HD patients in the first three years after dialysis start is only 52%.³²
- Mortality rates in dialysis patients are also adversely affected, depending on the underlying cause of kidney disease, or the co-existing medical conditions such as **diabetes, atherosclerotic heart disease, CHF, peripheral vascular disease (PVD), stroke, cancer, liver disease, gastrointestinal (GI) bleeding, or lung disease.**
- The five-year survival rates after the start of dialysis for DM, polycystic kidney disease, and glomerulonephritis are about 29%, 70%, and 58% respectively.⁴²

ESRD Dietary Management

The Recommended CKD 5ND (not on dialysis) daily dietary protein is 0.6-0.75 g/kg body weight (order “Renal Non-Dialysis”) in the Electronic Health Record System (EHRS). See PE-1 for dietary management while on dialysis.

ESRD Symptom Management

Table 1. Management of Common Symptoms in Patients with ESRD

Symptom	Management	Example Initial Dosage
Agitation and Delirium	Check if acidotic. Check electrolytes. R/O: uremia and need for emergent/urgent HD, infection, cerebral vascular injury and other causes of delirium	<ul style="list-style-type: none"> • N/A
Anorexia	If on dialysis, ensure adequate dialysis (minimize uremia); evaluate for depression, gastroparesis, and dry mouth	<ul style="list-style-type: none"> • Consider Dietary consult • Consultation with or referral to mental health for suspected depression
Chronic Stable Dyspnea	Regular physical activity; ensure optimal fluid balance; only use opioids for refractory dyspnea at the end of life	<ul style="list-style-type: none"> • N/A
Fatigue	If on dialysis, ensure adequacy of dialysis and treatment of anemia; encourage regular physical activity; evaluate for and treat depression	<ul style="list-style-type: none"> • N/A
Nausea/Vomiting	If on dialysis, ensure adequate dialysis (minimize uremia); ondansetron (Zofran) is safe at usual dosages; consider metoclopramide (Reglan; reduce dosage by 50%)	<ul style="list-style-type: none"> • Ondansetron – 4 mg orally q8 hours • Metoclopramide 5 mg twice per day
Pruritus	Ensure adequate dialysis (minimize uremia); encourage compliance with phosphate binders; use emollients liberally; consider antihistamines	<ul style="list-style-type: none"> • Hydroxyzine (Vistaril®), 25 mg orally q6 hours
Sleep Disturbance	<ul style="list-style-type: none"> • Treat pain; evaluate for depression, evaluate for and treat restless legs syndrome (RLS) and obstructive sleep apnea (OSA) - EHRS order: “Request for Neurology, polysomnography” • Helps both OSA and RLS: avoid caffeinated beverages and tobacco; minimize daytime naps; exercise • RLS with depression: <u>Best antidepressant for RLS is bupropion</u> 	<ul style="list-style-type: none"> • Confirm OSA by sleep study (C-PAP) • RLS - Discuss with Nephrologist and refer to Neurology if not improving • It is recommended to consult with psychiatry before starting bupropion for RLS

MONITORING (NOT ON DIALYSIS)**Table 2. Monitoring Guidelines—CKD 5 (No Dialysis)** See page 14 for CKD 5 (on dialysis) guidelines

Labs	Frequency	Notes/Indications
Fasting Lipid Panel (FLP)	q12 months or 1-3 months after start or dosage changes or as clinically indicated	
Chemistry	At least monthly and as needed	<ul style="list-style-type: none"> Includes CMP, creatinine, blood urea nitrogen (BUN), electrolytes, glucose, bicarbonate Monitor for acidosis
TSH	q6 months	Interpret with caution
PTH, Calcium, Phos	q1-3 months (Nephrologist orders)	For bone mineral density (BMD) monitoring ⁴
Vitamin D	At least once	
Serum Albumin	q3 months (Nephrologist orders)	
Serum Alanine Aminotransferase (ALT)	Periodic and/or based on known liver disease	
HBV: Surface Antigen (HBsAg), Surface Antibody (HBsAb), Core Ab (HBcAb)	<ul style="list-style-type: none"> Rescreen chronic HBV q3 months or per individual specialist recommendations. See HBV Care Guide 	<ul style="list-style-type: none"> Rescreen if about to undergo HCV treatment or immunosuppressive therapy. Isolated core (HBcAb) positive patients will need an HBV DNA level. Otherwise, Interval of rescreening for at-risk patients not specified. Follow AASLD guidelines-Chronic Hepatitis B
HCV: HCV with reflex to viral load and genotype ²⁸ (test code 11348)	<ul style="list-style-type: none"> Annually for patients at high risk such as HCV antibody/viral load positive/HCV treated ever, IVDU history/MAT/SUD, people with HIV and AIDS, men who have sex with men, and people with HBV, and if on hemodialysis 	<ul style="list-style-type: none"> Non-invasive staging with FIB4. Assess for liver fibrosis with Fibrotest (92688) and per current HCV recommendations (HCV Care Guide) Follow AASLD HCV guidelines for patients with Renal Impairment
Thyroid Stimulating Hormone (TSH)	q6 months	<ul style="list-style-type: none"> For hypothyroidism monitoring³⁹ Interpret with caution (see page 23)
A1c	At least q3-6 months if at goal, and more frequently during titration if not	For diabetes mellitus - glycemic control
Hemoglobin (Note: Anemia is defined as Hgb < 13 g/dL for men and < 12 g/dL in women)		
Not anemic	At least twice a year ²⁶ or when clinically indicated	
Confirmed Anemia (not on Erythropoiesis-Stimulating Agents—ESA)	At least q3 months, monitor for Hgb < 10	ESA decision on clinical scenario (rate of fall of Hgb, prior response, risk of transfusion need, risks of ESA treatment vs. anemia symptoms)
Patient with New Anemia		Evaluation: CBC with platelets and diff, retics, iron ferritin, transferrin saturation, B12 and folate
Patient with Confirmed Anemia, Iron Treatment	(Nephrologist manages)	<ul style="list-style-type: none"> IRON – (if not on ESA) iron route of administration depends on clinical scenario Monitor for start of IV iron treatment when transferrin saturation (TSAT) is ≤ 30% and ferritin is ≤ 500 ng/mL Monitor response to iron with TSAT and Ferritin
ESA Initiation and monitoring ²⁹	Monthly (Nephrologist manages)	Monitor: Antibody Medicated Pure Red Cell Aplasia (PRCA) RARE
TSAT and Ferritin	At least q3 months or more frequently when initiating treatment or increasing ESA dose ²⁹ (Nephrologist manages)	<ul style="list-style-type: none"> Sudden rapid decrease in Hgb (0.5-1 g/dL/week or requirement of transfusions at a rate of 1-2/week Normal Platelet and CBC and Retics < 10.000/microL

MONITORING (NOT ON DIALYSIS) (CONTINUED)**Table 2. Monitoring Guidelines—CKD 5 (No Dialysis) (Continued)**

Diagnostics/Miscellaneous Testing
Blood Pressure: Goal < 130/80 if patient tolerates/co-morbid conditions allow, otherwise the goal is < 140/90
ASCVD Risk Calculation: ASCVD Risk Estimator *
Computerized tomography (CT) and cystoscopy for hematuria (r/o RCC) (Note: do not assume hematuria is due to PCKD)
CXR of the hands and/or distal clavicles (superiosteal bone resorption [renal osteodystrophy] is pathognomonic for bone disease secondary to hyperparathyroidism) if evidence for uncontrolled secondary hyperparathyroidism
Bone density (DEXA) (Request for Radiology DX) if risk factors for osteoporosis
Nerve conduction velocity (NCV) for neuropathies, as clinically indicated
Sleep study for insomnia/restless legs/obstructive sleep apnea (OSA), as clinically indicated. Order “Request for Neurology, polysomnography”

RENAL REPLACEMENT THERAPY (RRT)-HEMODIALYSIS

RRT TIMING OF DIALYSIS INITIATION—Confer with nephrology specialist

- The optimal timing of initiation of maintenance dialysis in patients with ESRD is currently unknown, but Kidney Diseases Improving Global Outcomes (KDIGO) 2012 recommends timely referral for planning RRT in whom the **risk of kidney failure within 1 year is 10-20% or higher**.²⁶
- *Kidney Disease Outcome Quality Initiative (KDOQI) guidelines in 2015 (most recent) recommend that the decision to initiate maintenance dialysis should be based primarily upon assessment of specific complications of kidney disease, including signs and symptoms of uremia, protein-energy wasting, metabolic abnormalities, and volume overload, rather than based on a specific level of kidney function/GFR.*³⁶
- At CDCR there are 2 types of RRT, HD and kidney transplantation (no peritoneal dialysis).
- **KDOQI recommends to place access fistula at least 6 MONTHS before anticipated start of HD.**
- Alert your Chief Medical Executive (CME) so that the dialysis provider can work on the HD chair schedule.

SEE PAGE 10: CASCADE OF EVENTS THAT MUST BE INITIATED AT YOUR FACILITY FOR HD TO BEGIN

ABSOLUTE Indications for Hemodialysis:

- Uremia, generally symptomatic when GFR is < 10
- Uremic pericarditis (urgent indication)
- Uremic pleuritis
- Uremic encephalopathy – rare. Significantly altered cognitive function, confusion, without other cause and GFR < 5 (usually), seizures. Emergent dialysis is indicated
- Uremic bleeding (urgent)
- Uremic neuropathy – myoclonus, asterixis, wrist or foot drop

Nearly Universally Accepted Indication for Hemodialysis:

- Patients with GFR < 5 mL/min/1.73 m² – close to an absolute indication, risk of uremia very high. Start without delay

Other Indications for Hemodialysis: Collaborate with Nephrologist/patient

- Patients with GFR 5-15 mL/min/1.73 m² with signs or symptoms that could be due to ESRD and refractory to medical therapy
- Declining nutritional status and malnutrition
- Persistent or difficult to treat volume overload, refractory to diuretics
- Refractory HTN, poor response to anti-HTN medications
- Persistent nausea and vomiting
- Refractory acidosis, hyperkalemia, and hyperphosphatemia (usually GFR < 15) failing medical/conservative treatment
- Unexpected, accelerated loss of kidney function

Relative Indications for Hemodialysis:

- Mild cognitive impairment/decreased attentiveness and cognitive tasking. It is extremely important to exclude progressive dementia in such patients. Progressive loss of cognitive function in patients with known other underlying conditions (such as dementia, history of strokes, etc.) may be an indication for a trial of RRT for several weeks to see if cognitive decline improves
- Unrelenting fatigue and malaise
- Depression
- Persistent pruritus
- RLS

Generally, do not start dialysis:

- Patients with GFR > 15 mL/min/1.73 m² – we do not initiate chronic dialysis for such patients, even if they have possible symptoms related to ESRD
- No minimum GFR is absolute indication if no symptoms. Many patients (usually young and with few comorbid conditions) remain relatively asymptomatic despite an GFR < 15 mL/min/1.73 m²
- NOTE: No evidence that older age, DM, or ASCVD benefit from earlier initiation of dialysis over general recommendations

Risks of Late Referral and Late Initiation of Hemodialysis³⁹

- Higher overall mortality, higher 1-year mortality
- Presentation with biochemical indices of severe uremia and an imminent need for dialysis. Advanced metabolic abnormalities at the time of initiation of dialysis reflect suboptimal care of progressive CKD; this possibly contributes to the high morbidity and costs of initiation of dialysis
- Significantly greater degree of acidosis, anemia, hypocalcemia, hypoalbuminemia, and hyperphosphatemia
- Higher prevalence of hypoalbuminemia (80% vs. 56%)
- Higher prevalence of a hematocrit of less than 28% (55% vs. 33%)
- Greater likelihood of prolonged hospitalization (25 days vs. 14 days hospitalization) around the time of initiation of dialysis, and higher cost hospitalizations
- Hospitalized more frequently for the initiation of dialysis
- Less likely to have functioning permanent access to start dialysis, higher vascular access complications
- For uremic neuropathy indications-component of irreversibility from uremic neuropathy due to higher degree of dysfunction before dialysis
- Less likely to have adequate preparation which increases risk of morbidity and mortality
- Worse psychological acceptance

Vascular Access (See Attachment B for CVC details and Vascular Access Complications)

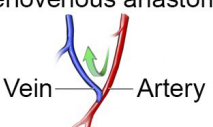
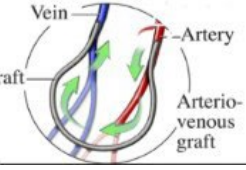
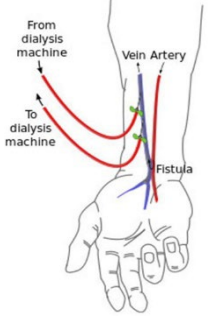
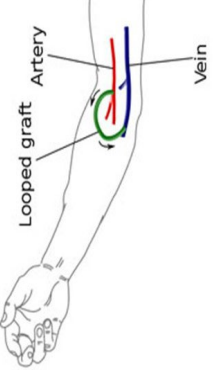
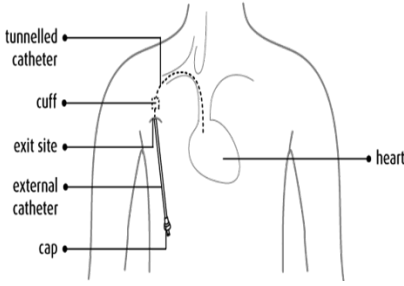
Once dialysis is anticipated, plans should be made for vascular access.

- Right away start to **preserve the vascular system** by avoiding blood draws or IV infusions from the anticipated arm and forearm (usually non-dominant upper extremity) and advise use the veins on the dorsum of the hands for these purposes.
- This transition period is one of exceptionally high vulnerability for patients; annual mortality rates in stage 5 CKD through the first year of maintenance dialysis exceed 20%.
- NOTE: There is a shortage of vascular surgeons at many facilities and the wait time for consult can be long. **Early referral is imperative.** Often mapping cannot be done at the initial visit which requires additional wait time prior to the vascular surgery consultation, as well as time necessary to get the procedure scheduled.
- **DO NOT HESITATE TO PLACE A MEDICAL HOLD TO ALLOW YOUR PATIENT TO COMPLETE THE NECESSARY EVALUATIONS AND PROCEDURES FOR THEIR PERMANENT VASCULAR ACCESS TO BE ACHIEVED AND AVOID THE NEED FOR TEMPORARY CATHETER ACCESS.** Patients can also be transferred to other units with better appointment access, such as Richard J. Donovan (RJD) or San Quentin Rehabilitation Center on a temporary basis.
- For patients already on dialysis with a CVC, referral to vascular surgery for purposes of creating an AVF or placing an AVG, place order as “high priority 14 days.”

Types of Vascular Access

- The AVF is the preferred access type and the goal for all dialysis patients. Encouraged by the National Kidney Foundation’s (NKF) “Fistula First Initiative.”
- Next best is AVG.
- CVC is to be used only when no other option is available due to high infection and mortality rate (note: CVC when tunneled, is also called Tunneled Dialysis Catheter-TDC). All efforts are expected to change to AVF as soon as possible. Conversations with patients about the morbid consequences of keeping a CVC should be documented and revisited.
- See Table 3 below on the types of AV access.

Table 3. Choice of Access

	Arteriovenous Fistula (AVF)	Arteriovenous Graft (AVG)	Central Venous Catheter (CVC)
What is it	<ul style="list-style-type: none"> • Direct anastomosis between artery and vein  <p>Arteriovenous anastomosis</p>	<ul style="list-style-type: none"> • Biologic or synthetic graft interposed between artery and vein  <p>Vein Artery graft Arterio-venous graft</p>	<ul style="list-style-type: none"> • Direct access into venous system via tunneled (surgically inserted into a vein and passed under the skin) or non-tunneled catheter
Location	<ul style="list-style-type: none"> • Forearm (radio-cephalic or distal AVF) first-simple, low complication rate and high patency rates at 1 year (56-79%) and does not preclude future access; then • Elbow (brachiocephalic or proximal AVF), and • Arm (brachial-basilic AVF with transposition or proximal AVF)  <p>From dialysis machine To dialysis machine Vein Artery Fistula</p>	<ul style="list-style-type: none"> • Forearm (radio-cephalic or distal AVF) first, then • Elbow (brachiocephalic or proximal AVF), and lastly, • Arm (brachial-basilic AVF with transposition or proximal AVF, then • Thigh  <p>Artery Vein Looped graft</p>	<ul style="list-style-type: none"> • R or L internal jugular vein (IJV), then • Femoral vein, then • Subclavian vein <p>Tunneled Central Venous Catheter</p>  <p>tunnelled catheter cuff exit site external catheter cap heart</p>

Types of Vascular Access (Continued)			
Table 3. Choice of Access (Continued)			
	Arteriovenous Fistula (AVF)	Arteriovenous Graft (AVG)	Central Venous Catheter (CVC)
Advantages	<ul style="list-style-type: none"> Significantly higher long-term patency (up to 20 years) Lower complication rate Superior patient survival 	<ul style="list-style-type: none"> Significantly shorter time to use Significantly lower rate of primary failure (12 - 20% fail to mature) Higher rates of "recirculation" whereby there is insufficient pressure to allow sufficient blood through to the dialysis machine, lessening the efficiency of the HD process 	<ul style="list-style-type: none"> Immediate access May be only option when AVF and AVG fail repeatedly
Disadvantages	<ul style="list-style-type: none"> Highest rate of primary failure: Only 50% mature for use Highest rate of hemodynamic consequences (steal, extremity edema, pulmonary HTN and/or high output failure, later cardiac remodeling and left ventricular hypertrophy [LVH])-worse with more proximal locations Severe CHF considered by some nephrologists to be a contraindication 	<ul style="list-style-type: none"> Higher stenosis, thrombosis, and infection rates (especially in younger patients) Hemodynamic consequences as for AVF, but lower risk Severe pruritus over graft location can cause skin breakage and become nidus of infection 	<ul style="list-style-type: none"> Higher Infection rate: Annually, approximately 30% of patients who use a CVC have a septic or bacteremic episode Risk of death from infection is 41% higher with CVC than with AVF Higher hospitalization rate for CVC patients Higher mortality rate: mortality rate was 51% in the first year in patients who exclusively used CVC Higher sustained risk: The chances of having an AVF placed once a CVC has been in place for > 6 months is low. Continuing a high morbidity and mortality risk throughout the life of the CVC
Plan	<ul style="list-style-type: none"> 6-9 months before HD need anticipated 	<ul style="list-style-type: none"> 2-6 weeks before subacute HD needed 	<ul style="list-style-type: none"> Urgent HD needed
Time to Mature*	<ul style="list-style-type: none"> 2-4 months Biologically female, African Americans, DM, ASCVD, HD > 1 year, prior use of CVC or AVG, have higher maturation failure rates 	<ul style="list-style-type: none"> 24 hours to 2 weeks after placement 	<ul style="list-style-type: none"> Immediate use
Complications	<ul style="list-style-type: none"> (See Attachment B) Thrombosis Edema Bleeding Hematomas Seroma Infection CHF/pulmonary HTN High output heart failure Central and distal steal syndromes Pseudoaneurysms Ischemic and other neuropathies Using access port for IV drug abuse (IVDA) 	<ul style="list-style-type: none"> (See Attachment B) Most common complication is failure related to stenotic vascular lesions Venous vascular incompetence with venous HTN-may cause access dysfunction and ischemic changes to the skin 	<ul style="list-style-type: none"> (See Attachment B) <u>AVOID A CVC ACCESS</u> <u>BRIDGE</u> - for patients whose need for dialysis is anticipated or occur before AVF maturation, prior routine care was to place the AVF and use a CVC as a "bridge" until the AVF is ready to use. The use of "bridging catheters" before fistula functioning dramatically increases the risk for complications. Including infections, hospitalizations, and death

*Maturity = increase size and thickening of the vessel in order to withstand repeated needle punctures and ↑ pressure created by the arterial blood flow and later the dialysis pump

Initiating Hemodialysis Treatment at the Facilities (see Flow Map next page)

STARTING HEMODIALYSIS:

Note: If patient comes into CDCR already established on HD, skip to Step 6.

1. HD need within 1 year suspected: Initiate **Nephrology Referral** if **not already established** and **work with Nephrologist to arrange vascular access** (see page 13) with vascular surgery referral. Ensure this is done early.
2. Vascular surgeons decide location and type of access with history, physical exam, duplex ultrasound and arterial/venous vascular mapping.
3. Vascular surgeon and nephrologist deem access is mature and ready for use.
4. **Patient has access** (either through vascular surgery placement, or temporary access placed during acute hospitalization, or patient already has established access on arrival to CDCR).
5. All patients entering CDCR with a dialysis catheter or who have had one placed during a hospitalization should be evaluated for permanent AVF or AVG which have much lower complication rates.
6. **Decision made to start HD** by consultant nephrologist (vascular access ready) or emergent or coming from hospital already initiated there (or transferring/entering and already on established HD).
7. **IMPORTANT: PCP Fills out the Medical Classification Chrono (MCC) and checks "Hemodialysis" box** (see Figure 1). Reason for checking the HD box:
 - Alerts custody to the logistical need for 3x/week appointments.
 - Ensures appropriate housing/institution by updating the Health Care Placement Oversight Program (HCPop) list.
 - Updates the renal transplant patient list.
8. PCP fills out the order for HD in the EHRS with the order, **"Request for Nephrology"** - choose **"Dialysis"** for "Requested Service." The order is the HD electronic request for services (eRFS).
9. The eRFS alerts UM who runs the case through Interqual. The eRFS is approved and automatically generates the **"Referral to Dialysis"** order in the EHRS.
10. The eRFS notifies the facility Utilization Management (UM)[†] to start coordinating collection of all Request for HD Unit Placement paperwork. If orders are needed, UM registered nurse (RN) will ask the PCP (or if inpatient, the hospital) to order. PCP should forward reports to the UM RN as they receive them in their inbox. Materials to collect are on page 26.
11. UM charts status report daily via the EHRS calendar charting function.
12. UM sends the completed clinical records placement packet to the dialysis provider's administrative assistant or RN who reviews for completeness and if so, forwards to the HD Unit nephrologist for review.
13. HD unit nephrologist accepts patient via email to UM RN with the recommended dialysis schedule.
14. Specialty office technician (OT) or dialysis coordinator places recurring appointments in Schapptbook as **"Follow up Dialysis Referral."** Appointment scheduling initiates the ducat process.
15. HD starts.
16. PCP changes diet order from "pre-renal" to "renal."
17. Primary Care Team – facilitate and guide patients into taking a greater role in their own care; educate on infection control, access preservation, exercise, diet, CV risk, and medication adherence. Encourage frank discussions with prescribers about medication side effects, logistical problems with medications, or other recommendations (see pages Patient Education pages).

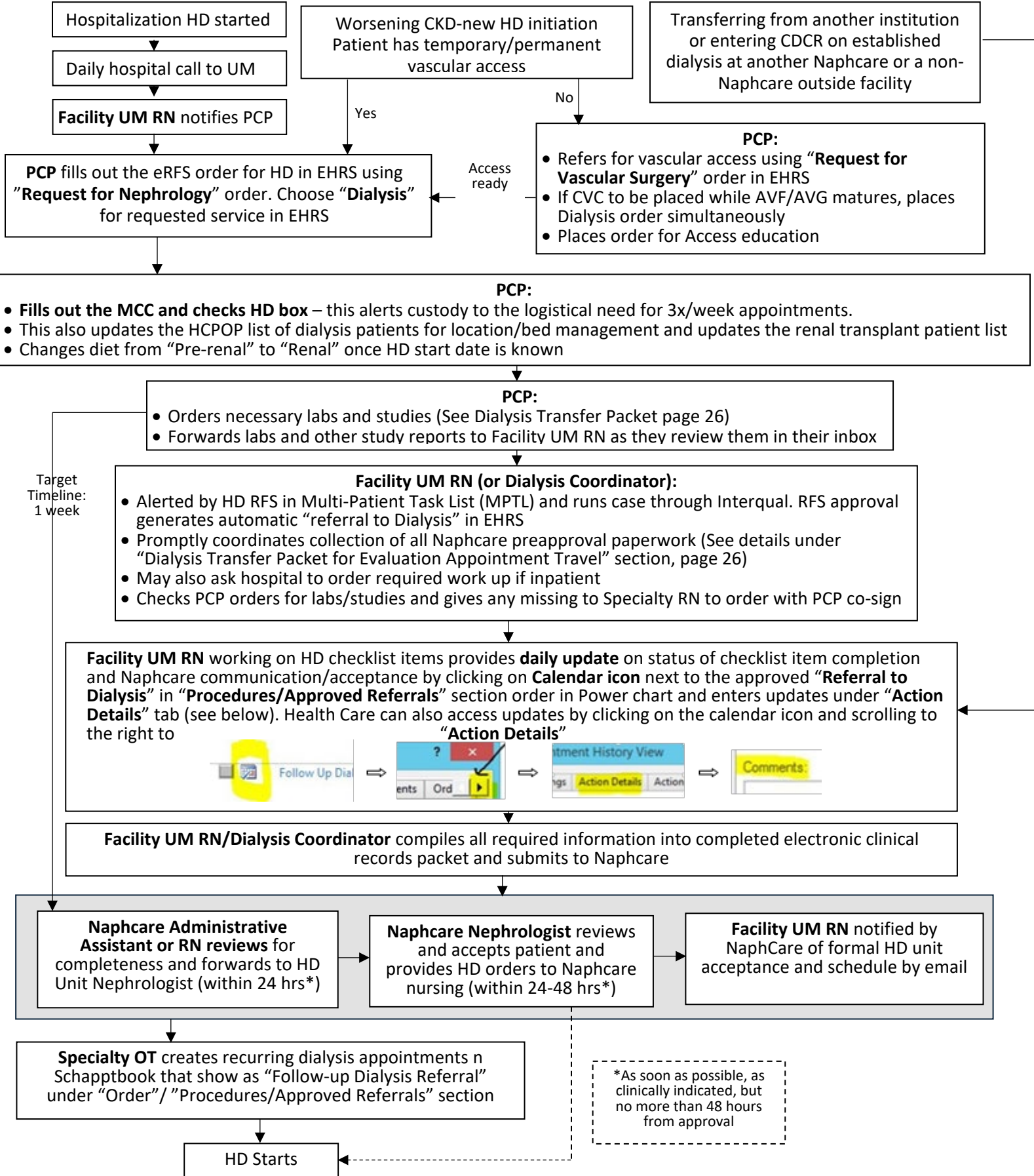
Figure 1: The MCC–HD box under "Specialized Services" on left

Proximity to Consult:	Frequent Basic Consultation	
Functional Capacity:	Limited Duty	
Medical Risk:	High Risk	
Nursing Acuity:	Special Nursing	

Specialized Services		
Clinical Category 1	<input type="checkbox"/> Therapeutic Diet*	<input type="checkbox"/>
Clinical Category 2	<input type="checkbox"/> Respiratory Isolation	<input type="checkbox"/>
Pregnancy Program	<input type="checkbox"/> Speech/Occ. Therapy*	<input type="checkbox"/>
Transplant Center	<input type="checkbox"/> Physical Therapy	<input type="checkbox"/>
Hemodialysis	<input checked="" type="checkbox"/> Durable Med. Equip.*	<input type="checkbox"/>
Dementia	<input type="checkbox"/> Transgender	<input type="checkbox"/>

[†] Some facilities have a dialysis coordinator RN who collects and coordinates all orders and clinical information for the dialysis provider.

Dialysis Initiation OR TRANSFER Process Flow Map



Monitoring (On Dialysis)

Table 4: Monitoring Guidelines—CKD 5 (On Dialysis)

Note: Once a patient starts dialysis, blood draws should occur at the dialysis center. Please note in your blood draw order comments for the blood to be drawn at dialysis. ESRD patients may have substantial intravenous access issues, and their veins should be preserved.

Labs	Frequency	Notes/Indications
Fasting Lipid Panel (FLP)	q12 months or 1-3 months after the start of medication or dosage changes or as clinically indicated	
Chemistry	Managed by dialysis facility (<i>Nephrologist orders</i>)	CMP, creatinine, blood urea nitrogen (BUN), electrolytes, glucose, bicarbonates—monitor for acidosis
PTH, Calcium, Phos	q1-3 months	<ul style="list-style-type: none"> For bone mineral density (BMD) monitoring⁴ Monthly assessment in dialysis facility
Vitamin D	at least once	
Serum Albumin	Monthly assessment in dialysis facility (<i>Nephrologist orders</i>)	
Serum Alanine Aminotransferase (ALT)	Monthly assessment in dialysis facility (<i>Nephrologist orders</i>)	Note: levels may be spuriously low)
HBV: HBsAg, HBsAB, Anti-HBc	On initiation of HD or transfer to a new HD unit	See AASLD guidelines and HBV Care Guide
HCV (HCV with reflex to viral load and genotype (test code 11348) ²⁸)	<ul style="list-style-type: none"> HCV RNA viral load at time of starting maintenance HD or if transfer to a new dialysis unit, HCV AB or RNA viral load q6 months²⁸ ALT monthly (to identify new infection between 6-month RNA checks)²⁸ 	<ul style="list-style-type: none"> FIB-4 is unreliable in dialysis patients. Fibrotest (92688) for all HCV+ patients on dialysis (prior history or active) Follow AASLD HCV guidelines for patients with Renal Impairment
Thyroid stimulating hormone (TSH)	q6 months for hypothyroidism monitoring ³⁹	Interpret with caution (see page 23)
A1c	At least q3-6 months if at goal, and more frequently during titration if not	For diabetes mellitus-glycemic control
Hemoglobin (<i>Nephrologist orders</i> . Note: Anemia is defined as Hgb < 13 g/dL for men and < 12 g/dL in women)		
Not anemic	Managed by dialysis facility	
Confirmed Anemia (<i>not on Erythropoiesis-Stimulating Agents—ESA</i>)	<ul style="list-style-type: none"> Managed by dialysis facility At least q3 months, monitor for Hgb < 10 	ESA start when Hgb between 9-10 g/dL
Patient with New Anemia		Evaluation: CBC with platelets and diff, retics, iron ferritin, transferrin saturation, B12 and folate
Patient with Confirmed Anemia, Iron Treatment	Managed by dialysis facility	<ul style="list-style-type: none"> IRON—(if not on ESA) <i>iron route of administration depends on clinical scenario</i> Monitor for start of IV iron treatment when transferrin saturation (TSAT) is ≤ 30% and ferritin is ≤ 500 ng/mL Monitor response to iron with TSAT and Ferritin

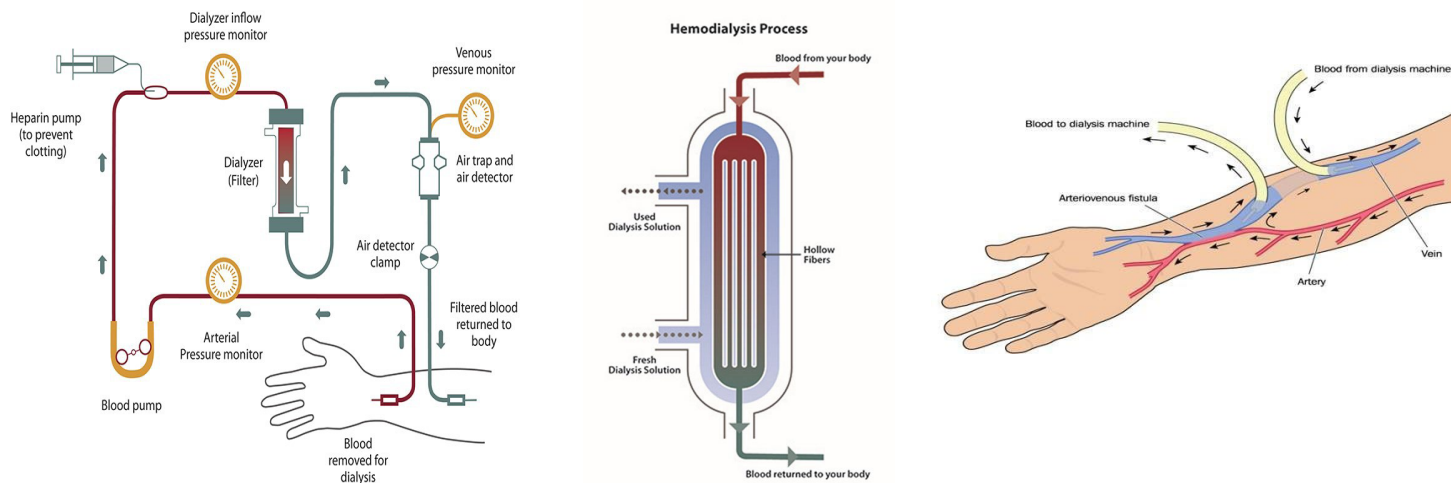
Monitoring (On Dialysis) (Continued)		
Table 4: Monitoring Guidelines—CKD 5 (On Dialysis) (Continued)		
ESA Initiation and monitoring ²⁹	<ul style="list-style-type: none"> Managed by dialysis facility Hgb monthly 	<ul style="list-style-type: none"> Monitor: Antibody Medicated Pure Red Cell Aplasia (PRCA) RARE Sudden rapid decrease in Hgb (0.5-1 g/dL/week or requirement of transfusions at a rate of 1-2/week Normal Platelet and CBC and Retics < 10.000/microL
TSAT and Ferritin	At least q3 months or more frequently when initiating treatment or increasing ESA dose ²⁹	
Diagnostics		
BP: Goal < 130/80 if patient tolerates/co-morbid conditions allow, otherwise the goal is < 140/90 <ul style="list-style-type: none"> Monitor for HTN with increased sodium load if on sodium bicarbonate for acidosis 		
ASCVD Risk Calculation: ASCVD Risk Calculator		
Renal US: After 5 years of HD, and every 5 years thereafter <ul style="list-style-type: none"> Request for Radiology US, RENAL BILAT screening to r/o renal cell carcinoma (RCC) associated with acquired cystic disease 		
Computerized Tomography (CT) and Cystoscopy for hematuria (r/o RCC) <ul style="list-style-type: none"> Note: For patients with polycystic kidney disease (PCKD) - do not assume hematuria is due to PCKD 		
X-ray of the hands and/or distal clavicles (superiosteal bone resorption [renal osteodystrophy] is pathognomonic for bone disease secondary to hyperparathyroidism) <ul style="list-style-type: none"> Bone density (DEXA) (Request for Radiology DX) If evidence for uncontrolled secondary hyperparathyroidism If risk factors for osteoporosis 		
Misc. testing: <ul style="list-style-type: none"> Nerve conduction velocity (NCV) for neuropathies: As clinically indicated Sleep study for insomnia/restless legs/Obstructive sleep apnea (OSA): As clinically indicated. Order: "Request for Neurology, polysomnography" 		

Hemodialysis Details

How does dialysis work?

Toxins and electrolytes are removed via a filter, called a **dialyzer**, and into a liquid **dialysate**. The movement of toxins occurs via both diffusion (gradient with dialysate) and convection (permeability) clearance. The removal of fluid volume in the filter is termed **“ultrafiltration.”**

A needle placed on the “arterial” side of the AVF connects to the dialysis machine as input and then exiting “filtered” blood is returned via another needle placed on the distal vein returning to the heart. See figures below:



All HD is NOT EQUAL.

Every patient has a unique dialysis “prescription.” The Nephrologist ordered dialysis parameters include:

- Length of each dialysis session (frequency is usually 3 sessions/week). Fluid overload can be managed with extra duration or a fourth session.
- Composition of electrolytes in the dialysate (potassium, sodium and bicarbonate).
- Blood flow rate, dialysate flow rate, choice of dialyzer (artificial kidney).

How is adequacy measured?

Urea (clearance K over time t , or Kt), one of the many “uremic” toxins in ESRD, is the end product of protein catabolism, is water soluble, and the volume of distribution is total body water (V). Urea is actually only mildly toxic by itself. However, it is used as an easily measurable surrogate for other small molecular weight uremic toxins. Urea clearance is quantified using “ Kt/V Urea” or just “ Kt/V ”.

Kt/V Urea: Adequacy of Dialysis (See Attachment C for more details)

Kt/V = dimensionless ratio to quantify dialysis dose and dialytic removal of urea (a surrogate for uremic toxins).

- K is a constant (urea clearance, usually fixed to the particular dialyzer)
- t is time (usually 3.5 – 5 hours 3x/week)
- V is the volume of distribution in liters (total body water = 60% of total weight + any kg edema fluid)

So, **Kt/V —compares the amount of water that passes through the dialyzer and is cleared of urea to the amount of water in the patient’s body.** A $Kt/V = 1$ means that the total volume of blood cleared of urea during a dialysis session is equal to the total body water of the patient. **A minimum acceptable Kt/V is 1.2, but 1.4 is more desirable.**

Since V is fixed, only K (choice of dialyzer or adjustments in blood flow through the dialyzer) or t (time on HD) can be manipulated by the nephrologist.

How do I use Kt/V ? When your patient has evidence of fluid overload, is declining or feeling unusually poorly, consider asking the dialysis providers to check the Kt/V . Adequacy of dialysis is inversely correlated with hospitalizations and mortality.

How do I find Kt/V on my patient? In the EHRs: Kt/V , Urea Reduction Ration [URR], BUN, albumin, H/H, PTH for each HD session is scanned and usually located in: “Notes”/“Miscellaneous Patient Care”/“Dialysis”-“Outside Records”) or “Notes”/“Procedures/Interventions”/“MAR-SCAN”).

Residual Renal Function on Hemodialysis

Preserve residual function as long as possible despite beginning regular HD. Many patients starting dialysis still have significant residual renal function, with 45% having an estimated GFR ≥ 10 mL/min/1.73 m². Preservation of this residual renal function (by avoiding nephrotoxic agents, hypotensive kidney ischemia, and other causes of AKI), has been associated with improved outcomes. Loss of residual renal function has effects upon volume control and patient survival.

Urinary volume is being seen as increasingly important. Even when the GFR is very low, the urine output is variable, ranging from oliguria to normal or even polyuria. These findings are related to the fact that the urine output is determined not by the GFR alone, but also by the difference between the GFR and the rate of tubular reabsorption.

- Although the remaining GFR may only be 4-5 mL/min in patients who have started on maintenance dialysis, this is sufficient to make a significant **contribution to the removal of potential uremic toxins since filtration is continuous**, as opposed to the 12 hours/week that the patient is undergoing HD.
- Continued urine output also facilitates the **regulation of fluid and electrolyte balance and may enhance nutritional status and survival.**
- Fluid removal is an essential function of the kidney and the one most identifiable by patients. The amount of urine output in dialysis patients equates to fluid that does not need to be removed with dialysis. In HD, **decreasing fluid removal with each dialysis treatment decreases the possibility of intradialytic hypotension**, which can lead to further reduction in residual renal function, myocardial stunning, ischemia, and increased mortality.

FACTORS THAT MAY ADVERSELY AFFECT RESIDUAL KIDNEY FUNCTION

Intradialytic Hypotension	It is important to avoid hypotension with or after dialysis. Hypotension during dialysis not only causes myocardial, cerebrovascular, and mesenteric ischemia but can also lead to decreased renal perfusion and further loss of kidney function. Patients on antihypertensive medications should be advised to hold those medications prior to dialysis.
Hypovolemia/Hypotension	Can be seen with overly aggressive ultrafiltration (large volume removal) during dialysis, over-diuresis, over-medicating for HTN, and septic shock/blood loss. NOTE: Unless urine output is negligible, diuretics should be continued in patients who initiate dialysis. Loop diuretics increase urine output and sodium excretion and decrease the need for volume removal with dialysis with its risk of hypotension. The dialysis nephrologist should determine when/if these drugs should be used.
ACEIs/ARBs	May damage residual kidney function in hemodialysis patients, but don't need to be discontinued unless so advised by the dialysis nephrologist.
Aminoglycosides	Generally believed that aminoglycosides should be avoided or used with extreme caution to preserve residual kidney function and avoid potential for ototoxicity.
Iodinated Radiocontrast Agents	Iodinated radiocontrast agents can cause acute tubular necrosis, possibly leading to the loss of residual kidney function. The risk/benefit should be weighed whenever a contrast study is considered.
Gadolinium (Gd)	Gadolinium contrast for Magnetic Resonance Imaging (MRI) is to be used with extreme caution and only if absolutely necessary. Certain Gd types are contraindicated in ESRD. When contrast needed, confer with radiologist on best study between CT with contrast or Gd.
NSAIDS	Avoid especially within the first 6-8 months after initiating dialysis and later avoid if at all possible if residual renal function is still in play.

Hemodialysis Complications

Although many acute and chronic complications of hemodialysis will be managed by the HD nephrologist, it is important for the PCPs to be aware of these complications and help identify when they occur. Once complications are identified, work with the HD team/nephrologist for optimal management.

Acute Complications

Immune Reactions	<ul style="list-style-type: none"> Type A anaphylactic: < 1%/yr, occur minutes into the dialysis session, often severe and life threatening Type B: more common, occur later in the dialysis session, chest and back pain, sometimes vomiting, dyspnea and hypotension
Access Recirculation	<ul style="list-style-type: none"> Dialyzed blood mixes with the un-dialyzed blood in the extra corporeal circuit rather than returning to the systemic circulation related to needle placement or venous anastomotic stenosis
Hypotension	<ul style="list-style-type: none"> Most common acute complication of hemodialysis (incidence is 15%-30%) Causes: Eating a meal prior to or during dialysis, taking anti-hypertensive medications pre-dialysis, rapid or excessive ultrafiltration, a rapid reduction in plasma osmolality, thermal energy transfer causing vasodilation, incorrectly low prescribed target weight, non-biocompatible dialysis membranes, autonomic neuropathy, and diminished cardiac reserve
Cramps	<ul style="list-style-type: none"> Occur with up to 20% during dialysis treatments, 33-86% in general Causes: Pathogenesis uncertain, but frequently related to acute extracellular volume contraction, hyponatremia, tissue hypoxia, hypomagnesemia
N/V	<ul style="list-style-type: none"> 5-15% occurrence
Headache +/- Altered Mental Status	<ul style="list-style-type: none"> Recurrent headaches on HD may be precipitated by acute caffeine withdrawal Dialysis disequilibrium syndrome (DDS) CNS bleed <ul style="list-style-type: none"> Subdural hematomas occur 10x more frequently in HD patients than general population and can develop with minimal trauma
Chest Pain	<ul style="list-style-type: none"> Angina (ASCVD) Hemolytic anemia-causes: overheating of the dialysate, hypotonicity, contaminants (formaldehyde, chloramines, bleach, nitrates, copper), HD machine mechanical factors Air embolism
Heparin-induced thrombocytopenia -Thrombosis (HITT- "white clot syndrome")	<ul style="list-style-type: none"> Continual exposure to heparin during dialysis sessions. HITT is not dose dependent Antibodies occur in 0-12% of HD patients. Thrombocytopenia (TCP), when it occurs, requires anticoagulant change by HD unit and future avoidance of heparin (include in "allergies")
Back Pain	<ul style="list-style-type: none"> Immobility Hemolytic anemia
Itching	<ul style="list-style-type: none"> 8% of dialysis patients experience Causes: Inadequate dialysis, hyperphosphatemia, hyperPTH, dry skin, elevated serum magnesium and aluminum concentrations
Fever/Chills	<ul style="list-style-type: none"> Investigate and r/o infection/catheter-related bloodstream infection (CRBSI), especially if CVC
Air Embolism	<ul style="list-style-type: none"> Rare due to air detectors in HD machines Symptoms: CNS changes, chest pain and dyspnea. Can be fatal
Dyspnea (after initiation of treatment)	<ul style="list-style-type: none"> Dialyzer membrane reaction Acute coronary syndrome Pericardial effusion with tamponade
Fatigue	<ul style="list-style-type: none"> Nearly universal after dialysis; usually resolves after a few hours
Hyperkalemia	<ul style="list-style-type: none"> Refer to Attachment D

Chronic Complications

HEMATOLOGIC CONDITIONS: ANEMIA*		*Target hemoglobin (Hb) level: 9-10 g/dL ³⁶
Anemia Pathogenesis	<ul style="list-style-type: none"> Erythropoietin deficiency Shortened erythrocyte survival Iron deficiency 	
Consequences of Anemia in Kidney Disease	<ul style="list-style-type: none"> LVH and/or dilatation Decreased exercise capability Decreased quality of life Decreased cognitive capacity Increased intradialytic hypotension 	
Transfusions and its Complications	<ul style="list-style-type: none"> Transfusion reactions (fever, allergic reactions, hemolytic reactions/fatal hemolysis, and anaphylaxis) Thrombotic complications Bone marrow suppression Transfusion-associated viral infection Human Leukocyte Antigen (HLA) pre-sensitization—increases chances of later graft rejection for transplant. Part of why avoidance of transfusions is important 	
Iron deficiency Treatment Nephrology manages	<ul style="list-style-type: none"> Oral iron salts Ferric citrate primarily used as a PHOS binder also provides oral iron supplementation and reduces ESA dosing IV iron Ferric sucrose, gluconate or carboxymaltose. Iron dextran is no longer used 	
Complications of IV iron	<ul style="list-style-type: none"> Anaphylactic reactions very rare with current iron preparations Excess iron deposition (hemochromatosis) 	
Biochemical Parameters for Monitoring Iron Therapy Nephrology manages	<ul style="list-style-type: none"> Serum ferritin (indirect measure stored iron), GOALS: Ferritin ≥ 100 ng/mL (mcg/L) < 500 ng/ml, > 25% TSAT <p>NOTE: Serum ferritin is an acute-phase reactant, serum iron and TSAT also affected by inflammation. Hence in inflammatory states the determinants of iron stores may be overestimated</p>	
Erythropoietic Agents	<ul style="list-style-type: none"> Erythropoietin (Epogen®, Procrit®) Formulary (F) Darbepoetin (Aranesp®) NF 	
Treatment with Erythropoietic Agents Nephrology manages. Communicate with specialist	<ul style="list-style-type: none"> There are conflicting studies. Improved morbidity, quality of life, and decreased mortality with higher Hb levels in observational databases, though evidence from randomized control trials (RCTs) in hemodialysis patients does not suggest a mortality benefit. Greater mortality with “normalized” target Hb (12 g/dL for women, 13 g/dL for men) in a large randomized clinical trial of patients with CVD. Hence, goal is to avoid transfusions and aim for a hemoglobin of 9-10 g/dL. There are no studies available regarding erythropoietic agents and exogenous estrogen use for gender affirming therapy. ESA resistance: <u>Most predominant predictor of CV events and fatality.</u>²² Classified as hyporesponsiveness if no increase in Hgb after first month with appropriate dosing Causes of ESA resistance (top 4 are leading causes): <ul style="list-style-type: none"> ➤ Uremic toxicity (inadequate dialysis)-improve efficiency ➤ Inflammation-check C-reactive protein (CRP), treat infections or inflammatory conditions ➤ Hyperparathyroidism-treat/manage (discuss with nephrologist as they manage) ➤ Iron deficiency (discussed next)-replenish iron (Nephrology manages) ➤ Increased blood loss: <ul style="list-style-type: none"> ◆ Dialyzer blood loss ◆ Frequent phlebotomy ◆ GI bleeding ◆ B12/folate deficiency (replete) ◆ Hemolysis: Kinking of dialysis tubing, thermal erythrocyte injury, PRCA (acquired red cell aplasia—bone marrow disorder with isolated decline of erythrocyte line due to ESAs) 	

Chronic Complications (Continued)	
CARDIOVASCULAR	
Fluid Overload	<ul style="list-style-type: none"> Patients experience shortness of breath and/or show pleural or cardiac effusions on radiology studies or pulmonary hypertension on ECHOs and the HD nephrologist may not be aware; generally a fourth session per week or longer duration of dialysis is needed Cardiac effusions may need serial US to ensure no tamponade develops Significant pulmonary hypertension can occur Co-management with the HD nephrologist is paramount in improving quality of life, improving cardiovascular dynamics and avoiding unnecessary hospitalizations
CVD	<ul style="list-style-type: none"> High prevalence of morbidity and mortality in ESRD and especially dialysis population. Accounts for > 50% of deaths Related to arrhythmia, cardiomyopathy, ischemic heart disease, and other cardiac conditions Accelerated atherosclerosis and increased vascular calcification in dialysis patients, <u>younger patients may have significant ASCVD if on HD for a long time</u> Cardiac arrhythmias and sudden death—frequent cause of dialysis-associated CV mortality (high frequency and severity of atrial and ventricular arrhythmias), prolonged Q-T interval in dialysis patients High incidence of peripheral vascular disease (PVD) requiring amputation
Risk Factors for Atherosclerosis in HD Patients	<ul style="list-style-type: none"> “Traditional” risk factors: HTN, DM, age, smoking, dyslipidemia, family history ESRD “non-traditional” risk factors: <ul style="list-style-type: none"> Endothelial dysfunction: Hyperhomocysteinemia, acute-phase inflammatory response: <ul style="list-style-type: none"> C-Reactive Protein (CRP), Pro-inflammatory cytokines (interleukin 6), other acute-phase reactants Increased oxidative stress and vascular calcification
Hyperlipidemia ²⁹	<ul style="list-style-type: none"> Advise therapeutic lifestyle changes (diet and exercise) for all In adults ≥ 50 yrs in CKD 5 <u>without dialysis</u>, treatment with statin or statin/ezetimibe is recommended In adults < 50 yrs in CKD <u>without dialysis</u>, use statins if known ASCVD, DM, estimated 10-year risk calculation is > 10% (See ASCVD Risk Calculator) In adults with <u>dialysis-dependent</u> CKD, KDIGO recommends avoiding initiation of statins or statin/ezetimibe combinations. However, there is no recommendation to stop therapy in dialysis patients who are already receiving statins or statin/ezetimibe combinations.
HTN ²⁵	<ul style="list-style-type: none"> Therapeutic lifestyle changes Treat to goal of < 130/80 in overt ASCVD, DM, and all proteinuric CKD 5ND (not on dialysis) if tolerated. (See CCHCS Care Guide: Hypertension) < 140/90 more realistic to achieve Once on HD, highly individualized and should be managed by Nephrology.
DM	<ul style="list-style-type: none"> HbA1c not as accurate in ESRD due to decreased RBC survival. Values > 7.5 may overestimate extent of hyperglycemia. (See CCHCS Care Guide: Type 2 Diabetes) CKD 5 before HD: As for general DM population. Typically < 7%, < 8% for some. HbA1c target that is associated with the best clinical outcome in dialysis patients with DM has not been established. Typically < 7-8% depending on hypoglycemia, comorbid conditions, and age. <u>Very tight control (5.4 - 6.9%) is associated with increased mortality in ESRD patients in some studies.</u>
Pericarditis	<ul style="list-style-type: none"> Treat underlying condition-usual causes: infectious/viral, rheumatologic/vasculitic, malignant, drug-induced (minoxidil-discuss with Nephrology), uremic <u>Serial ECHOs</u> to ensure not enlarging toward tamponade (if moderate in size, repeat in 1 week, then 2 weeks, then monthly, then quarterly if needed) <u>Avoid heparin</u> and systemic anti-coagulation (may precipitate pericardial bleeding-tamponade) <u>Discuss volume status with HD unit nephrologist.</u> Treatment: intense dialysis, daily, for small - medium effusions with serial ECHOs to monitor progress HLOC for pericardiocentesis, pericardial window for tamponade or failure of intense dialysis <p>NOTE: Pharmacologic treatment (NSAIDs, colchicine, steroids) improve symptoms but do not enhance recovery</p>

Chronic Complications (Continued)	
PROTEIN-CALORIE MALNUTRITION	
Pathogenesis of Malnutrition	<ul style="list-style-type: none"> Wasting and malnutrition common in HD patients, multifactorial Inadequate protein and/or calorie intake due to nausea, uremia, hormonal alterations and inflammation Inadequate dialysis <u>Recommended HD daily dietary protein 1.2 g/kg of body weight per day</u> <u>Recommended HD daily energy intake: 35 kcal/kg of body weight per day for people aged < 60 years and 30-35 kcal/kg of body weight per day for people aged > 60 years</u>
Markers of Nutritional Status and Markers of Visceral Protein Stores	<ul style="list-style-type: none"> Serum albumin (also a negative acute phase reactant) Serum pre-albumin (also a negative acute phase reactant) BUN and CREAT (indirect measures of dialysis adequacy in addition to nitrogen intake and muscle mass surrogates)
Nutritional Therapy	<ul style="list-style-type: none"> HD Initiation Oral nutritional supplementation/liquid nutritional supplementation—consult dietician Intradialytic parenteral nutrition Vitamins (only formulary water soluble MVI is “Nephrovite”) and trace element supplementation (coordination between HD unit dietician and CDCR’s) CKD 5ND (not on dialysis) has “pre-renal” diet. Change to “renal diet” once dialysis starts (discontinue pre-renal diet)
Infection	<ul style="list-style-type: none"> <u>Second leading cause of death in HD patients (after heart disease)</u> <u>Infection-related mortality 12-22% in patients with ESRD</u> Septicemia responsible for 75% of infectious deaths <u>Sepsis-related mortality 100-300-fold greater in dialysis patients than general population</u>
Risk Factors for Septicemia	<ul style="list-style-type: none"> DM Older age Hypoalbuminemia Catheters for vascular access
Pathogenesis of Infection and Altered Immunity	<ul style="list-style-type: none"> Most infections caused by catalase-producing bacteria (e.g., Staphylococcus species) Opportunistic infections less frequent
HBV Infection	<ul style="list-style-type: none"> Decreasing prevalence in HD units: vaccination, universal precautions, fewer transfusions due to ESAs. Check HBsAg Testing required each time change or visit a new HD units Use 2 doses of Heplisav-B® given 1 month apart. Note that patients who are also not immune to Hepatitis A should receive the 2 dose Hepatitis A (Havrix®-1440 units/mL solution 6 - 12 months apart) and then 2 doses of the Heplisav-B® (4 injections total) and no longer use the Twinrix®, which is less potent for Hepatitis B Dialysis patients frequently do not develop protective antibody after HBV vaccination. Check proof of immunity (Serum Antibody > 10 mIU/mL). If no or poor antibody response, repeat the Heplisav-B® series
HCV Infection	<ul style="list-style-type: none"> Leading cause of liver disease in HD patients Declining incidence in HD units, but high overall prevalence in the incarcerated
HIV Infection	<ul style="list-style-type: none"> Treatment with highly active antiretroviral therapy, refer to HIV specialist (Consult to HIV) Must have non-detectable HIV viral load for at least 3 months for transplant candidacy (see page 25)

Chronic Complications (Continued)	
RENAL OSTEODYSTROPHY	
Secondary Hyperparathyroidism (SHPT)	<ul style="list-style-type: none"> • High bone turnover renal osteodystrophy • Osteitis fibrosa • Characterized by high serum PTH levels
Pathogenesis of SHPT (hyperPTH)	<ul style="list-style-type: none"> • Decreased renal phosphorus excretion, leading to hyperphosphatemia, a potent stimulus for PTH secretion • Hypocalcemia • Low calcitriol levels • Skeletal resistance to PTH
Signs and Symptoms of SHPT (hyperPTH)	<ul style="list-style-type: none"> • Bone pain • Proximal muscle weakness • Spontaneous tendon rupture • Pruritus • Metastatic and extra skeletal calcifications
Assays for PTH	<ul style="list-style-type: none"> • HD unit will order iPTH q3 months • PTH needs to be < 1000 pg/mL for renal transplant candidacy. Discuss with Nephrology if > 1000 pg/mL • Discuss adherence with diet, phosphate binders if persistently elevated PTH
Treatment of SHPT (hyperPTH) Nephrology will manage	<ul style="list-style-type: none"> • Decrease phosphorus intake/phosphorus-restricted diet. • Use of phosphorus binders (nephrologist manages): <ul style="list-style-type: none"> ○ Calcium-containing phosphorus binders (calcium acetate, calcium carbonate) ○ Non-calcium-containing phosphorus binders (sevelamer carbonate or hydrochloride, lanthanum carbonate) • Administration of vitamin D analogs • Calcimimetic agents (cinacalcet) • Parathyroidectomy: <ul style="list-style-type: none"> ○ Reserved for severe refractory hyperparathyroidism ○ Subtotal parathyroidectomy usually recommended: <ul style="list-style-type: none"> ➢ Recurrence of hyperparathyroidism after 5 yrs in 20-30% of patients ➢ Careful monitoring for hypocalcemia required postoperatively
Osteoporosis	<ul style="list-style-type: none"> • DEXA—order if changes management (T score-spine or hip) osteopenia when -1 to -2.4; osteoporosis if > -2.5, Z-scores ≥ -2 are below expected range for age <ul style="list-style-type: none"> ○ Before 65 years if hypocalcemia, immunosuppression, smokers and alcoholics, 10-year fracture risk (FRAX Risk Assessment Tool*) is greater than or equal to a 65-year-old Caucasian female, thin, advanced age, history of fracture, gonadal insufficiency, immobilization, early menopause ○ All patients after 65 years, but if on HD, only needed if it will change management • Bisphosphonates okay before dialysis • Bisphosphonates highly controversial once on HD (discuss with Nephrology)
Osteomalacia	<ul style="list-style-type: none"> • Bone softening (different from bone thinning of osteoporosis), prevents bones from mineralizing and thus weak and more likely to bend and break • Associated with bone pain, frequent fractures, and marked musculoskeletal disability • Radiologically characterized by pseudofractures aka “Looser Zones” (radiolucent bands extending from cortex inward perpendicular to bone surface)
Adynamic Bone Disease	<ul style="list-style-type: none"> • Characterized by slow rate of bone formation (low bone turnover without osteoid accumulation, collagen and subsequent mineralization are subnormal). Bone appears inert and without activity • Lower PTH values can occur with overaggressive phosphate binding than in other patients with renal osteodystrophy (and over-suppression increases risk)
Brown Tumor of Osteodystrophy	<ul style="list-style-type: none"> • Cortical and trabecular bone are lost and replaced by loose connective tissue. Collections of osteoclasts, reactive giant cells and hemorrhagic debris form a distinct mass or “brown tumor” of hyperparathyroidism • Imaging shows radiolucent osteoclastic lesions, must r/o malignancy

Chronic Complications – Renal Osteodystrophy (Continued)	
Dialysis-Related Amyloidosis	<ul style="list-style-type: none"> Seen in patients on long-term HD therapy (usually > 5 yrs). Amyloid B2 microglobulins are not dialyzable and accumulate, infiltrating tendons, ligaments, joints and viscera (especially GI tract) Causes carpal tunnel syndrome and bilateral scapulohumeral periarthritis commonly, chronic joint pain and stiffness, and destructive arthropathy (fractures and tears in tendons and ligaments) Diagnosis by means of imaging techniques and clinical syndrome, cystic bone lesions that enlarge rapidly (brown tumors more static), pathologic fracture work up
CALCIFIC UREMIC ARTERIOLOPATHY or CALCIPHYLAXIS	
Clinical Presentation	<ul style="list-style-type: none"> Calciphylaxis is misnomer, no systemic anaphylactic or hypersensitivity reaction Skin disorder characterized by excruciatingly painful ischemic skin necrosis Presents as painful red nodules or plaques (in areas of greatest adiposity) Progresses to ulcerative lesions with necrotic centers and violaceous borders Lethal with high morbidity and mortality. <u>6-month survival is 50%</u>
THYROID DISORDERS	
Thyroid Hormone Metabolism Disruption	<ul style="list-style-type: none"> The kidney normally plays an important role in the metabolism, degradation, and excretion of several thyroid hormones. CKD leads to disturbed thyroid physiology. However, the overlap in symptomatology between the uremic syndrome and hypothyroidism requires a cautious interpretation of the tests of thyroid function. Hypothyroidism will generally have an elevated TSH and decreased free T4 with normal thyroid hormone-binding globulin (TBG). Delayed deep tendon relaxation may confirm the diagnosis.
ELECTROLYTE DISORDERS	
Metabolic Acidosis	<ul style="list-style-type: none"> Managed by nephrologist Due to decreased excretion of acid Keep serum bicarbonate concentration between 23-29 mEq/L²⁹
Limit Dietary Potassium Intake	<ul style="list-style-type: none"> Used to prevent recurrence of hyperkalemia Limit intake from all sources to 40-60 mEq (mmol)/day (e.g., food, salt substitutes, supplements) Poor patient adherence to low-potassium diets may be due to: <ul style="list-style-type: none"> Consumption of food from canteen or other non-prescribed sources
Potassium Binders	<ul style="list-style-type: none"> <u>Patiromer NF (Veltassa® NF) and sodium zirconium cyclosilicate NF (Lokelma® NF) are the binding resins of choice with SZC preferred for acute hyperkalemia due to more rapid onset of action.</u> For patients with heart failure or volume overload issues, consider patiromer to avoid sodium load. Avoid sodium polystyrene resin (Kayexalate) due to potential GI toxicity unless other agents are unavailable. Do not use in conjunction with sorbitol and never use in: <ul style="list-style-type: none"> Postoperative patients Patients with an ileus Patients with a large or small bowel obstruction Patients with constipation or at risk of becoming constipated (e.g., due to opioid use) Patients with underlying bowel disease, e.g., ulcerative colitis or <i>C. difficile</i> colitis
Address Contributing Medications	<ul style="list-style-type: none"> Several medications have the potential to increase potassium levels, including: <ul style="list-style-type: none"> ACEIs/ARBs Beta Blockers, especially non-cardioselective. Calcineurin inhibitors (e.g., tacrolimus, cyclosporine) NSAIDs Potassium-sparing diuretics (e.g., amiloride, spironolactone, eplerenone, triamterene) Trimethoprim-sulfamethoxazole When making decisions regarding dose reduction of ACEI, ARB, spironolactone, or eplerenone in heart failure or post-myocardial infarction (MI), see the following charts Target Doses of Meds for Systolic Heart Failure, Target Dose of Post-MI Medications, Heart Failure Treatment at a Glance, and Medication Safety Principles and Practice in CKD. Some clinicians give scheduled potassium binder doses to avoid dosage reductions or discontinuation of therapy for evidence-based regimens (e.g., ACEIs or ARBs in patients with CKD, heart failure, post-MI). Patiromer and sodium zirconium cyclosilicate have been studied for this purpose.
Hyperkalemia	<ul style="list-style-type: none"> Refer to Attachment D

DELAYED INITIATION/CONSERVATIVE MANAGEMENT/CHOOSING AGAINST DIALYSIS

All dialysis patients should complete an [Advance Directive for Health Care](#) and [Physician Orders for Life-Sustaining Treatment \(POLST\)](#).

Dialysis and Quality of Life – The Renal Physicians Association and the American Society of Nephrology issued a practice guideline affirming the rights of patients to decline dialysis.³⁷

Dialysis is physically and emotionally taxing, fraught with frequent and serious complications and quality of life is unquestionably diminished. Several studies have found little or no survival benefit with dialysis versus conservative management in patients older than 65.

Any modest survival benefit from dialysis decreases with the presence of comorbid conditions, especially ischemic heart disease. Providers can counsel older patients and those with multiple comorbidities that non-dialytic management is a viable option in ESRD.

Patients who decline dialysis *initiation* can live for months to years. Studies have showed that patients who refuse dialysis have a median life expectancy of 6.3 to 23.4 months. Functional status generally remains stable until the last month of life.

ADVANCED CARE PLANNING

The 5-year survival rate for patients with stage 5 CKD is 38%, less than that of acquired immune deficiency syndrome (AIDS) and many cancers. For patients older than 65 years, the five-year survival rate is only 18%. Given this high mortality, **advanced care planning is a critical topic to address** at all opportunities, such as annual physicals, hospital admissions, and routine off visits for all dialysis patients.

CARDIOPULMONARY RESUSCITATION (CPR)

Patients with renal failure have poor outcomes after CPR. In one study of 74 patients receiving dialysis who underwent CPR for cardiopulmonary arrest, only 8% survived to hospital discharge, and only 3% were alive 6 months after CPR. These outcomes were significantly worse than those in patients who were not receiving dialysis (12% survival to hospital discharge, 9% survival 6 months after CPR). Patients who survive CPR often have neurologic compromise or need ongoing mechanical ventilation.

STRUCTURE AND PROCESS OF COMPREHENSIVE CONSERVATIVE MANAGEMENT RECOMMENDATIONS²⁶:

1. A comprehensive management program considering the following:
 - Symptom and pain management
 - Psychological care
 - Spiritual care
 - Culturally sensitive care for the dying patient
2. End-of-life care: (See [Palliative Care Guide](#))
 - Withdrawal of HD once started—patients who discontinue dialysis die within 1 - 2 weeks
 - Physician Orders for Life-Sustaining Treatment (POLST)
 - Part A: Resuscitation Status (CPR - Yes/No)
 - Part B: Medical Interventions (Full/Selective/Comfort-Focused Treatment)
 - Part C: Artificially Administered Nutrition (Feeding Tube - Yes/No/Limited Trial)
 - Part D: Signatures/Summary of Medical Condition
 - Does not specify decision-maker (use Advance Directive or Progress Note)
 - Document CDCR 7421, Advance Directive for Health Care to identify surrogate decision-makers, and initiate palliative care as indicated

CMF, CIW/CCWF Hospice Admission Criteria:

- Documented clinical progression of disease and prognosis for imminent death within 6 months
- Custody review (some custody levels require housing in single cell only and single rooms are limited)
- The patient requires assistance with activities of daily living (ADLs) and/or skilled nursing care at a level that is appropriate for the specific unit
- POLST completed; do not resuscitate (DNR) recommended, but not required
- Advance Directive recommended, but not required

CMF, CIW/CCWF Hospice Referral Process

Providers with patients meeting admission criteria should contact the CME at CIM, CIW or CCWF.

- [Hospice Admission Forms](#) - Documentation can be compiled from EHRS or any available source, to include with referral submission.
- Sometimes there is a waiting list for admission, but this varies and providers are encouraged to communicate with CMF if they have an urgent referral.

According to U.S. Renal Data System⁴³, the mortality rate is twice as high for dialysis patients aged 65 and above, in comparison to the general population who have DM, cancer, CHF, CVA/transient ischemic attack (TIA), or acute MI. The condition of the patient at the time of starting dialysis does affect the life expectancy. Studies have also indicated that the survival rates are lower for ESRD patients, who are 65 years and above.³⁸

Risk factors for ESRD

Mortality:

Age > 65
DM
ASCVD (CVD, PVD, cerebrovascular diagnosis)
Ischemic HD/CAD
CHF
COPD
Liver disease

RENAL TRANSPLANT CONSIDERATIONS AND REFERRAL PROCESS

Renal Transplant Facts

- Mortality rates and treatment costs are significantly lower for transplant patients vs. continued HD (\$33K vs. \$88K/year)
- Wait times for a typical cadaveric non-infected, relatively healthy or younger kidney is 8 - 14 years or 6 - 9 years for HCV+ or other high-risk donors.
- Transplant before dialysis start (GFR < 20mL/min/1.73 m²) has superior outcomes over transplant after HD begins.
- Organs are provided via a highly regulated system with complicated algorithms for the weighting of factors run by the United Network for Organ Sharing (UNOS) who is contracted by the US Department of Health and Human Resources.
- Graft and patient survival decline with each year of dialysis (inversely related to “vintage”- length of time on dialysis).

CCHCS Renal Transplant Program (See attachment E for more details)

- Headquarters (HQ) Transplant Team works closely with the contracted Transplant Center.
- It is imperative to keep a strong and positive relationship with the contracted Transplant Center.
- Evaluations are ONLY initiated through Central Team.
- Currently all RT candidates are identified and screened by the Centralized HQ Transplant Team.
- Patients are evaluated based on their length of dialysis/first day of dialysis (FDOD). It is helpful to add the FDOD as a free text to the problem list or as a recurring text in your progress note.
- HCV should be treated; having a positive viral load no longer confers a transplant wait time benefit.
- An intensive evaluation process will be initiated by the central HQ Transplant Team in collaboration with the contracted Transplant Center and patients will be followed throughout their transplant process by the central team.
- Refer any questions, special considerations, and any HD patients that you think may have been missed to:
CPHCSTransplantProgramCoordinator@CDCR.ca.gov.

CCHCS Renal Transplant Inclusion criteria

Must include all criteria:

- ESRD without absolute contraindication (see exclusion criteria section below)
- EPRD > 1 year if on dialysis > 6 years, otherwise EPRD > 2 years
- CKD 5 with GFR < 20%, not yet on dialysis

CCHCS Renal Transplant Absolute Exclusion Criteria

- Co-morbid condition or systemic disease and/or frailty that precludes surgery or expected to result in very poor rehabilitation potential
- Active malignancy
- Cardiac disease if any of the following exist: EF < 30%, untreated or uncorrectable CVD, unsuccessful revascularization after workup, MI within 6 months
- Severe PVD defined as the presence of rest pain or uncorrectable with surgical or percutaneous intervention
- Severe pulmonary disease defined as chronic obstructive pulmonary disease (COPD) or restrictive lung disease if any of the following exist: home O₂ therapy (includes those using solely at night), uncontrolled asthma, severe cor pulmonale, FEV₁ 20-30% of predicted, RA PO₂ < 60-70 mmHg, restrictive with exercise desaturation SaO₂ < 90%, > 4 respiratory infections in the last 12 months, moderate disease but progressive with steep rate of decline
- Advanced liver disease defined as decompensated cirrhosis (decompensated defined as symptomatic complications related to the cirrhosis-jaundice, ascites, variceal hemorrhage, or hepatic encephalopathy)
- Active post-transplant lymphoproliferative disease
- Active infection (including wounds) either responsive or unresponsive to antibiotics or other appropriate anti-infective agents that is not HCV, HBV, or disseminated cocci with diffusion compliment fixation or titers and not on lifelong azole therapy, and for HIV see below
- Patients that are HIV+ and any of the following exist: CD 4 count < 200, detectable RNA within the prior 3 months, opportunistic infections in the prior 6 months, progressive multifocal leukoencephalopathy, chronic intestinal cryptosporidiosis, lymphoma, Kaposi's Sarcoma
- Active or recent substance use—stability of rehabilitation is evaluated case by case. At least 6 - 12 months without relapse
- Mental illness compromising ability to adhere to post-transplant regimen (include MH documentation, Form 7225-2, coordinated by the CCHCS Renal Transplant Team and the institutional Chief of Psychiatry (or designee) and hemodialysis unit social worker, with referral to transplant center).
- BMI ≥ 40
- If surgery expected after or close to release date and no social support system or insurance
- Non-adherence that has not been successfully remediated, abusive behavior to staff, or violent rule violations (RVRs)

Please notify the HQ team if you have reservations about your patient's compliance and have concerns that it could affect their ability to stick to a complicated and demanding post-transplant treatment regimen of medications, appointments and blood draws at : CPHCSTransplantProgramCoordinator@CDCR.ca.gov.

If you know or suspect your patient has an absolute contraindication, it may be helpful to discuss their health status as it relates to transplant and emotionally prepare your patient that transplant is not or may not be an option for them. Please notify the transplant team of any pertinent information. You or HQ can alert the Nephcare social workers who can assist with any related grief or adjustment disorder during the patient's hours on dialysis.

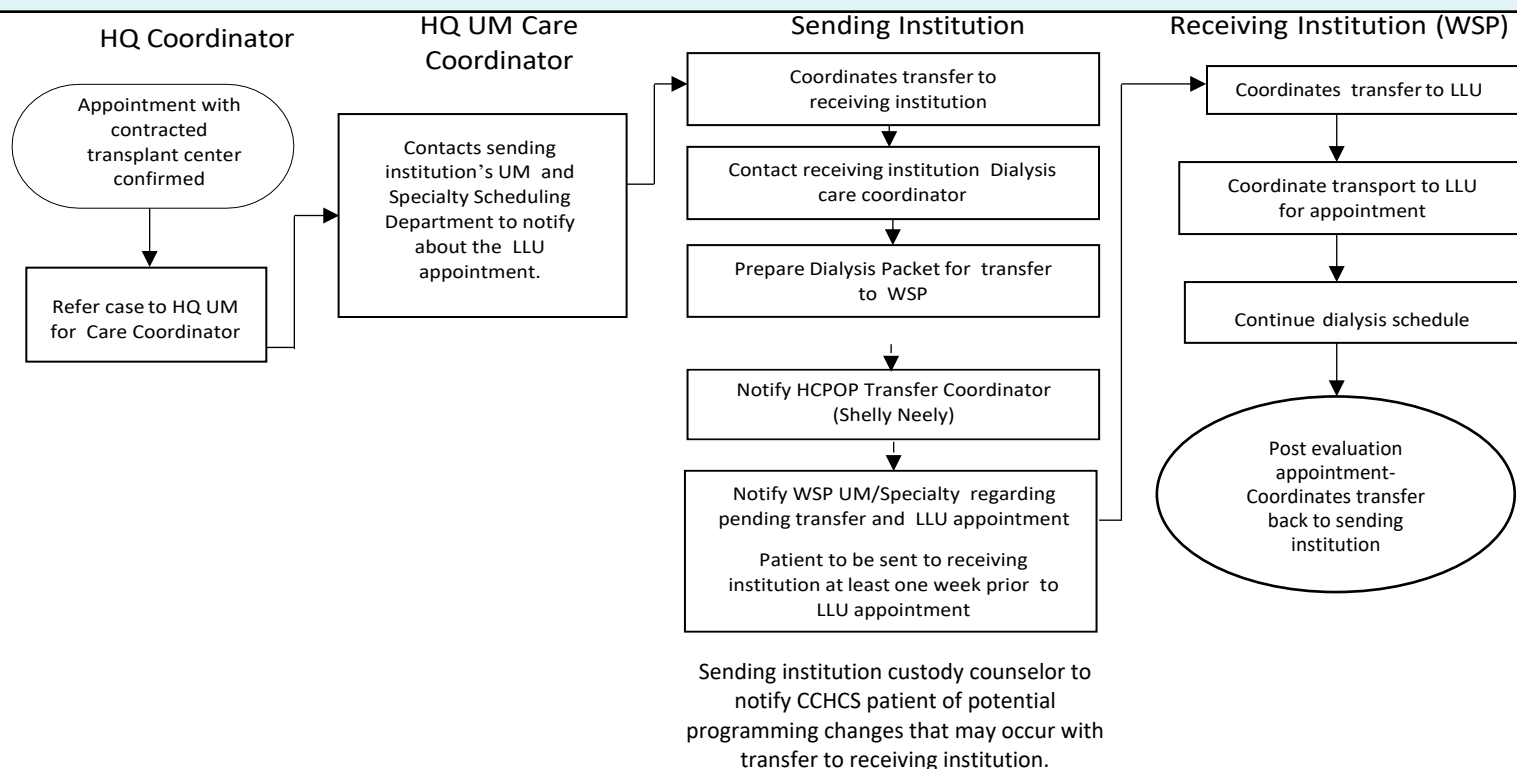
RENAL TRANSPLANT CONSIDERATIONS AND REFERRAL PROCESS (CONTINUED)

Once a patient has been through the initial phase steps of agreeing to referral for consideration of renal transplant and they have no contraindications noted on mental health evaluation, typically coordinated by the institutional Chief of Psychiatry, or designee, and also the hemodialysis unit social worker screening, history and physical, or diagnostic studies, they are referred to the transplant center. The transplant center will review their records and if they agree, they will ask for an in-person evaluation. Transporting patients who are receiving regular dialysis is complex and often requires coordination and intense communication. See information below on Dialysis Transfer Packet and Flow Map for those involved in the transfer.

Dialysis Transfer Packet for Evaluation Appointment Travel: (See HD Initiation & Transfer Process Flow Map page 13)

- | | | |
|--|--|---|
| <ul style="list-style-type: none"> • First Date of Dialysis • Does patient have tracheotomy Y/N? • Current RN, RD, and SW assessments Vaccination record including: <ul style="list-style-type: none"> ○ CXR ruling out TB within the last 3 months ○ Hep B Ab, Ag, Core and Hep C antibody lab results* ○ Flu, pneumonia, COVID-19, and HBV vaccination series <p><i>*Request for blood to be drawn at dialysis in the order comments</i></p> | <ul style="list-style-type: none"> • Legible copy of H&P within the last year • Most recent HD orders for treatment • Current Plan of Care and progress notes • Current MAR including Epogen, paricalcitol, iron sucrose (if applicable) • Labs* within 30 days: H/H electrolytes, Kt/V, URR, Phos, T-Sat, Albumin, etc. • Any dialysis related procedures, i.e., AVF/CVC placement, Venograms, etc. | <ul style="list-style-type: none"> • Note from Nephrologist if patient is new to dialysis • Last 3 dialysis Post-Treatment Reports • Documentation of Advance Directive (if applicable) • Most recent EKG if available, or if patient has known heart condition • Demographics must be legible. Include patient's name, CDCR #, and DOB • Documentation of height, amputations, ambulatory status, allergies, diabetic status (Naphcare Kardex) |
|--|--|---|

Dialysis Packet Flow Map



UNOS LISTING (United Network of Organ Sharing)

After completion of all necessary work-up and an in-person evaluation, the transplant center surgery team may deem the patient a suitable candidate for United Network of Organ Sharing (UNOS) listing and the patient will be formally UNOS "waitlisted" for a kidney. For factors considered in determining assignment priority of kidney to recipient, see next page.

Living Organ Donation

Living donation from a family member to an CCHCS patient is allowed but the logistics and finances are complex. The transplant center will address living donation with the patient. If an ESRD patient has a potential living kidney donor and has not relayed that information to the central renal transplant team previously, please email the central team coordinator at: CPHCSTransplantProgramCoordinator@cdcr.ca.gov. Note: Patients are also allowed to donate organs to their family members, although ethical considerations must be thoroughly understood. CDCR will not be financially responsible for any part of the CCHCS patient-to-family-member donation process. Please send your questions to the central transplant coordinator and/or the institution utilization management lead.

UNOS Listing and Factors that Affect Time on the Kidney Waitlist

Dialysis Start Date	The longer patient is on dialysis the earlier to be transplanted (higher rank on the UNOS list).
Blood Type	Transplants are ABO compatible. AB blood has shortest wait, then A blood. Due to high prevalence, those with Type O blood, will have longer wait because those kidneys are divided between all the different blood type recipients. An O donor can give to anyone, and an AB recipient can accept from anyone. B blood can be somewhat less waiting or more than type O. There are new rules designed to provide greater access to blood type B candidates who can agree to accept a riskier kidney from subtypes of a type A blood type donor (A2 [A, non-A1] or A2B [AB, non-A1B]).
Kidney Donor Risk Index (KDRI)	Risk for kidney graft failure which is based on: donor's age, height, weight, ethnicity, cause of death, whether donated after circulatory death (DCD) or not, medical history, HTN, HCV status, DM and serum creatinine and protein levels. It is the relative risk compared with the average (50th percentile) donor as a reference donor. Used to calculate the KDPI below.
Kidney Donor Profile Index (KDPI) About KDPI	Index accepted by patient—lower is better (higher post-transplant longevity). Low score = younger and healthier kidney (< 20), typically lasts 11 years; score 20-85 = standard kidney, typically last 9 years, high score = > 85, older sicker donor, typically last 5 1/2 years. KDPI based on risk for kidney graft failure which is based on the KDRI above.
Estimated Post Transplant Survival Score (EPTS) EPTS Score Calculator	Assigned to all patients on the UNOS list; Scale 0-100%. Lower is better (higher post-transplant longevity). Takes into account: Age, DM, prior solid organ transplants, and time on regular dialysis. Scores < 20% are matched first with offers for kidneys from donors with KDPI scores of 20% or less. This means that the kidney is in the "top 20%" and thus likely to function longer than 80% of other available kidneys. After EPTS < 20% offered, those with EPTS > 20% are offered. (KDPI > 20% kidneys are not matched for priority).
Calculated Panel Reactive Antibodies (CPRA or PRA) Level	Scale 0-99%, percent of specific HLA antibody reactions within given panel. Lower is better (higher post-transplant longevity). CPRA of > 20% is considered sensitized (~30% of transplant patients) and > 98% is highly sensitized. More antibodies = harder to match. Theoretically, the PRA is the % chance of acute rejection . For example: PRA of 80% = rejection likely 80% of the time. Technology likely to change the way this affects allocation. There is a sliding scale to give priority to highly sensitized patients in attempts to equilibrate access to kidneys who may wait 3-4 times longer for a kidney.
Public Health Service (PHS) Kidney Consent	Patient agrees to take kidney with higher chance of HIV, HCV and other blood diseases. Infectious disease status is separated into AB+, but NAT- or AB+ and NAT+. HCV Kidneys can be available in approximately months to 2 years.
HCV Status	HCV+ donor kidneys are now available to all potential recipients, thereby reducing wait times. The HCV is then generally treated 3-6 months post-transplant.
Prior Transplant	New time on dialysis starts after last graft failed, unless graft deemed never to have worked. Such a nonfunctioning graft is formally defined as: kidney graft <u>removal</u> within the first 90 days of transplant or failure in the first 90 days with documentation that the patient is on dialysis or GFR ≤ 20 mL/min.
Organ specific Antibody matching	How well the patient matches with the specific available kidney. Improved match moves patient up on the list for the particular organ in question.
Medical Urgency	Imminent lifesaving need moves patient up in the list.
Age of Recipient	Kidneys are "longevity matched"- donor and recipient in generally same age range. The closer in age range, the higher on the list for the organ in question.
Size of Kidney	Weight and size of the kidney compared with recipient. The closer the match, the higher on the list for the organ in question.

Transplant Center Annual Review

Patients wait a variable amount of time for their organ offer depending on many factors including type of kidney accepted, time on dialysis, blood type, and HLA status. While listed and awaiting organ offer and transplant surgery, the transplant center conducts an annual chart review and will notify the central CCHCS Transplant Program as to what labs/diagnostics are needed. Sometimes an in-person meeting is requested.

Clinical Changes in Medical Status of Patients While Renal Transplant Waitlisted

PROVIDERS: PLEASE NOTIFY THE TRANSPLANT TEAM OF ACUTE EVENTS THAT MAY INTERFERE WITH CANDIDACY OR REQUIRE TIME FOR TREATMENT/RESOLUTION BEFORE TRANSPLANT CAN BE PURSUED.
(CPHCSTransplantProgramCoordinator@cdcr.ca.gov). For example:

- + Drug Tox/Substance Use Disorder (SUD) treatment (needs to be stable without relapse a minimum of 6 months)
- Open active wounds (need to be healed)
- Cancer work ups, or recent cancer treatment (historical cancers will need hematology/oncology clearance)
- Acute hospitalizations and major adverse events
- Multiple/patterned refusals of dialysis itself, major diagnostics or consultations, follow-ups, PCP appointments, non-adherence with adverse health consequences (refusals for pre and post HD vitals are not considered substantive)
- Refusals of recommended vaccinations
- Behavioral problems and inability to cooperate or regulate with consequent adverse health consequences
- Abusive treatment of staff, violent RVRs
- Refusal to go to dental appointment for transplant clearance and/or refusal to comply with recommended dental treatment especially if moderate to severe periodontal disease or potential development of infection

Approaching Organ Offer- Transferring to Closer Proximity to Transplant Surgery Center

- The transplant center will alert HQ regarding the anticipated transplant time.
- HQ will alert the RT UM Coordinator (RTUMC) if patients are within days to 1 - 2 years of anticipated organ availability and transplant surgery.
- The RTUMC will initiate the process for patient transport to a facility physically close to the transplant center. Currently: RJD, CIM/CIW, or WSP, under urgent or non-urgent conditions by alerting local UM teams. If a northern California transplant facility is contracted, this movement may not be necessary for all.
- Regional and local UM nurses coordinate with the dialysis unit, medical staff, and custody to arrange the transportation.
- HQ provides the transplant center with patient's current facility transplant coordinators and the Treatment and Triage Area's (TTA) 24-hour number in the case of an earlier than expected organ offer.
- Facilities that house listed transplant patients need to develop local operating procedures (LOPs) for emergency transplant response (See Attachment F Example LOP and Guidance).

Basic Process for Organ Offer

1. When a kidney is available, UNOS will contact the transplant center. This kidney is viable for 24 - 36 hours only. The transplant center will call the patient facility TTA and other contacts with notification that there is a potential matched kidney for transplant.
2. The goal for the CDCR facility housing the patient is to respond to the transplant center within 30 - 45 minutes regarding patient status.
3. TTA staff must accept or reject an offered kidney within 1 hour.
4. Patient should be brought to the TTA, where the TTA RN will assess if the patient is medically stable (checks vitals, no acute illnesses, no infections, no open wounds, etc.) If the patient is medically stable, plans are made to transfer him/her immediately and the transplant center can be notified that the organ will be accepted.
5. The patient's institution should prepare and send the routine documents for off-site appointments, along with Nephcare (dialysis unit) records with 2 months of information from the medical record (labs, imaging reports, consultation reports, recent med lists/MARS) along with the patient to the transplant center.
6. The transport team must be notified in order to mobilize and be able to assure patient arrival at the transplant center within 8 hours.
7. The patient is taken to the hospital for surgery for pre-op and RT surgery.

If you require any assistance with transportation or housing issues pre-transplant, contact the transplant coordinator at:

CPHCSTransplantProgramCoordinator@cdcr.ca.gov

If your facility will house UNOS listed patients, **LOPs for routine and emergency transport for your institution** will need to be created, if not in place already. Facilities need to assemble the staff and design an emergency transplant LOP with the following elements: *See Attachment F for examples of urgent transport LOPs.*

Organ Offer Urgent Transfer Process Recommendations for Facilities if Housing Waitlisted Patients

1. Assign point of first contact from the transplant center.
 - List who to contact and back-ups: Assign daytime and after-hours/weekend custody, provider and nursing staff coordinators who will designate who will be “on-duty” for organ alerts and their phone numbers.
 - Provide HQ with contact phone numbers or beeper numbers along with TTA phone number.
 - Provide staff with HQ and the transplant center contact information.
2. Decide which personnel will notify:
 - CME and Medical Officer of the Day (MOD) and other facility leadership if desired
 - Custody
 - HD Unit
 - Transport Team
 - Health Information Management (HIM) and back up staff for getting copies of medical record
 - TTA RN
 - Housing unit and have patient brought to the TTA for transport evaluation
 - Headquarters
 - The transplant center within 30 - 45 minutes regarding patient status and transportability with assurance of patient arrival at the transplant center within 8 hours
3. Decide who will be the main coordinator that will monitor, watch the time, and coordinate with the transplant center for daytime and evenings/weekends.
4. Decide who will have the duty of the clinical assessment in the TTA.
 - The patient must be medically evaluated: Check vital signs and signs, cardiopulmonary status and symptoms of acute illnesses, infections, or other medical issues that would deem the patient unstable for transport and/or surgery.
5. Designate who will have the duty of obtaining pertinent medical records:
 - If HIM staff is not available during weekends and evenings, decide who will directly make copies and compile the medical records at such times:
 - a. Same clinical documents as would for routine off-site appointments
 - b. Last two months of Nephcare records and information from the medical record (progress notes, medications, and diagnostic tests)
 - c. Most recent labs in Quest, if beyond the 2 months already copied
6. Once LOPs are in place - TTA staff awareness and education/information session should be conducted.

MEDICATIONS**Common Medications to Avoid or use with caution in ESRD/Dialysis Patients**

Medications to Avoid	Comments
ACEI/ARB	Although KDIGO 2012 ²⁶ still recommends, recent literature discourages use in all HD patients, except <u>may still be useful in treating severe heart failure with reduced ejection fraction (HFrEF).</u>
ASA	Bleeding risk. Contraindicated unless specifically prescribed for blood thinning, nephrotoxic.
Cisplatin	Avoid when GFR < 30 ml/min/1.73 m ² .
Codeine	Metabolized to morphine; active metabolites accumulate in patients with renal failure; can cause respiratory depression, hypotension, and narcolepsy.
Direct Acting Oral Anticoagulants (DOAC)	Limited data in HD patients. NOT RECOMMENDED.
Gabapentin	Avoid, but may be used in low doses.
Gadolinium	Nephrogenic sclerosing dermopathy/Nephrogenic Systemic fibrosis.
Gentamicin	Nephrotoxic and vestibulotoxic; may adversely affect residual renal function.
Hydrocodone	Parent drug and active metabolites accumulate in patients with renal failure; no safety.
Lithium	Difficult to achieve safe dosing. Nephrotoxicity. Nephrogenic diabetes insipidus.
Low Molecular Weight Heparins (LMWH)	AVOID or DISCONTINUE. Limited data for dialysis patients and not recommended. Accumulates in CKD. If recommended for use by hematology-oncology specialist, it should be managed in hospital (HLOC) setting.
Meperidine (Demerol)	Active metabolite accumulates in patients with renal failure; can cause seizures.
Metformin	Lactic acidosis
Morphine	Active metabolites accumulate in patients with renal failure; can cause myoclonus, seizures, and respiratory depression. Avoid, or use only when death is imminent.
Neomycin	Trace GI absorption may accumulate and be nephrotoxic.
Nitrofurantoin	Reduced antibiotic efficacy/treatment failures, increased N/V and anorexia.
NSAIDS	Nephrotoxic, may decrease residual renal function.
Pre-Gabalin	Avoid, but may be used in low doses.
Radiocontrast	Nephrotoxic, may decrease residual renal function.
Sulfonylureas	Extended half-life increases risk of hypoglycemia.
Tramadol	Maximal dosage should not exceed 50-100 mg twice daily.
Tricyclics	Pro-arrhythmic
Trimethoprim/sulfamethoxazole	Do not use. Potential for interstitial nephritis and/or hyperkalemia.
OTC Medications to Avoid	Comments
Ibuprofen	Nephrotoxic, may decrease residual renal function.
Maalox, Mintox, gelusil (aluminum hydroxide)	Aluminum can accumulate in people with ESRD and cause aluminum toxicity.
Milk of Magnesia (magnesium hydroxide) Magnesium citrate, magnesium hydroxide/simethicone)	Magnesium can accumulate in people ESRD, especially if used often, and result in hypermagnesemia, arrhythmia, and hypotonia.
Naproxen	Nephrotoxic, may decrease residual renal function.
Regular multivitamins	Have patients bring to HD to clear with nephrologist.
Vitamin D	<ul style="list-style-type: none"> Over the counter vitamin D must be activated in a functioning kidney. “Activated” vitamin D as calcitriol, doxercalciferol or alfacalcidol for high PTH levels. These forms of vitamin D will work for people on dialysis.

Cautionary Notes for Common Medications in People with ESRD²⁶ By Drug ClassConsult Med Tables on page 30, and References such as [Epocrates](#) and [Clinical Pharmacology](#)

Agents	Cautionary Notes
1. Antihypertensives/Cardiac Medications	
Beta-blockers	<ul style="list-style-type: none"> Reduce dose by 50% in people in ESRD. Beta-blockers that are hydrophilic (including atenolol, bisoprolol, and nadolol) require dosing adjustments in CKD patients. May cause hyperkalemia (1%-5%), especially non-cardioselective.
Digoxin	<ul style="list-style-type: none"> Avoided in ESRD due to increased risk of toxicity on HD. If used, reduce dose based on plasma concentrations.
Renin-angiotensin-aldosterone system (RAAS) antagonists (ACEIs, ARBs, aldosterone antagonists, direct renin inhibitors)	<ul style="list-style-type: none"> Patients are generally taken off these drugs after dialysis begins. If using for CHF, dose adjust in ESRD. Assess GFR and measure serum potassium within 1 week of starting or following any dose escalation. Temporarily suspend during intercurrent illness, planned IV radiocontrast administration, bowel preparation prior to colonoscopy, or prior to major surgery. Discuss with Nephrology when HD start anticipated. Avoid in people with suspected functional bilateral renal artery stenosis.
2. Analgesics	
NSAIDS	<ul style="list-style-type: none"> Avoid in ESRD. Should not be used in people taking lithium. Avoid in people taking RAAS blocking agents.
Opioids	<ul style="list-style-type: none"> Use with caution in ESRD. Avoid morphine and codeine. If use, dosage reduction is recommended. Metabolite accumulation can lead to supratherapeutic concentrations and cause severe harm. Dosing intervals for opioids may need to be modified in CKD patients.
3. Antimicrobials	
Aminoglycosides	<ul style="list-style-type: none"> Avoid if can substitute. If must use, reduce dose and increase dosing interval in ESRD. Monitor serum levels (trough and peak) closely. Avoid concomitant ototoxic agents such as furosemide.
Antifungals	<ul style="list-style-type: none"> Avoid amphotericin unless no alternative in ESRD. Reduce maintenance dose of fluconazole by 50% or more in ESRD. Reduce dose of flucytosine in ESRD.
Fluoroquinolones	<ul style="list-style-type: none"> Reduce dose by 50% in ESRD.
Macrolides	<ul style="list-style-type: none"> Reduce dose by 50% in ESRD.
Penicillin	<ul style="list-style-type: none"> Risk of seizures in ESRD with high doses.
Tetracyclines	<ul style="list-style-type: none"> Reduce dose in ESRD; can raise serum urea concentration.
4. Hypoglycemics	
Sulfonylureas	<ul style="list-style-type: none"> Avoid in ESRD. High risk of hypoglycemia (due to long T 1/2) outweighs benefits.
Insulin	<ul style="list-style-type: none"> Partially renal metabolized and will need reduced dose. <u>Cut initial dose by 50%</u>. Consider endocrine referral.
Metformin	<ul style="list-style-type: none"> Do not use in ESRD.
Empagliflozin	<ul style="list-style-type: none"> Do not use if eGFR < 45.
Sitagliptin	<ul style="list-style-type: none"> If eGFR < 30, use only 25 mg/day, if between 30-49, use only 50 mg/day.
Liraglutide	<ul style="list-style-type: none"> Limited data available on use in patients with renal impairment.

Cautionary Notes for Common Medications in People with ESRD (Continued)			
Agents	Cautionary Notes		
5. Lipid-lowering			
Statins	<ul style="list-style-type: none">• 2019 ACC/AHA: Moderate-intensity statin therapy in combination with ezetimibe (if already on maximally tolerated statin) can be useful in adults age 40 to 75 with CKD who have greater than a 7.5% ASCVD risk and are not treated with dialysis or kidney transplant. If patients are currently undergoing dialysis and already receiving a statin, it is reasonable to continue statin therapy despite potential decreased efficacy in this population.• Atorvastatin (F) and pravastatin (F) have <u>DO NOT</u> have dose adjustment recommendations.• rosuvastatin (F) and lovastatin (NF) <u>DO</u> have dose adjustment recommendations.		
Fenofibrate	<ul style="list-style-type: none">• Increases creatinine by approximately 0.13 mg/dl (12 mmol/l). Do not initiate use with statins in ESRD. Once on dialysis, TGs should be > 1000 before considering treatment.		
6. Chemotherapeutic			
Melphalan	<ul style="list-style-type: none">• Reduce dose.		
Methotrexate	<ul style="list-style-type: none">• Reduce dose.• Avoid if possible when GFR < 15 ml/min/1.73 m².		
7. Anticoagulants			
Warfarin ³¹	<ul style="list-style-type: none">• Increased risk of bleeding.• Treatment and prophylaxis: May need lower doses when dialysis initiated and monitor INR closely.• Risk/benefit in ESRD somewhat controversial, but most studies show acceptable risk.		
Direct Acting Oral Anticoagulants (DOAC) ^{8, 46}	<ul style="list-style-type: none">• AVOID• Apixaban is only approved DOAC for ESRD, but has no RCT safety data. All other DOACs are contraindicated in ESRD due higher risk of hospitalization or death from bleeding compared to warfarin in ESRD patients.		
Low-molecular-weight heparin (LMWH)	<ul style="list-style-type: none">• AVOID. No enoxaparin (Lovenox[®]) in ESRD patients.		
Medications Requiring Renal Dosage Adjustments			
Note: List isn't inclusive of all renally-dosed medications			
Allopurinol (Zyloprim)	Amantadine (Symmetrel)	Metoclopramide (Reglan)	Acyclovir (Valtrex)
Lithium (Lithobid)	Fexofenadine (Allegra)	Fesoterodine (Toviaz)	Gabapentin (Neurontin)
Common Antimicrobials Requiring Renal Dosing			
Note: List isn't inclusive of all renally-dosed medications			
Cephalexin (Keflex)	Cefuroxime (Ceftin)	Clarithromycin (Biaxin)	Nitrofurantoin (Macrobid)
Piperacillin/Tazobactam (Zosyn)	Amoxicillin (Amoxil)	Ciprofloxacin (Cipro)	Levofloxacin(Levaquin)
Tetracycline (Sumycin)	Trimethoprim/Sulfamethoxazole (Bactrim)		

Medication by Class		
MEDICATION	DOSING	COMMENTS
DIURETICS AND SELECT ANTIHYPERTENSIVES		
Chlorthalidone Tablet: 25 mg, 50mg, \$\$	<ul style="list-style-type: none"> <u>Initial</u>: 25 mg orally once daily <u>Usual dose</u>: 12.5-25 mg orally once daily <u>Max dose</u>: 100 mg/day (25 mg/day in the elderly) <u>Renal impairment</u>: CrCL ≥ 10 mL/min: no adjustment CrCL < 10 ml/min: necessary (UpToDate) Avoid use 	<ul style="list-style-type: none"> <u>Contraindications</u>: anuria, hypersensitivity to sulfonamides, use with caution Long-acting thiazide thus may be more effective in lowering SBP over a 24-hour period than HCTZ Rarely effective or used alone in CKD5 <u>Hepatic impairment</u>: use with caution
Hydrochlorothiazide [HCTZ] Capsule/Tablet: 12.5 mg Tablet: 25 mg, 50 mg \$	<ul style="list-style-type: none"> <u>Initial</u>: 12.5-25 mg orally once daily <u>Usual dose</u>: 12.5-50 mg orally once daily <u>Max dose</u>: 50 mg/day <u>Renal impairment</u>: CrCL ≤ 30 ml/min: Do not use, generally not effective 	<ul style="list-style-type: none"> <u>Contraindications</u>: anuria, breastfeeding, hypersensitivity to sulfonamides, use with caution Rarely effective or used alone in CKD5 <u>Hepatic impairment</u>: use with caution since minor alterations of fluid and electrolyte balance may precipitate hepatic coma
Metolazone Tablet: 2.5 mg, 5 mg, 10 mg \$\$\$	<ul style="list-style-type: none"> <u>Initial</u>: 2.5-5 mg orally once daily <u>Usual dose</u>: 2.5-5 mg orally once daily <u>Max</u>: 5mg/day <u>Renal impairment</u>: no adjustment needed, if severe, caution advised 	<ul style="list-style-type: none"> <u>Contraindications</u>: anuria, hepatic encephalopathy, hepatic coma or pre-coma, hypersensitivity to sulfonamides or thiazide diuretics use with caution Rarely used alone Generally used in combination with a loop diuretic to enhance diuresis <u>Hepatic impairment</u>: use with caution since minor alterations of fluid and electrolyte balance may precipitate hepatic coma
Furosemide (Lasix®) Tablet: 20 mg, 40 mg \$	<ul style="list-style-type: none"> <u>Initial</u>: 20-80 mg orally twice daily <u>Usual dose</u>: 20-160 mg/day divided in 2 doses <u>Max</u>: 600 mg/day <u>Renal or hepatic impairment</u>: use with caution, minor alterations of fluid and electrolyte balance may precipitate hepatic coma. Caution advised for cirrhosis/ascites 	<ul style="list-style-type: none"> Black Box Warning: if given in excessive amounts, furosemide can lead to profound diuresis resulting in fluid & electrolyte depletion <u>Contraindications</u>: anuria, hepatic coma, electrolyte imbalances, concomitant use of desmopressin Use caution in the elderly, in cirrhosis, concomitant ototoxic drugs (e.g., aminoglycosides), sensitivity to sulfonamides, iodinated contrast dye, hepatic failure
Bumetanide (Bumex®) Tablet: 0.5 mg, 1 mg, 2 mg \$-\$\$\$	<ul style="list-style-type: none"> <u>Initial</u>: 0.5 mg-1 mg orally once daily. Multiple daily doses may be given at 4-5 hour intervals if initial diuretic response not adequate <u>Usual dose</u>: 0.5-2 mg orally once daily <u>Maintenance</u>: administer orally on an intermittent schedule such as every other day or for 3-4 days with a 1-2 day rest period in between <u>Max dose</u>: 10 mg/day <u>Renal impairment</u>: contraindicated in anuria 	<ul style="list-style-type: none"> Same as furosemide, but better GI absorption <u>Hepatic impairment</u>: use with caution, minor alterations of fluid and electrolyte balance may precipitate hepatic coma. Keep dose to a minimum. Contraindicated in hepatic coma

Bold = Formulary *See prescribing information for complete description of contraindications/precautions, adverse effects and drug interactions.

The cost scale \$-\$\$\$\$\$ represents the relative cost of acquisition of medication only. Frequency and complexity of medication administration (institution workload, effect on adherence) should be considered when determining overall cost-effectiveness of treatment.

Medication by Class		
MEDICATION	DOSING	COMMENTS
DIURETICS AND SELECT ANTIHYPERTENSIVES		
Triamterene/HCTZ (Maxzide [®] , Dyazide [®]) Capsule: 37.5/25 mg Tablet: 37.5/25 mg, 75/50 mg \$	<ul style="list-style-type: none"> <u>Initial</u>: 37.5/25 mg orally once daily <u>Usual dose</u>: 37.5/25 mg to 75/50 mg orally once daily <u>Max dose</u>: 75/50 mg/day <u>Renal impairment</u>: AVOID CrCl < 30 ml/min: Do not use (contraindicated) <u>Hepatic impairment</u>: use with caution since minor alterations of fluid and electrolyte balance may precipitate hepatic coma 	<ul style="list-style-type: none"> Black Box Warning: Abnormal elevation of serum potassium levels (≥ 5.5 mEq/L) can occur. Risk of hyperkalemia is increased in patients with renal dysfunction, diabetes (with or without renal impairment), the elderly, and severely ill. <u>Contraindications</u>: hypersensitivity to sulfonamides, severe renal impairment, concomitant use of amiloride, eplerenone, and spironolactone, pregnancy, breastfeeding Caution in the following: patients with diabetes, hepatic or renal impairment, and hypercalcemia Rarely effective or used alone in CKD5
Minoxidil Tablet: 2.5 mg, 10 mg \$-\$\$\$	<ul style="list-style-type: none"> <u>Initial</u>: 2.5 mg/day orally once daily, increase dose gradually q 3-7 days <u>Usual dose</u>: 10-40 mg/day in 2 divided doses <u>Max dose</u>: 100 mg/day <u>Renal impairment</u>: CrCl 10-50 ml/min: extend dosing interval to 24 hours CrCl < 10ml/min: not recommended <u>Hepatic Impairment</u>: no specific recommendations available, use with caution and titrate gradually 	<ul style="list-style-type: none"> Black Box Warnings: Appropriate Use: Administer under close supervision usually in combination with therapeutic doses of beta-blocker to prevent tachycardia and increased myocardial workload; must also usually give with loop diuretic to prevent serious fluid accumulation; hospitalize patients with malignant HTN and if concomitant guanethidine for initial treatment, monitor to avoid too rapid or large orthostatic decrease in blood pressure. Serious Cardiac Event Risk: Powerful antihypertensive with serious adverse event risk including pericardial effusion sometimes progressing to tamponade and angina pectoris exacerbation; reserve for HTN patients without adequate response to max therapeutic dose of diuretic and 2 other antihypertensives Usually administered with diuretic and β-blocker to counteract sodium and water retention and reflex tachycardia Powerful antihypertensive with serious adverse event risk including pericardial effusion sometimes progressing to tamponade and angina pectoris exacerbation; reserve for hypertensive patients without adequate response to maximum therapeutic dose of diuretic and 2 other antihypertensives <u>Contraindications</u>: patients with pheochromocytoma, pericardial effusion Avoid use of minoxidil for 1 month after acute MI

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Medication by Class		
MEDICATION	DOSING	COMMENTS
PHOSPHATE BINDERS		
Calcium acetate (PhosLo® - gelcap) Capsule: 667 mg \$\$\$ Solution: 667 mg/5 mL \$\$\$\$\$	<ul style="list-style-type: none"> <u>Initial Dose</u>: 2 capsules (1334 mg) orally with each meal <u>Titration</u>: may increase dose q 2-3 wk to lower serum phosphate concentrations within the desired range as long as hypercalcemia does not develop <u>Max Dose</u>: specific max dosage information is not available; generally the maximum daily dose of elemental calcium should not exceed 2g/day (~12 capsules/day) 	<ul style="list-style-type: none"> <u>Contraindications</u>: hypercalcemia <u>Caution in the following</u>: hypercalciuria, hypophosphatemia, GI obstruction, nephrolithiasis Maintain the serum calcium-phosphate product less than 55 mg²/dL² <u>Hepatic Dosing</u>: no specific recommendations available <u>Renal Dosing</u>: no adjustment
Sevelamer Carbonate (Renvela®) Sevelamer Hydrochloride (Renagel®) Tablet: 800 mg \$\$\$\$\$	<ul style="list-style-type: none"> <u>Initial Dose</u> (Carbonate and Hydrochloride): <ul style="list-style-type: none"> Phosphate 5.6-7.4 mg/dL: 800 mg orally 3 times daily with meals Phosphate ≥7.5 mg/dL: 1600 mg orally 3 times daily with meals <u>Titration</u>: 800 mg/dose q 2wk to target serum phosphate levels <u>Max Dose</u>: 13 g/day sevelamer carbonate; 14 g/day sevelamer hydrochloride 	<ul style="list-style-type: none"> <u>Contraindications</u>: hypophosphatemia, GI obstruction <u>Caution in the following</u>: dysphagia (tablet), GI motility disorder, severe constipation, major GI tract surgery, fecal impaction, ileus, GI perforation <u>Hepatic Dosing</u>: no specific recommendations available <u>Renal Dosing</u>: no adjustment
Lanthanum carbonate (Fosrenol®) CHEWABLE: 500 mg, 1000 mg \$\$\$\$\$	<ul style="list-style-type: none"> <u>Initial Dose</u>: 500 mg orally 3 times daily with or immediately after meals <u>Titration</u>: 750 mg/day q 2-3 wk to target serum phosphate levels <u>Max Dose</u>: 4500 mg/day Chew or crush tablets completely before swallowing. Do not swallow intact tablets 	<ul style="list-style-type: none"> <u>Contraindications</u>: GI obstruction, ileus, fecal impaction <u>Caution in the following</u>: diverticular disease, peritonitis, GI ulcer, GI motility disorder, inflammatory bowel disease, hepatic impairment <u>Hepatic Dosing</u>: no specific recommendations available <u>Renal Dosing</u>: no specific recommendations available
Aluminum hydroxide SUSP: 320 mg per 5 mL \$	<ul style="list-style-type: none"> <u>Initial Dose</u>: 300-600 mg orally 3 times daily with meals Note: Other agents preferred. Use should be reserved for serum phosphorus levels > 7 g/dL and limited to short-term use (4 weeks) given the toxicities associated with long-term use <u>Titration</u>: per nephrology. Monitor serum phosphate and titrate dose accordingly <u>Max Dose</u>: not established 	<ul style="list-style-type: none"> <u>Contraindications</u>: GI obstruction, hypophosphatemia <u>Caution in the following</u>: patients predisposed to constipation or complications associated with constipation, elderly Do not use in conjunction with a citrate salt <u>Hepatic Dosing</u>: no adjustment provided in manufacturer labeling <u>Renal Dosing</u>: aluminum may accumulate in renal impairment and cause toxicity
Ferric Citrate (Auryxia®) Tablet: 1 g \$\$\$\$\$	<p>Usual adult dose for hyperphosphatemia of renal failure</p> <ul style="list-style-type: none"> <u>Initial Dose</u>: 2 tablets (2 grams ferric citrate) orally 3 times a day with meals <u>Titration</u>: adjust dose in increments of 1-2 tablets per day at intervals of one week or longer as needed to maintain target serum phosphorous levels <u>Average dose</u>: 8-9 tablets per day <u>Max Dose</u>: 12 tablets per day <p>Comments: monitor serum phosphorous and titrate dose accordingly Usual adult dose for anemia associated with chronic renal failure: see comments Usual Adult dose for iron deficiency anemia: see comments</p>	<ul style="list-style-type: none"> <u>Contraindications</u>: iron overload syndromes, hemochromatosis <u>Caution in the following</u>: pregnancy <p>Usual adult dose for anemia associated with chronic renal failure</p> <ul style="list-style-type: none"> <u>Initial Dose</u>: 1 tablet (1 gram ferric citrate) orally 3 times a day with meals <u>Titration</u>: Adjust dose as needed to maintain target hemoglobin levels <u>Average dose</u>: 5 tablets per day <u>Max Dose</u>: 12 tablets per day <p>Usual Adult dose for iron deficiency anemia</p> <ul style="list-style-type: none"> <u>Initial Dose</u>: 1 tablet (1 gram ferric citrate) orally 3 times a day with meals <u>Titration</u>: Adjust dose as needed to maintain target hemoglobin levels <u>Average dose</u>: 5 tablets per day <u>Max Dose</u>: 12 tablets per day

Bold = Formulary *See prescribing information for complete description of contraindications/precautions, adverse effects and drug interactions.

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Medication by Class		
MEDICATION	DOSING	COMMENTS
ANEMIA		
Ferrous sulfate Tablet: 325 mg (elemental iron: 65 mg) \$	<ul style="list-style-type: none"> <u>Initial Dose</u>: 325-1000 mg/day ferrous sulfate (65-200 mg/day elemental iron) orally in divided doses (1-3 times daily) <u>Titration</u>: goals: Hgb > 10 and < 12, Ferritin ≥ 100, < 500 ng/mL TSAT > 25%, < 30% Smaller daily doses may be better tolerated. 	<ul style="list-style-type: none"> <u>Contraindications</u>: hemochromatosis, anemia-hemolytic, hemosiderosis, ulcerative colitis If goals are not met with oral iron after 1 - 3 months, consider IV iron supplementation. The best way to administer oral iron is an area of active study, with increasing evidence suggesting that alternate-day dosing (taking the iron every other day rather than every day) may result in better iron absorption than daily dosing. Avoid concurrent administration with medications that lower gastric acidity, or, administer along with ascorbic acid 500 mg.
Iron sucrose (Venofer®) 20 mg/mL Requires IV access \$\$\$\$\$	Non-dialysis dependent-chronic kidney disease <ul style="list-style-type: none"> <u>Dose</u>: 200 mg elemental iron Usual total treatment course is 1000 mg of elemental iron Administer on alternate days for 5 doses Slow IV push over 2-5 minutes or diluted in up to 100 mL of 0.9% Sodium Chloride Injection infused over 15 minutes 	<ul style="list-style-type: none"> Test dose generally not required Adverse effects (nausea, vomiting, hypotension, abdominal pain) are rare and can usually be managed by slowing infusion rate For CKD 5D (on dialysis) patients, iron therapy is managed by the dialysis provider
Epoetin Alpha (Epogen®, Procrit®) INJ: 2000 units/mL, 3000 units/mL, 4000 units/mL, 10,000 units/mL, 20,000 units/mL, 40,000 units/mL \$\$\$\$\$	CKD 5 Not on Dialysis <ul style="list-style-type: none"> <u>Initial Dose</u>: individualize dose SC/IV 3x/wk; Start: 50-100 units/kg SC 3x/wk or 10,000 units weekly or 20,000 units every other week. Use lowest dose necessary to maintain Hgb level sufficient to reduce RBC transfusion need. <u>Titration</u>: managed by nephrology. Increase dose 25% if Hgb response < 1 g/dL/4wk, may increase dose no more frequently than q4wk; do not increase dose further if inadequate response by 12wk; decrease dose 25% if Hgb response > 1 g/dL/2wk; decrease dose or interrupt treatment if Hgb > 10 g/dL CKD 5 On Dialysis <ul style="list-style-type: none"> Anemia management protocol per dialysis provider 	<ul style="list-style-type: none"> <u>Black Box Warning: increased Mortality and Serious Cardiovascular Events in CKD Pts</u>: Increased risk of death and serious cardiovascular events when administered to target Hgb > 11 g/dL; no trial has identified a Hgb target level, ESA dose, or dosing strategy that does not increase these risks; use lowest dose sufficient to decrease need for RBC transfusion. <u>Contraindications</u>: uncontrolled HTN, ESA-assoc. pure red cell aplasia. <u>Caution in the following</u>: if CVD, stroke, CABG surgery, orthopedic surgery, seizure disorder, breast CA, non-small cell lung CA, head and neck CA, lymphoid CA, cervical CA, pregnancy.

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Medication by Class		
MEDICATION	DOSING	COMMENTS
NUTRITIONAL SUPPLEMENTS		
Nephro-Vite® oral (Vitamin B complex and C Supplement) \$	<ul style="list-style-type: none"> <u>Initial Dose</u>: one tablet orally daily Hemodialysis, take AFTER treatment on dialysis days <u>Titration</u>: n/a <u>Max Dose</u>: one tablet per day 	<ul style="list-style-type: none"> <u>Contraindications</u>: undiagnosed anemia (folic acid corrects the hematologic manifestations of pernicious anemia, while the neurologic complications progress), significant or unexplained hepatic disease, active peptic ulcer disease (PUD). Folic acid alone is improper therapy for the treatment of pernicious anemia and other megaloblastic anemias where B-12 is deficient
Folic acid Tablet: 1 mg \$	<ul style="list-style-type: none"> <u>Initial Dose</u>: 1 mg orally once daily <u>Titration</u>: none <u>Max Dose</u>: 1 mg orally daily. For patients with deficiency states or disease (e.g., megaloblastic anemia), intakes have been > 5 mg/day orally, and up to 15 mg/day orally in some cases. 	<ul style="list-style-type: none"> <u>Contraindications</u>: undiagnosed anemia (folic acid corrects the hematologic manifestations of pernicious anemia, while the neurologic complications progress) Folic acid alone is improper therapy for the treatment of pernicious anemia and other megaloblastic anemias where B 12 is deficient
Cholecalciferol (vitamin D3) Tablet: 400 units, 1000 units, 2000 units Ergocalciferol (Vitamin D2) Capsule: 1.25 mg (50,000 units) \$	<ul style="list-style-type: none"> <u>Initial Dose</u>: 50,000 units orally once weekly or 6000 units orally once daily for at least 8 weeks <u>Titration</u>: increase dose 2-fold to 3-fold if obese, malabsorption syndrome, drug-induced vitamin D deficiency <u>Max Dose</u>: not defined 	<ul style="list-style-type: none"> <u>Contraindications</u>: hypercalcemia, hypervitaminosis D <u>Caution</u>: in patients with fat malabsorption, hyperphosphatemia, renal stones, renal impairment, liver disease, CVD, renal osteodystrophy, leukemia, lymphoma, or sarcoidosis
SECONDARY HYPERPARATHYROIDISM		
Calcitriol (Rocaltrol®) Capsule: 0.25 mcg, 0.5 mcg \$	<p>CKD 3-5 Not on Dialysis</p> <ul style="list-style-type: none"> <u>Initial Dose</u>: 0.25 mcg orally once daily <u>Usual Dose</u>: 0.25-1.0 mcg orally once daily <u>Titration</u>: 0.25 mcg/day, adjusted monthly <u>Max Dose</u>: not defined Only if recommended by the consulting nephrologist, who will guide starting dose and dose adjustments. <p>CKD 5 on dialysis</p> <ul style="list-style-type: none"> Dose adjustments by dialysis nephrologist 	<p>CKD 3-5 Not on Dialysis</p> <p>KDIGO guidelines (2017) do not recommend routine use of vitamin D analogs in patients not on dialysis; it may be reasonable to reserve use for patients with CKD 4 or 5 and with severe and progressive hyperparathyroidism. Caution is advised to avoid hypercalcemia or elevated phosphate levels. Treatment should not be based on a single elevated value and should be managed by the dialysis unit nephrologists.</p>
Paricalcitol (Zemlar®) INJ: 2 mcg/ml, 5 mcg/ml \$\$-\$\$\$\$	<ul style="list-style-type: none"> Reserved for use in the dialysis facility 	<ul style="list-style-type: none"> Dose adjustments by dialysis nephrologist

Bold = Formulary *See prescribing information for complete description of contraindications/precautions, adverse effects and drug interactions. The cost scale \$-\$\$\$\$\$ represents the relative cost of acquisition of medication only. Frequency and complexity of medication administration (institution workload, effect on adherence) should be considered when determining overall cost-effectiveness of treatment.

Medication by Class, Cont'd		
MEDICATION	DOSING	COMMENTS
SECONDARY HYPERPARATHYROIDISM, Cont'd		
Doxercalciferol (Hectorol) Capsule: 0.5 mcg 1 mcg 2.5 mcg \$\$\$\$\$	Predialysis - Stage 3 or 4 CKD (CrCl 15 to 59 mL/min) <ul style="list-style-type: none"> <u>Initial Dose</u>: 1 mcg orally once daily <u>Titration</u>: 0.5 mcg/day q2 weeks to reach target iPTH concentrations. Prior to increasing the dose, ensure that calcium is within normal limits. <u>Max Dose</u>: 3.5 mcg/day Only if recommended by the consulting nephrologist, who will guide starting dose and dose adjustments. 	CKD 3-5 Not on Dialysis KDIGO guidelines (2017) do not recommend routine use of vitamin D analogs in patients not on dialysis; it may be reasonable to reserve use for patients with CKD 4 or 5 and with severe and progressive hyperparathyroidism. Caution is advised to avoid hypercalcemia or elevated phosphate levels. Treatment should not be based on a single elevated value and should be managed by the dialysis unit nephrologists.
Cinacalcet (Sensipar®) Tablet: 30 mg, 60 mg, 90 mg \$-\$\$\$	<ul style="list-style-type: none"> <u>Initial Dose</u>: 30 mg orally once daily <u>Titration</u>: titrate as necessary, 30 mg q4 wks, based on intact parathyroid levels and corrected total serum calcium (60, 90, 120, and 180 mg/day) <u>Max Dose</u>: 180 mg/day Initiation and dose adjustments only as recommended by the consulting nephrologist.	<ul style="list-style-type: none"> <u>Contraindications</u>: hypocalcemia Not recommended for PTH suppression among non-dialysis CKD patients because of the risk of hypocalcemia and increased urinary calcium excretion. KDIGO 2017 guidelines do not provide guidance for the use of cinacalcet. <u>Caution in the following</u>: hepatic impairment (Child-Pugh classes B and C), seizure disorder, long QT syndrome, history of QT interval prolongation, family history of long QT syndrome or sudden cardiac death, conditions that predispose to QT interval prolongation, pregnancy, breast-feeding, esophagitis, heart failure, peptic ulcer disease, severe vomiting.
HYPERURICEMIA		
Allopurinol (Zyloprim®) TAB: 100 mg, 300 mg \$-\$\$	<ul style="list-style-type: none"> <u>Initial Dose</u>: 100 orally once daily <u>Titration</u>: Increase by 100 mg/day at weekly intervals until serum uric acid level decreases to 6 mg/dL or less <u>Maximum Dose</u>: 800 mg/day <u>Renal Dosing</u>: CrCl 10-20 mL/min: 200 mg qd; CrCl 3-9 mL/min: 100 mg qd 	<ul style="list-style-type: none"> <u>Caution in the following</u>: renal and hepatic impairment. Avoid initiating during an active gout flare.
Febuxostat (Uloric®) TAB: 40 mg 80 mg \$\$-\$\$\$	<ul style="list-style-type: none"> <u>Initial Dose</u>: 40 mg orally once daily <u>Titration</u>: increase to 80 mg orally once daily in patients who do not achieve a serum uric acid < 6 mg/dL after 2 weeks. <u>Maximum Dose</u>: 120 mg daily <u>Renal Dosing</u>: GFR ≥ 30 mL/min-no dose adjustment; < 30-15 mL/min 40 mg maximum dose; < 15 mL/min on dialysis-not studied. 	<ul style="list-style-type: none"> May be initiated during a gout flare with concomitant pharmacologic prophylaxis with a NSAID or a glucocorticoid for the first 3-6 months. Recommended for patients who have had an inadequate response to allopurinol, who are intolerant to allopurinol or in whom allopurinol is not advisable.

Bold = Formulary *See prescribing information for complete description of contraindications/precautions, adverse effects and drug interactions. The cost scale \$-\$\$\$\$ represents the relative cost of acquisition of medication only. Frequency and complexity of medication administration (institution workload, effect on adherence) should be considered when determining overall cost-effectiveness of treatment.

Medication by Class, Cont'd		
MEDICATION	DOSING	COMMENTS
HYPERKALEMIA		
Sodium polystyrene sulfonate (SPS [®] , Kionex [®]) Oral Suspension: 15 gm/60 ml \$-\$\$	<ul style="list-style-type: none"> • <u>Initial Dose</u>: 15 g orally once daily • <u>Usual Dose</u>: Oral Suspension: 15 g orally 1-4 times per day. Rectal Suspension: 30-50 g rectally q6 hours • <u>Titration</u>: To target serum potassium levels (< 5.5 mEq/L) • <u>Maximum Dose</u>: Not defined 	<ul style="list-style-type: none"> • <u>Contraindications</u>: Hypokalemia, GI obstruction, reduced GI motility, constipation, fecal impaction risk • <u>Caution in the following</u>: GI disease or history of surgery, marked edema, severe CHF, severe HTN, hyponatremia, sodium restriction. • Concomitant administration of sorbitol and sodium polystyrene sulfonate is not recommended due to risk for colonic necrosis. However, the manufacturer of sodium polystyrene sulfonate recommends that the resin is sometimes administered as an enema mixed with an aqueous vehicle such as sorbitol. Such usage requires subsequent administration of a non-sodium containing cleansing enema. • <u>Should NOT be used for the chronic treatment of hyperkalemia.</u>
Patiomer (Veltassa [®]) powder for oral suspension: 8.4 gm, 16.8 gm, 25.2 gm \$\$\$\$	<ul style="list-style-type: none"> • <u>Initial Dose</u>: 8.4 g orally once daily • <u>Usual Dose</u>: Initial: 8.4-16.8 g orally once daily • <u>Titration</u>: Adjust in increments of 8.4 g at 1-week or longer intervals to goal serum potassium levels. • <u>Maximum Dose</u>: 25.2 g/day 	<ul style="list-style-type: none"> • <u>Contraindications</u>: GI obstruction, severe constipation, fecal impaction, GI motility disorder • <u>Caution</u>: Hypomagnesemia may occur; monitoring recommended and magnesium supplementation may be required. GI motility may become worse and result in decreased efficacy. • Administer 3 hours before or after other medications to avoid interference with drug absorption.
Sodium zirconium cyclosilicate (Lokelma [®]) powder for oral suspension: 5 g per pkt, 10 g per pkt \$\$\$\$	<ul style="list-style-type: none"> • <u>Initial Dose</u>: 10 g orally 3 times daily for up to 48 hours, initially, then 10 g orally once daily • <u>Titration</u>: 5 g/day no more frequently than qwk to target serum potassium levels (< 5.5 mEq/L) • <u>Maximum Dose</u>: 30 g/day • <u>Dialysis Dosing</u>: 5-15 grams orally daily on non-dialysis days 	<ul style="list-style-type: none"> • <u>Contraindications</u>: Severe constipation, GI obstruction, fecal impaction, reduced GI motility, post-op • <u>Caution in the following</u>: Renal disease, heart failure, sodium restriction, fluid overload risk

Bold = Formulary *See prescribing information for complete description of contraindications/precautions, adverse effects and drug interactions. The cost scale \$-\$\$\$\$ represents the relative cost of acquisition of medication only. Frequency and complexity of medication administration (institution workload, effect on adherence) should be considered when determining overall cost-effectiveness of treatment.

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ATTACHMENT A: IMMUNIZATIONS IN ESRD TABLE^{12, 34}

Vaccine	Dosage	Notes
Influenza*	1 dose/year	<ul style="list-style-type: none"> • Use inactivated (TIV) annually. • Influenza Live (LAIV) is CONTRAINDICATED. • Note: Oseltamivir antiviral needs renal adjustment for creatinine clearance of 10-30mL/min to 75 mg qD for treatment and 75 mg qOD for prophylaxis.
SARS-CoV-2 (COVID-19)	<p>Per the latest Advisory Committee on Immunization Practices (ACIP) recommendations and CDC Interim Clinical Considerations</p>	Please check current CDC recommendations .
HBV	3 doses	<ul style="list-style-type: none"> • In EHRS: Use Heplisav-B® (more potent) for ESRD patients. • CDC states: Testing should be performed 1 - 2 months after administration of the last dose of the vaccine series for anti-HBs > 10 mIU/mL. If < 10, re-vaccinate with Heplisav® brand. If still not > 10, test for HBV Sag. • Test annually for HBV Sab.
Pneumococcal Pneumonia	New recommendations. See CDC latest recommendations and next page.	
ESRD same as general population: <ul style="list-style-type: none"> • Tetanus/diphtheria/pertussis (Tdap) • Zoster/shingles¶ CDC: RZV [preferred] • Varicella (VCA)¶ • Measles/mumps/rubella (MMR)¶ • Haemophilus influenzae type b (Hib) • Meningococcal (meningitis) 		Rare Vaccines: <ul style="list-style-type: none"> • Typhoid • Rotavirus • Smallpox • Yellow Fever Anthrax • Japanese Encephalitis

NOTE: Compared with immunocompetent adults, HD patients are less likely to have protective levels of antibody after vaccination with standard vaccine dosages.

* Nasal influenza (LAIV), is contraindicated in patients with CKD and severe immunodeficiency including treatment with immunosuppressive agents¹⁵

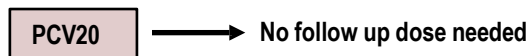
¶ Live, attenuated viral vaccines. Live vaccines are contraindicated in immunocompromised patients due to risk of vaccine-induced infections. Even though the limited number of studies in CKD patients has not shown any adverse reactions, these vaccines should be avoided, with the exception of varicella and MMR vaccines. <https://pmc.ncbi.nlm.nih.gov/articles/PMC4928524/>

ATTACHMENT A: IMMUNIZATIONS IN ESRD TABLE (Continued)**Pneumococcal
Pneumonia****Age ≥19** (Ages 19-64 and >65 years now have the same guidelines)**For those who have not previously received any pneumococcal vaccine, CDC recommends:**

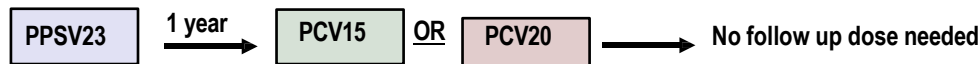
- Give 1 dose of PCV15 or PCV20.
 - ▶ If PCV15 is used, this should be followed by a dose of PPSV23 at least 8 weeks later. ESRD is considered an immunocompromising condition and as such, the minimum interval is 8 weeks instead of the 1-year minimum interval for non-immunocompromised adults.



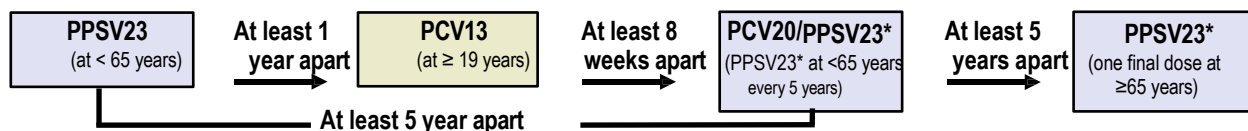
- ▶ If PCV20 is used, a dose of PPSV23 is NOT indicated.

**For those who have only received PPSV23, CDC recommends:**

- Give 1 dose of PCV15 or PCV20 administered at least one year after the most recent PPSV23 vaccination.
- Regardless of if PCV15 or PCV20 is given, an additional dose of PPSV23 is not recommended since they already received it.

**For those who have received PCV13 with or without PPSV23, CDC recommends:**

- Give dose of PPSV23 at least 8 weeks after PCV13 and at least 5 years after the previous dose of PPSV23 (Note: A second dose is not indicated for those with cerebrospinal fluid leaks or cochlear implants).
- Administer 1 final dose of PPSV23 at 65 years or older. This dose should be given at least 5 years after the most recent dose of PPSV23.



*For adults who have received PCV13 but have not completed their recommended pneumococcal vaccine series with PPSV23, one dose of PCV20 may be used if PPSV23 is not available. If PCV20 is used, their pneumococcal vaccinations are complete.

ATTACHMENT B: VASCULAR ACCESS AND POTENTIAL COMPLICATIONS

Patients with ESRD requiring dialysis with vascular access through central venous catheter (CVC) are at increased risk of infection, death from infection, hospitalizations, and mortality.

Avoid if at all possible. Consider AVG first. CVC may be the only choice, when urgent or emergent HD is required either at the time of initiation of RRT or when a permanent access is not useable. These devices are universally available, can be inserted into different sites of the body, and maturation time is not required, allowing immediate HD.

CVCs and Potential Complications

NON-TUNNELED DIALYSIS CATHETER:

- Goes directly into the venous system
 - Typically non-cuffed, non-tunneled catheters used for immediate vascular access such as:
 - Acute renal failure in bed-bound patients.
 - Short-term use in patients with malfunction of permanent access.
 - Lacks a subcutaneous cuff and should be restricted to the first 1 or 2 weeks of HD. Beyond 1 week, the infection rate increases exponentially.
- NOTE: Guidelines recommend that temporary catheters should remain in place no longer than 5 days at the femoral vein.**
- Insertion of a cuffed, tunneled catheter is recommended as soon as it is known that prolonged RTT (more than 2 weeks of HD) is needed.

TUNNELED DIALYSIS CATHETER:

- Surgically inserted into a vein and passed under the skin. Only the end of the catheter is brought through the skin.
 - Passing it under the skin allows it to stay in place better allowing the patient to move about more freely.
- Chronic (tunneled) catheters:**
- Has a subcutaneous cuff which is placed in the subcutaneous tissue near the insertion site of a tunneled catheter which allows for fibrous sealing of its skin entry; this provides a barrier against infection by preventing migration of bacteria down the outer surface of the catheter.
 - Can potentially be used for months to years.

CVC Localized Infections

- Affects the CVC insertion site or may spread subcutaneously.
- Exit-site infection has the highest incidence in hemodialyzed patients, especially in short-term CVC patients.

NON-TUNNELED DIALYSIS CATHETER:

- Erythema, tenderness, induration, or exudate within 2 cm from the exit site.
- Non-tunneled CVC patient having fever and mild-to-moderate diseases (no hypotension or organ failure), it is not strictly necessary to remove the CVC. It is essential to **carry out blood cultures both from CVC and peripheral vein** and to consider an antibiotic therapy that will be necessary in case of positive blood cultures.

TUNNELED DIALYSIS CATHETER:

- Erythema, tenderness, induration, or exudate are present at more than 2 cm distance from the exit site or along the subcutaneous route of the tunneled CVC.

Infectious disease or Nephrology consult for therapy strongly recommended.

Empiric coverage-not excreted by kidneys, long half-life for once daily dosing after HD and wide spectrum and active against Gram-positive (especially Staphylococci) and Gram-negative bacilli. In susceptible patients, consider anti-fungal coverage.

Catheter-Related Bloodstream Infections (CRBSI)*

*Sepsis, suppurative thrombophlebitis, metastatic infections such as lung or brain abscesses, osteomyelitis, and endocarditis.

The chance that a patient with CVC may have developed a CRBSI must be taken into account whenever there is fever, rigors, or hypotension and if no other possible causes of infection.

NON-TUNNELED DIALYSIS CATHETER:

Seriously ill patients (hypotension, hypo-perfusion, or signs and symptoms of organ failure) with a non-tunneled CVC, **need blood cultures from the CVC and peripheral vein**. The CVC must be removed and inserted in a new site or exchanged over a guidewire; antibiotic therapy must be initiated promptly. The tip of the removed CVC must be sent for culture, and in the case of a positive result, the new CVC should be replaced again.

TUNNELED DIALYSIS CATHETER (TDC):

Almost always demand CVC removal and systemic antibiotic treatment. Ensure usable new site before removing infected catheter.

OR

Remove and substitute the CVC. Catheters should be exchanged as soon as possible and within 72 hours of initiating antibiotic therapy in most instances, and such exchange does not require a negative blood culture result.

The **guidelines of Infectious Disease Society of America**, of the National Institute for Health and Clinical Excellence, and the position statement of European Renal Best Practice provide detailed advice about CRBSI prophylaxis and management.

ATTACHMENT B: VASCULAR ACCESS AND POTENTIAL COMPLICATIONS (CONTINUED)**CVC Access Care****PRESERVING VASCULAR ACCESS SITES AFTER ACCESS SURGERY**

Peripheral and central veins are the lifeline for the ESRD patient's future. Recommendations to preserve access:

1. Venipunctures should be minimized and whenever possible confined to the dorsum of the hand.
2. Placement of central catheters, especially PICC lines, should be avoided, due to the risk of central venous stenosis.
3. After a patient is established on dialysis, all blood sampling should be obtained at the dialysis facility through the existing vascular access, thereby avoiding unnecessary venipunctures and potentially affecting future access sites.

WHAT PCPs SHOULD MONITOR/ACCESS EXAM:

1. Check thrill-should feel like purr or vibration, the pulse soft and easy to compress.
2. Auscultate Access-whoosh of the bruit should be continuous, rumbling and low pitch (can hear high pitch at the site of stenosis).

WHAT TO TEACH YOUR PATIENTS ABOUT PROTECTING ACCESS:^{5,36} fistulas and grafts (see patient handout page PE-6):

- Check for vibration (thrill) routinely, and alert dialysis unit or care team immediately if thrill is not present or changed.
- If there is any new redness, pain or swelling of the arm alert dialysis unit or care team immediately.
- No venipuncture for blood draws on access arm.
- No BP on access arm.
- No IV access on access arm.
- No straps on access when carrying heavy totes.
- Avoid tight clothing and jewelry (wrist watches, snug bracelets).
- Do not sleep on the access arm.
- Teach patients to monitor phlebotomists and HD technicians for rotating sites of needle insertion to prevent pseudoaneurysms and to speak up.
- Apply only gentle pressure to the access site after the needle is removed to avoid clotting the blood.
- If bleeding does not stop with gentle pressure within 30 minutes, seek help.
- Bathing and other activities as normally tolerated.

AV Fistula Potential Complications

- **Acute ischemic monomelic neuropathy (IMN)-rare. Immediately send to HLOC for ligation.** Distinguish from vascular steal.
- **Edema** beyond 2 weeks placement post-op (can take up to 6 weeks to resolve) - frequently due to central vein stenosis.
- **Bleeding**
- **Hematomas** - perivascular collection external to the 3 vessel layers.
- **Infection** - 20% of all access loss. Includes infection risk of unused graft with clot.
- **High Output Heart Failure**-elevated cardiac output due to perceived lower peripheral blood flow.
- **Pseudoaneurysms**-leakage of blood between two arterial wall layers as opposed to "true" which involves all 3 layers and is a localized dilation. Refer pseudoaneurysms to a surgeon when:
 - Symptomatic
 - > 2 times wider than the graft
 - ≥ 4 cm in diameter
 - Threatens the viability of the overlying skin, regardless of diameter, skin under duress
 - Evidence of infection
 - Expanding
 - Large or multiple pseudoaneurysms that limit the number of cannulation sites
- **Carpal Tunnel Syndrome and other Mononeuropathies** - amyloid deposits, compression, or ischemic due to vascular steal (lack of flow to proximal limb artery), risk increases with age of access.
- **Distal extremity steal syndromes** - high flow/low resistance and increased pressures in venous system. Refer to vascular surgery.
- **Thrombosis:**¹
 - 90% have stenotic lesion due to intimal hyperplasia
 - There is no routine preventative anticoagulation
 - Many of the SAME COMPLICATIONS AS AVF
- Functional survival of AVG is much shorter than with AVF

AV Graft Potential Complications

- The natural course of AVG is **THROMBOSIS** due to venous stenosis caused by neointimal hyperplasia, and also hypotension, and excessive compression causing hemostasis.
- **AVG INFECTIONS** are serious complications and are the second leading cause of dialysis access loss. The incidence of HD-related bacteremia is more than 10x higher in AVGs than AVFs.
- **AVG ISCHEMIA** as a result of access placement is more common with AVGs than AVFs. Vascular steal syndrome and IMN (ischemic axonal-loss mononeuropathy due to lack of flow in major proximal limb artery) are two important clinical entities to be distinguished.

ATTACHMENT C: DIALYSIS ADEQUACY

There are numerous measurements of dialysis adequacy and other monitoring (PTH, hemoglobin/hematocrit) that are obtained during dialysis. This information should be scanned into the EHRS for PCP team review.

What is Kt/V Urea: Adequacy of Dialysis

EHRS: HD details including URR, BUN, Kt/V, albumin, H/H for each HD session are all scanned and usually located in: "Notes"/"Miscellaneous Patient Care"/"Dialysis" - "Outside Records") or "Notes"/"Procedures/Interventions"/"MAR-SCAN").

Kt/V is a dimensionless ratio used to quantify dialysis dose and dialytic removal of urea (a surrogate for uremic toxins).

- K is a constant (usually fixed to a particular dialyzer),
- t is time (usually 3.5 – 5 hours 3x/week),
- V is the volume of distribution in Liters (total body water = 60% of total weight) + any kg edema fluid).

So the ratio – **K** multiplied by **t** divided by **V**, or **Kt/V** – compares the amount of water that passes through the dialyzer and is cleared of urea to the amount of water in the patient's body.

Minimally acceptable adequacy value

A Kt/V=1 means that the total volume of blood cleared of urea during a dialysis session is equal to the total body water of the patient. **A minimum acceptable Kt/V is 1.2, but 1.4 is more desirable.**

Note: retrospective studies suggest that a Kt/V < 1.0 is associated with poor outcomes and that a Kt/V ≥ 1.2 is associated with better survival. Patients may retain other toxic solutes that ultimately are equally or more important than urea in influencing prognosis on dialysis. Achieving higher values are fraught with undesirable necessities such as longer dialysis times or more frequent dialysis. The HEMO study showed that targeting a spKt/V higher than 1.4 did not improve survival or reduce hospitalization rates over 2.8 years. *However, the **HEMO study** also showed that the optimum Kt/V may be higher than 1.2 in women and smaller patients < 20kg/m² (significant survival benefit).*

When Kt/V Drops

Check for post dialysis BUN measurement, commonly in error.

- 40% of the cases occur due to decreased dialysis time (patient left early or dialysis session too short) or inadequate dialyzer blood flow (Qb).
- 25% of cases are due to significant access recirculation (See page 18).

At the end of the dialysis session, the concentration of BUN is lower in the blood and extracellular fluid than in cells. This is due to sequestration of urea in the tissues. Following dialysis, urea diffuses out of the tissues back into the blood. The difference between the two BUNs is the "rebound." The spKt/V (sp=single pool) calculated using the end of dialysis BUN will be higher than the eKt/V (e=equilibrated), which is calculated from the BUN after post-dialysis equilibration. It is the eKt/V that more accurately reflects the effective dose of dialysis. The BUN at the end of dialysis can be used to calculate the equilibrated BUN value using validated equations or by keeping the patient for 30-60 min to take another blood sample. This measurement is generally done monthly, but it is not the only way to judge the efficacy of dialysis.

Kt/V *overestimates* dialysis adequacy in thin, malnourished patients due to sarcopenia and a low "V". Kt corrected for body surface area may be more accurate in these patients.

ATTACHMENT D: ESRD COMPLICATIONS – HYPERKALEMIA MANAGEMENT

Hyperkalemia Management—an acute complication of ESRD, but is not an acute complication of dialysis itself.

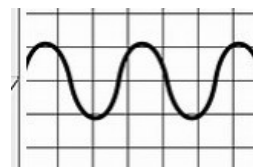
From: Mount, [Treatment and prevention of hyperkalemia in adults](#), last updated 02/05/2024.

K > 6: Send to HLOC. See Acute Therapies to lower potassium next page.

- Signs of hyperkalemia: confusion, muscle cramps, weakness or paralysis, cardiac conduction abnormalities or arrhythmias – One or more of these clinical manifestations is considered a hyperkalemic emergency (IV Calcium, Insulin and Glucose and/or dialysis).
- Cardiac arrest can occur with no specific warning signs
- The most serious manifestations of hyperkalemia are muscle weakness or paralysis, cardiac conduction abnormalities, and cardiac arrhythmias, including sinus bradycardia, sinus arrest, slow idioventricular rhythms, ventricular tachycardia, ventricular fibrillation, and asystole. These manifestations usually occur when the serum potassium concentration is ≥ 7 mEq/L with chronic hyperkalemia, or possibly at lower levels in patients with an acute rise in serum potassium and/or underlying cardiac conduction disease.
- ECG changes: Wide array of possible ECG changes. As hyperkalemia increases, so does ECG abnormalities, But ECG is not sensitive for diagnosis.
- A tall peaked T wave with a shortened QT interval is the earliest change (waveform 1), followed by progressive lengthening of the PR interval and QRS duration (waveform 2). The P wave may disappear, and ultimately, the QRS widens further to a sine wave (see waveforms depicted below).
- Can cause Brugada Syndrome: pseudo-Right Bundle Branch Block (BBB), “coved” or “saddleback” ST elevation-at least 2 precordial leads (“**Brugada Syndrome**”).
- Right BBB, LBBB, bifascicular block, advanced AV block, sinus brady, sinus arrest, slow idioventricular rhythms, VTach Vfib, Asystole.



Waveform 1 (peaked T waves)



Waveform 2 (sine wave)

K = 5.5-5.9:

- Acute treatment – sodium polystyrene sulfonate (Kayexalate) 15 g PO QID or 30 g PR BID (Note: not for chronic use).
- Patiromer or sodium zirconium cyclosilicate for chronic use. Other medications should be taken 2 hours before or 3 hours after resin in order to avoid interference with absorption.
- Correct acidosis, usually with sodium bicarbonate.
- Reverse hypovolemia.
- Recheck K+ six hours after dose.
- Discontinue all nephrotoxic medications including ACE/ARB, spironolactone, NSAIDs, lithium, calcium channel blockers, heparin, propranolol, labetalol, and carvedilol (but not atenolol), cyclosporine and tacrolimus also can raise potassium (contact prescriber for advisement on dose lowering vs. discontinuation).
- Note: Non-selective beta blockers cause post-prandial rise in K+, but not persistent hyperkalemia.
- Consider causes, assess for potential dietary indiscretions; RD consultation.
- Prevent further rise and recurrence.
- Consider diuretics if appropriate.

ATTACHMENT E: RENAL TRANSPLANT FLOW CHART AS OF JANUARY 10, 2022 (PAGE 1)

PHASE I: A master dialysis list is generated and updated at Headquarters (HQ). From the master dialysis list, the Headquarters Renal Transplant Team (HQ RTT) initiates the referral for renal transplant. Primary care providers (PCPs) or institution leadership may also request a transplant evaluation by contacting the HQ RTT. CPHCSTransplantProgramCoordinator@cdcr.ca.gov

Referral from PCP or HQ RTT from master dialysis list

RTT Provider

Completes medical review and CDCR 7553-1 Pre-Evaluation Checklist

No Contraindication/Patient Proceeds -**RTT Provider**

1. Reviews 7553-7 Kidney Transplant Evaluation Patient Agreement with patient and both sign
2. Completes the following CDCR forms:
 - 7553-4 Pre-Transplant Medical History
 - 7553-5 Evaluation-Physical Exam
 - 7553-6 Physician's Order Pre-Diagnostic Testing
3. Reviews
 - One years of labs
 - Dental records (from last 6 months. Consult to Dental if > 1 year or work needed at last appointment.
4. Refers patient to Mental Health/Social Worker to complete the 7553-2 Pre-Transplant Psychosocial Assessment, and to Dental to complete the 7553-8 Dental Evaluation

Contraindication/Patient Refusal – RTT Provider

1. Meets with patient after discussion with nephrology consultant.
2. Creates letter in Electronic Health Record System (EHRS) Message Center to distribute to patient.
3. Submits form to support and Health Information Management (HIM) to scan.
 - For contraindication - CDCR 7553-1 Pre-Evaluation Checklist
 - For patient refusal - CDCR 7225 Refusal of Exam

Mental Health (MH)/Social Worker

If the Social Worker or MH provider has concerns, they will communicate a recommended course of action via the form 7553-2 or a clinical note in the patient's chart. The RTT Provider may pause the evaluation process while the patient's issues.

RTT Support

1. Completes the following:
 - CDCR 7553-3 Patient Evaluation Referral Request (Provider signs)
 - LOA
 - eRFS (Provider signs)
2. Submits package to RTT Provider

***Transplant Package Includes**

- CDCR 7553-1 Pre-Evaluation Checklist
- CDCR 7553-2 Pre-Transplant Psychosocial Assessment
- CDCR 7553-3 Patient Evaluation Referral Request
- CDCR 7553-4 Pre-Evaluation Medical History
- CDCR 7553-5 Evaluation - Physical Exam
- CDCR 7553-6 Evaluation Pre-Diagnostic Testing
- CDCR 7553-7 Kidney Transplant Evaluation Patient Agreement
- CDCR 7553-8 Dental Evaluation
- Electronic Request for Services (eRFS)
- Letter Of Agreement (LOA)
- Immunization history
- Primary Care Physician recent progress note
- Pertinent Specialty Consultant note
- Dental Evaluation note
- All diagnostic reports
- CD image recording of Radiological exams
- All lab result reports

PHASE II CCHCS partners with an outside tertiary care medical center transplant team who makes the final decision of approving a patient to be placed on the national United Network of Organ Sharing (UNOS) list to possibly receive a kidney. They also perform the surgery if a patient is approved, and a kidney is found.

RTT Provider & Support

1. Provider reviews Transplant Package*
2. Support sends Transplant Package to Renal Transplant Center Team Coordinator

Medical Center Transplant Team

1. Reviews package for decision
2. Sends approval letter and appointment for patient's initial visit or denial letter to RTT Support

Medical Center Transplant Team Denial - RTT Provider & Support

1. Provider meets with patient to discuss
2. Support sends letter to HIM to scan and to institution Utilization Management Review Nurse (UMRN) to give to patient

Medical Center Transplant Team Approval - RTT Support

1. Confirms receipt of Transplant Center appointment
2. Notifies HQ Nurse Consultant Program Review (NCPR) to coordinate visit
3. Sends Approval Letter to HIM to scan

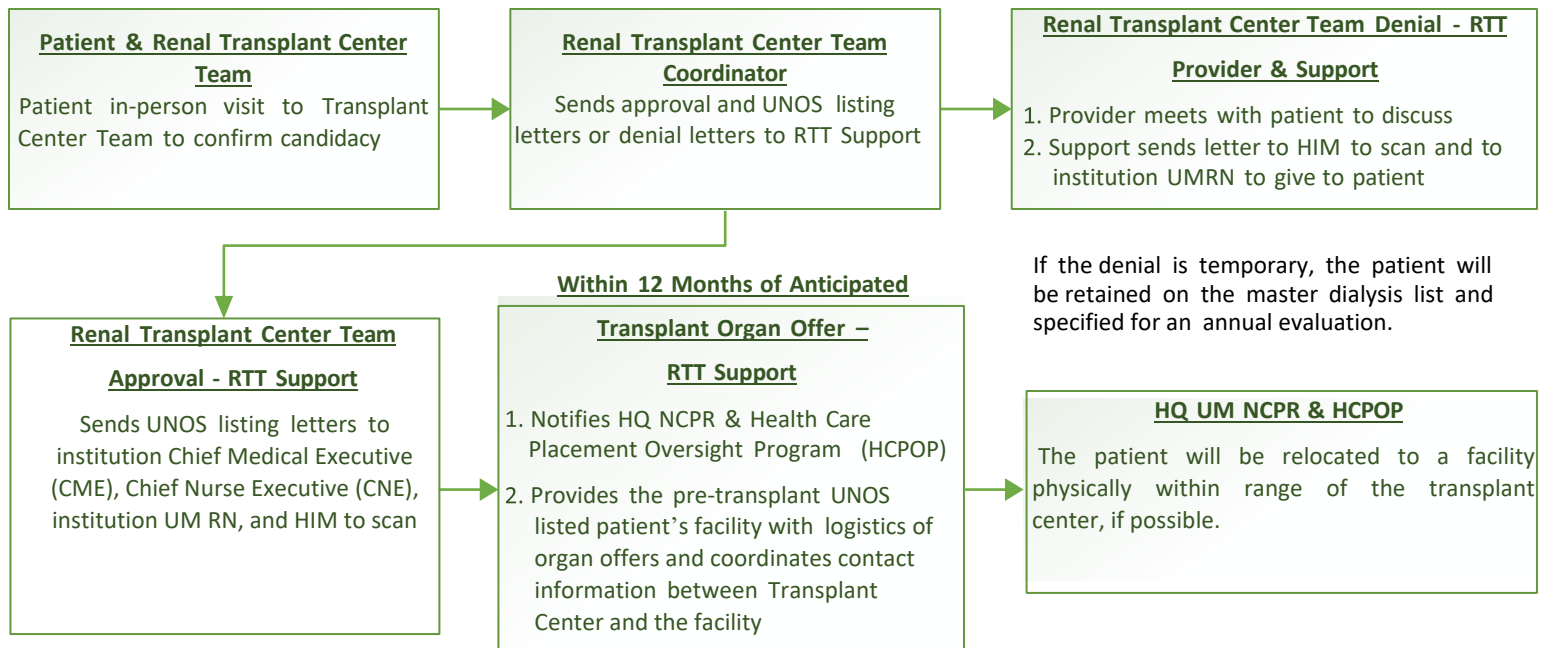
Direct Care Contracts & Transplant Center

Contracts works with Transplant Center to negotiate and finalize the LOA

If the denial is temporary, the patient will be placed back on the master dialysis list for an annual evaluation.

ATTACHMENT E: RENAL TRANSPLANT FLOW CHART AS OF JANUARY 10, 2022 (PAGE 2)

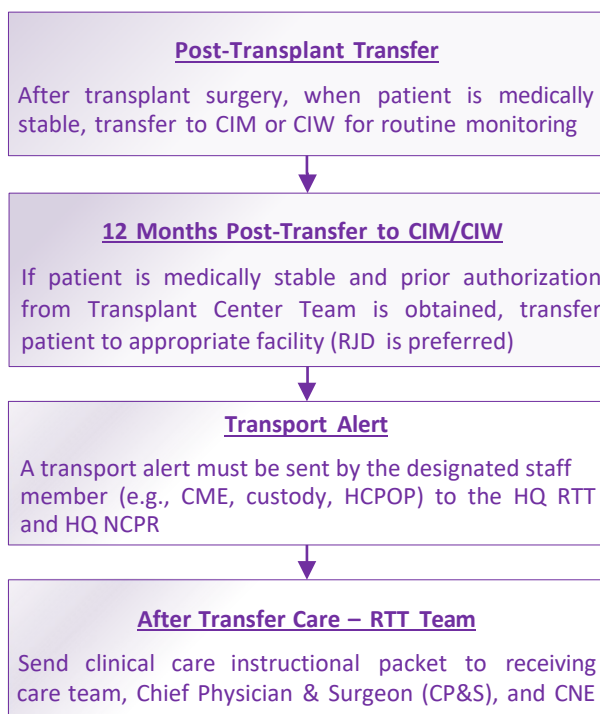
PHASE III UNOS is a private, non-profit organization that manages the U.S. organ transplantation system under contract with the federal government. <https://unos.org/transplant/>



RTT Provider and PCP monitor patient's clinical status until organ is offered and the patient is transported to transplant hospital for transplant surgery. When an organ is offered, the facility, HQ NCPRs, and HCPOP coordinate the necessary transportation logistics in the event of an organ offer. Clinicians follow their standard patient status evaluation as part of the pre-transport "Out to Medical" process.

PHASE IV: The location of transgender patients will follow CCHCS policy on placement. Medical care is coordinated and under the direction of the Medical Center Transplant Team via direct communication between CDCR providers and Medical Center Transplant Team providers.

Transportation of post-kidney transplant patients is restricted to the appropriate facilities and should never be to a facility in a coccidiomycosis-endemic area. Richard J. Donovan (RJD) Correctional Facility is the preferred institution for post renal transplant patients.

**Institutions Post-Transplant**

Zero to three months: CIM, CIW, RJD
 Three to six months: CIM, CIW, RJD
 Six to twelve months: CEN, CIM, CIW, LAC, RJD
 More than twelve months: CAL, CEN, CHCF, CIM, CIW, LAC, RJD (preferred)

Clinical Care Instructional Packet includes:

- Contact information for the HQ RTT
- Same Day Tacrolimus (TAC) Level Ordering, including order and Transplant Medical Center courier instructions to request labs to be run at the Transplant Medical Center laboratory
- Instructions for ordering a Medical Center Transplant Team Telemedicine visit
- Instructions for Post-Renal Transplant PowerPlan
- Link to Post-Renal Transplant Care Guide
- Post-Renal Transplant care summary
- Instructions for medical hold with Medical Classification Chrono (MCC) comments.
 - Transfers must go through the HQ NCPR Lead and HQ RTT
 - Do not transfer patient to cocci 1 or cocci 2 facilities

ATTACHMENT F: EXAMPLE ORGAN OFFER LOPS FOR URGENT TRANSFER PROCESS**EXAMPLE: CHCF LOP for Organ Offer Patient Transfers**

The transplant center will contact the Standby Emergency Medical Services Team (SEMS) by phone at any time in the event a kidney is available. SEMS will:

1. Treat it as a code 3 situation.
2. Notify custody right away about the transfer and make arrangements with custody regarding transferring the patient to the transplant center within the required 8-hour time frame.
3. Communicate patient status and transportability must be reported back to the transplant center within 30 - 45 minutes.
4. Notify the supervising registered nurse (SRN) III on call regarding the emergent transfer.
5. Contact housing unit and have them to send the patient to SEMS clinical team location.
6. Have the medical team complete a clinical assessment, get the necessary paperwork, and get the patient ready for transfer ASAP.
7. Alert the CME and the CME will notify HQ (cphcstransplantprogramcoordinator@cdcr.ca.gov) when successful transportation has occurred.

EXAMPLE: WSP LOP for Organ Offer Patient Transfers

The transplant center will be given the Watch Commander phone number and the Watch Commander will be notified of organ offer.

1. The Watch Commander shall immediately notify the following staff: Please refer to the list of contact numbers for the below listed staff:
 - a. TTA RN.
 - b. The CME. If the Watch Commander is unable to contact the CME, then he will continue down the list of medical contacts, refer to the Contact List for specifics.
2. The Watch Commander will provide the above listed individuals with the contracted hospital's contact person's phone number and begin the process of putting together a transportation team.
3. The CME or secondary physician contacts will notify the health care staff.
NOTE: The transportation team must be able to be mobilized and have the patient to the contracted hospital within an 8-hour period/window.
4. The TTA RN will immediately upon receiving notification from the Watch Commander, contact the MOD and CME.
5. The TTA RN will contact HIM. HIM will ensure the TTA transport packet has the most current relevant information within the health record. If it is a weekend or holiday, TTA staff will access the EMR and ensure the packet is current.
6. The TTA RN will make arrangements with custody to have the patient brought to the TTA. The RN will assess the -patient, check vital signs, assure stability and has no acute illnesses, infections, open wounds, etc. that would prevent the patient from being accepted by the contracted hospital as an organ transplant recipient.
7. The TTA RN will contact the contracted hospital's contact staff to discuss the patient's current health status and also to discuss any other needs the patient may have (e.g., current medication, dialysis, etc.). The TTA RN will make contact with the transplant center staff person within 30 minutes of receiving notification as the transplant center must respond within one hour to UNOS after receiving notification that an organ is available.
8. The TTA RN will keep in contact with the MOD and/or CME. The CME and/or MOD will communicate with the TTA RN to consult, advise, and assure timely and accurate responses to the contracted hospital's contact person.
9. The TTA RN will communicate instructions given by the transplant center to the MOD and/or CME and carry out all orders/special instructions (e.g., nothing by mouth (NPTO), clear liquids, full liquids, regular diet, etc.).
10. The TTA RN will send the past 2 months of progress notes, labs, imaging reports, consultation reports and recent medication list/MARS with the transportation team.
11. The TTA RN, or designee, will alert CME and the CME will notify HQ (cphcstransplantprogramcoordinator@cdcr.ca.gov) when successful transportation has occurred.

PATIENT EDUCATION

DIETARY GUIDELINES – STAGE 5 CHRONIC KIDNEY DISEASE (CKD)

For most people in stage 5, before starting dialysis, eating becomes a challenge. This is because of uremia, a condition that occurs when waste builds up in the blood. Preventing malnutrition is a top priority, as it can increase the risk of hospitalization and even death before starting dialysis or undergoing surgery for a kidney transplant.

Here are 5 guidelines to help you manage your diet in stage 5 kidney disease prior to dialysis or transplant:

1. Know your protein amount and try to eat that amount each day.

- Limiting protein helps reduce uremia and waste buildup in the blood.
- However, a low-protein diet along with loss of appetite also puts you at high risk for malnutrition.
- The recommended amount of protein when you are on dialysis is about double the amount recommended for patients with kidney disease but not on dialysis.
- If you haven't already, ask to see a registered dietitian who will determine the right amount of protein for you.

2. Eat enough calories to maintain your weight, even if you are overweight.

- You may have a hard time eating due to appetite troubles, changes in taste, gastrointestinal problems, allergy to certain animal proteins, chronic inflammation, medications, depression and other medical conditions such as diabetes or heart disease.
- It is important to eat enough to prevent weight loss and to help preserve your body's muscle stores.
- Ask your medical provider or dietitian about a nutritional supplement for a CKD non-dialysis diet if you are experiencing poor appetite and weight loss.

3. Monitor potassium levels that may increase due to low urine output or from medications.

- Potassium builds up in the body when kidney function declines.
- CKD stage 5 patients should limit intake and avoid the highest potassium foods and track your potassium level by getting regular blood tests.
- Your medical provider or dietitian will provide additional information on potassium and your kidney diet.

High-potassium foods:

Avocado	Bananas	Cantaloupe and honeydew
Dried fruit	Legumes	Oranges/orange juice
Nuts and seeds	Milk and yogurt	Tomato products (juices, sauces, paste)
Pumpkin and winter squash	Potatoes	Salt substitutes and low-sodium foods that contain potassium additives



4. Phosphorus levels are likely to occur naturally if you are limiting high protein foods.

- If you are following a low-protein diet, you naturally decrease phosphorus intake, because protein and phosphorus go together.
- Patients in CKD stages 3-5 need to watch their phosphorus. Talking with your medical provider or dietitian so that you understand your choices.

Foods High in Phosphorus:

Cheese	Ice cream	Milk and yogurt	Dark sodas
Chocolate	Legumes	Nuts and seeds	Processed foods



Additional sources of phosphorus are from phosphate additives in processed foods. Read ingredient labels to avoid additives with "phos" in it.

5. Control fluid retention and blood pressure with lower sodium (salt) and fluid intake and taking prescribed medications.

- Fluid and sodium (salt) restriction needed vary greatly with people in stage 5 CKD, so your requirements will be assessed by your medical provider and dietitian. Sodium should usually be decreased to less than 2,400 mg/day.
- Weigh yourself daily to track weight gains. Fluid weight gains occur quickly, and you may have swelling and shortness of breath. A high-sodium diet can make you retain more fluid and can affect blood pressure.
- Ask your medical provider or dietitian about the amount of sodium you need each day.

High Sodium Foods to Avoid:

Soy sauce	Hot dogs	Top Ramen/soup	Deli Meat
Bacon	Sausage	Ketchup	Seasoning and spice mixes containing salt
Ham	Mustard	Cheese	Peanut butter
Salami	Pickles	Cottage cheese	Snack foods such as potato chips, salted nuts

PATIENT EDUCATION**HEMODIALYSIS****WHAT IS HEMODIALYSIS?**

Healthy kidneys clean your blood and remove extra fluid in the form of urine. When your chronic kidney disease has progressed to stage 5, you are close to kidney failure and only have 10-15% of your kidney function left, which means you need dialysis to help your body remove waste and fluid from your blood to keep you healthy, since your kidneys are not able to do this anymore.

- In-center hemodialysis (dialysis) requires you to visit a dialysis center approximately 3 times per week.
- During dialysis, a machine filters your blood and clears toxins from your kidneys using a special filter called a dialyzer (also called an artificial kidney).
- To get your blood into the dialyzer, the medical provider needs to make an entrance into your blood vessels, called a fistula. This is done with minor surgery, usually to your arm. However, if your blood vessels are not adequate for a fistula, the medical provider may use a soft plastic tube to join an artery and a vein under your skin. This is called a graft.
- Occasionally, an access is made by means of a narrow plastic tube, called a catheter, which is inserted into a large vein in your neck. This type of access should be temporary because it has a much higher risk of infection, but is sometimes used for long-term treatment.

CAN DIALYSIS CURE MY CHRONIC KIDNEY DISEASE?

No. When chronic kidney disease progresses to kidney failure over time, your kidneys do not get better and you will need dialysis for the rest of your life, unless you are able to receive a kidney transplant.

Studies have shown that getting the right amount of dialysis improves your overall health, makes you feel better, keeps you out of the hospital, and may help you live longer.

It is important that you do all that you can to protect your remaining kidney function by:

- Taking blood pressure medications as instructed by your medical provider, if prescribed
- Avoid medications that can harm your kidneys (anti-inflammatory medicines like Motrin® or naproxen, NSAIDs, and certain antibiotics)
- Make sure conditions like diabetes and high blood pressure are well controlled

HOW LONG ARE DIALYSIS TREATMENTS?

Dialysis treatments usually last about 4 hours. The time needed for your dialysis depends on:

- How well your kidneys work
- How much fluid weight you gain between treatments
- How much waste you have in your body
- Your body weight
- The type of artificial kidney used

**IS A SPECIAL DIET NEEDED?**

Yes. Your choices about what to eat and drink while on hemodialysis can make a difference in how you feel and can make your treatments work better.

- Between dialysis treatment sessions, wastes can build up in your blood and make you sick. You can reduce waste buildup by controlling what you eat and drink.
- Some foods cause wastes to build up quickly between your dialysis sessions. If your blood contains too much waste, your kidney treatment session may not remove them all.
- It is important to keep your fluid and sodium (salt) limits so you don't build up too much fluid in your body between dialysis treatments.
- If you get thirsty but need to limit your fluids, try chewing gum, sucking on hard candy, or rinsing your mouth out with water but not swallowing.
- Patients on dialysis should eat more protein and decrease the amount of potassium, phosphorus, sodium, and fluid in their diet.
- Patients with diabetes or other health conditions may have additional diet restrictions.
- Talk to your dietician about your individual diet needs.

PATIENT EDUCATION

HEMODIALYSIS (CONTINUED)

How Long Can You Live on Dialysis?

If your kidneys have failed, you will need to have dialysis treatments for the rest of your life unless you are able to get a kidney transplant. Life expectancy on dialysis can vary depending on your other medical conditions and how well you follow your treatment plan. Average life expectancy on dialysis is 5-10 years, however, many patients have lived well on dialysis for 20 or even 30 years. Talk to your health care team about how to take care of yourself and stay healthy on dialysis.

Is Dialysis Uncomfortable?

Dialysis should NOT be painful. You may have some discomfort when the needles are put into your fistula or graft, but most patients have no problems. The dialysis treatment itself is painless. However, some patients may have a drop in their blood pressure. If this happens, you may feel sick to your stomach, vomit, have a headache or cramps. With frequent treatments, those problems usually go away.

What Are The Side-Effects to Dialysis?

When you begin dialysis, the needles put in your fistula or graft may be uncomfortable. You can help yourself by following your diet and fluid allowances. The need to remove too much fluid during dialysis is one of the things that may make you feel uncomfortable during your treatment.

Fluid Intake

Kidney disease causes trouble regulating water. If your body holds too much water, it will be hard for your heart to pump and will increase your blood pressure and can leak fluid into the lungs.

Another way to look at fluid is to see how much fluid weight you gain between dialysis treatments. A good goal is 1.5-2 kilograms (3-4 lbs.) between dialysis treatments for most people. Check with your medical provider about what amount of fluid weight gain is safe for you.

When kidneys fail, you will need to 'restrict your fluids' (drink less), not just water. A fluid is anything that is liquid at room temperature, for example: coffee and tea, other beverages, but also soups, ice, ice cream, or gelatin desserts.



Just Exactly What Does Restricting Fluids Mean?

For most people on dialysis, restricting fluid means limiting yourself to 3 or 4 8-ounce cups of fluid a day. If you put out any urine, you may be able to have a little more. Ask your dialysis team how much fluid you may have each day.

How Much is One Cup?

One issue for most people is just exactly what is a 'cup'? We all have different size cups and drinking glasses at home, but a standard household measuring cup is 8 fluid oz. A coffee mug may hold 12 ounces, but when poured into an insulated travel mug, which looks twice as tall, it actually holds less. So, it's a good idea to measure fluids to see how much liquid your drinking glasses, coffee cups, or mugs hold.

Measuring your cups and glasses just one time will help you to know how much fluid they hold.

Sodium Intake

The secret to staying within your fluid allowance though, doesn't have anything to do with willpower, or fluid. It has to do with salt.

Salt makes you thirsty. The more foods high in salt (also called sodium) you eat, the thirstier you will be. It is hard, almost impossible, to limit fluid when you eat foods that are high in sodium. So the real trick to keeping your fluid gains manageable, so that you don't have cramping, blood pressure drops, and feel bad during and after your treatment, is to limit your salt intake to about 1,500 mg a day.



PATIENT EDUCATION

NUTRITION AND HEMODIALYSIS

Now that you are beginning hemodialysis, there may be many changes in your daily life. Your medical provider has probably told you that you may need to make some changes in your diet. The dietitian at your dialysis center or facility will help you plan a diet for your special needs.

Why Do I Need to Be on a Special Diet?

Because your kidneys are not able to get rid of enough waste products and fluids from your blood and your body now has special needs, you will need to limit fluids and change your intake of certain foods in your diet. How well you feel will depend on eating the right kind and amounts of food and taking the medications your medical provider orders for you. Many of your medications can help control the nutrients in your body.

Your diet is very important to your care. It is important that you have the right amount of protein, calories, fluids, vitamins and minerals each day. Your dietitian will help you plan your meals to make sure you get the proper balance. If you need help, be sure to ask.

Your dietitian or nurse might look at the fat and muscle stores in your face, hands, arms, shoulders, and legs. Your dialysis care team will look for changes in your blood level of proteins, and especially one called albumin. A change in this protein can mean that you are losing body protein.



What Should I Limit Eating?

Foods containing high amounts of sodium, phosphorus and potassium are restricted. Your dietitian will provide you with food lists that tell you which foods are less restricted and which ones you should avoid or limit.

Potassium is easily removed by dialysis, but when it builds up in the blood between treatments, it can cause muscle weakness and make your heart stop beating. Certain fruits, vegetables, dairy products and other foods that are high in potassium will need to be restricted from your diet.

Phosphorus [fos-fer-uhs] is difficult for hemodialysis to filter from the blood so it's important to limit foods that contain the mineral. Phosphorus can build to high levels in the bloodstream and cause weak bones, heart problems, joint pain or skin ulcers. Your medical provider may also prescribe a medicine called a phosphorus binder to help keep phosphorus levels normal.

Sodium (salt) causes your body to hold onto more fluid and raises your blood pressure. Eating less sodium and drinking less fluid can help you feel comfortable before and after your dialysis sessions.



What Can I Eat?

You can increase the amount of protein (lean meat, poultry, fish and egg whites) if available.

Vitamins

Although vitamins don't provide calories, they are important because they help to access nutrients from foods. Some vitamins in over the counter supplements can build up to toxic levels in dialysis patients. If you are on dialysis, your dietitian can recommend a multivitamin for you that is appropriate for people on dialysis. Always check with your dietitian or medical provider before adding a supplement. If you take a prescribed renal vitamin supplement, take it after your dialysis treatment to avoid washing it out.



What If I Have Diabetes?

You have the same recommendations to control carbohydrates that you did before starting dialysis. The better you control your blood sugar, the better you will feel. You may need changes in your medicines once on dialysis.

PATIENT EDUCATION	
COMMON PROBLEMS WHEN ON DIALYSIS	
Low Blood Pressure:	Symptoms can include dizziness, lightheadedness or tiredness. You should be aware of these symptoms and let your health care team know if you are experiencing any of these. Your health care team might adjust the time you spend on dialysis and recommend restrictions on your fluid intake.
Nausea and Vomiting:	Can be caused by uremia (buildup of toxins in the blood) or other factors. If you have nausea or vomiting, speak with your health care team.
Restless Leg Syndrome (RLS):	Some dialysis patients can get RLS where one needs to keep moving their legs because the leg nerves and muscles create uncomfortable feelings such as crawly, prickly or itchiness. RLS usually happens while sitting or lying down and can disrupt sleep. RLS can have multiple causes, such as some forms of kidney disease, uremia, iron deficiency, or neuropathy (nerve damage). It is important to speak to your health care team for a diagnosis and a prescription which will help address the specific cause.
Muscle Cramping:	The exact cause is unknown, but it is believed muscle cramping has something to do with fluid removal toward the end of a dialysis session. Treatment might include stretching, warm compresses to the affected area, or medication. Speak with your health care team if you experience muscle cramping.
Dry Itchy Skin:	<p>Many dialysis patients have issues with dry or itchy skin. It is called <i>uremic pruritus</i> [yoo-re-mik pru-ri-tes]. Itchy skin is different for everyone, and it can happen at any time of day, on any part of the body. What's important is trying to understand what may be causing it and finding the best way to manage it.</p> <p>What causes dry, itchy skin? A combination of things can cause your skin to be itchy and dry. Some issues are:</p> <ul style="list-style-type: none"> • Limited fluid intake: Your dialysis treatment removes extra water from your body and your limited fluid intake between treatments can cause dry skin and itchiness. • Unmanaged phosphorous: Often, itching is caused by high blood levels of phosphorus in your body that can bind with calcium and lead to feeling itchy. If your medical provider has given you phosphate binders, taking them as instructed, and at the same time every day, will help. • Not enough dialysis: Sometimes too much or too little dialysis can lead to symptoms like dry, itchy skin. Talk to your health care team about your symptoms and find out if you are getting the right amount of dialysis. • Allergies and other causes: Be sure you are not sensitive to the soaps, laundry detergents, lotions, or perfumes you may be using. Sometimes the dyes and fragrances in these products can cause allergic reactions that make skin itchy. Also, showering with water that is too hot can leave your skin too dry and lead to itchy skin. <p>Useful Tips:</p> <ul style="list-style-type: none"> • Try to figure out what is causing the itching. Is it better at some times than others? What helps or makes it worse? Tell your health care team what changes you feel and see with your skin. • Find a good skincare routine, with daily cleansing and moisturizing. Ask your health care team which moisturizers work best for your symptoms. • Don't scratch your skin! Scratching tends to make the itching worse, and may even damage the skin and lead to infection. • Stick to the diet given to you by your health care team along with your phosphate binders.
Too Much Fluid in Between Dialysis Sessions:	<p>If you have too much extra fluid in your body, you may need longer or more frequent hemodialysis treatments. There is a limit to how much fluid can safely be removed during each dialysis treatment.</p> <p>How does fluid overload affect you?</p> <ul style="list-style-type: none"> • Swelling: In your feet, ankles, wrist, and face is a sign of too much fluid in your body. This is called <i>edema</i> [ih-dee-muh]. • Discomfort: Cramping, headache and stomach bloating can make you feel uncomfortable. • High blood pressure: The excess fluid in your blood stream makes it difficult for your body to keep a healthy blood pressure. • Shortness of breath: The extra fluid in your body can enter your lungs, making breathing difficult.
Heart Problems:	<p>The extra fluid can affect your heart rate, the muscles of the heart, and may increase the size of your heart. How to avoid fluid overload:</p> <ul style="list-style-type: none"> • Watch your fluid intake. • Most hemodialysis patients should not drink more than 32 ounces per day. Ask your health care team how much fluid is right for you and if you should be on a renal diet. • Avoid salty foods. Salt makes your body hold on to extra fluid. It will also make you thirstier, which makes it harder to control your fluid intake between treatments. • Keep track of your daily weight. Keeping track of your weight is important between dialysis sessions. If you see sudden weight gain between sessions, you should tell your medical provider immediately.

PATIENT EDUCATION

HEMODIALYSIS ACCESS

How Your Access Works

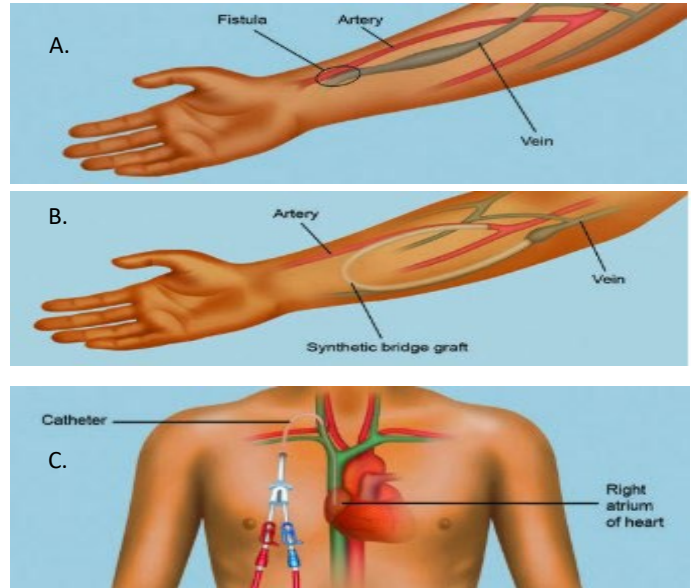
Hemodialysis access, or vascular access, is a way to reach the blood for hemodialysis. The access allows blood to travel through soft tubes to the dialysis machine where it is cleaned as it passes through a special filter, called a dialyzer.

The access is placed by a minor surgery. You will have one of the following:

- **Fistula (picture A):** An access made by joining an artery and vein in your arm. Best choice if your blood vessels are strong enough. Less problems and lasts longer.
- **Graft (picture B):** An access made by using a piece of soft tubing to mimic a vein in your arm. Second best.
- **Catheter (picture C):** A soft tube that is placed in a large vein, usually in your neck. Usually temporary, but sometimes only option. We try very hard not to use these except in emergencies or for a very short time. These catheters carry a very high risk of infection and other serious problems.

If your access is a fistula or graft, your nurse or technician will place two needles into the access at the beginning of each treatment.

These needles are connected to soft tubes that go to the dialysis machine. Your blood goes to the machine through one of the tubes, gets cleaned in the dialyzer, and returns to you through the other tube. If your access is a catheter, it can be connected directly to the dialysis tubes without the use of needles.



Caring for Your Access

An access that is not working well can decrease the amount of dialysis you receive and usually results in a trip to the hospital. Here are some tips you should follow to help keep a fistula or graft working longer:

Fistula or Graft:

- Wash with an antibacterial soap each day, and always before dialysis.
- Do not scratch your skin or pick scab.
- Check for redness, a feeling of excess warmth, or the beginning of a pimple on any area of your access.
- Ask your dialysis care team to rotate the needles when you have your dialysis treatment.

Catheter:

- Keep catheter dressing clean and dry.
- Make sure access area is cleaned and the dressing is changed by your care team at each dialysis session.
- Keep an emergency dressing kit in your cell in case you need to change your dressings between treatments.
- Never open your catheter to the air.

Protect your access:

- Check the blood flow several times each day by feeling for a vibration, also called a pulse or thrill. If you do not feel this, or if there is a change, reach out to your health care team.
- Do not wear tight clothes or jewelry on your access arm.
- Do not carry anything heavy or do anything that would put pressure on the access.
- Do not sleep with your head on the arm that has your access (it's ok to sleep on your side that has the arm with the access).
- Do not let anyone use a blood pressure cuff on your access arm or draw blood from access arm.
- Apply only gentle pressure to the access site after the needle is removed. Too much pressure will stop the flow of blood through the access and it can clot.

If you have breakthrough bleeding after you have dialysis, apply gentle pressure to the needle site with a clean towel or gauze pad. If the bleeding does not stop in 30 minutes, notify your health care team, go to the Correctional Treatment Center (CTC) or your dialysis center.

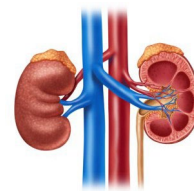
PATIENT EDUCATION

KIDNEY TRANSPLANTS

WHAT IS A KIDNEY TRANSPLANT?

A kidney transplant is a surgical procedure to place a new donor kidney inside your body to do the work your kidneys can no longer do.

A kidney transplant can treat advanced kidney disease and kidney failure, but it isn't a cure. Some forms of kidney disease may return after transplant.



RISKS OF A KIDNEY TRANSPLANT

Serious complications from surgery may occur:

- Bleeding and bruising more easily
- Blood clots
- Weight gain
- Leaking from the tube that links the kidney to the bladder
- Infections (can be severe)
- Failure of the donated kidney
- Rejection of the donated kidney
- Heart attack
- Stroke
- Death



Medications **MUST** be taken every day after a kidney transplant. They have serious side effects such as:

- Bone thinning or bone damage
- Diabetes
- Excessive hair growth or hair loss
- High blood pressure
- High cholesterol
- Increased risk of cancer
- Puffiness
- Preventing immune system from functioning that can result in infections that can be severe and dangerous
- Weight gain
- Acne



BENEFITS OF A KIDNEY TRANSPLANT

- A successful kidney transplant can improve your quality of life and reduce your risk of dying.
- You will not need dialysis anymore.
- You may have an increase in energy level and a strong appetite!



PATIENT EDUCATION

KIDNEY TRANSPLANTS (CONTINUED)

How Do I Know If I Qualify for a Kidney Transplant?

Qualifying for a kidney transplant is a very detailed process that takes a long time. Not everyone who wants a kidney transplant can get one.

You must be healthy enough to have the surgery and be free from serious conditions such as cancer and major organ problems, like heart, liver or lung disease.

Your medical provider must fill out many forms and perform many tests which will include information such as:

- Detailed past medical history
- Patient consent
- Mental health assessment
- Detailed Physical exam
- Dental exam
- Multiple blood tests, imaging scans and other tests



Your Primary Care Team will work with specialists to review all your test results and forms to decide if a kidney transplant will be safe and beneficial for you.

It is important to comply with all testing and evaluations ordered by your care team to ensure you do not delay the review process.

Who Does Not Qualify for a Kidney Transplant?

You may not be able to get a kidney transplant if you have any of the following:

- Have severe heart disease or another serious long-term illness
- Have active cancer or recently had cancer
- Are too overweight
- Drink too much alcohol or use drugs
- Have a mental illness that your mental health provider thinks is not controlled well enough for transplant.
- Have a history of not taking medications as prescribed
- Do not go to your appointments
- You have trouble cooperating and getting along with others or have trouble controlling anger as evident in your medical chart through your interactions with medical care professionals or altercations with other residents.



Where Can a Kidney Come From?

- A new kidney can come from a living donor (family or friend) or a dead donor.
- If a living donor is not used, you can go through a process to get on a list to get a kidney from a dead donor.
- An organization called UNOS (United Network for Organ Sharing) keeps this list. When a new kidney becomes available, UNOS decides who is next on the list to get it. There are many rules that UNOS must follow.
- Most people spend at least 6-9 years on the list before being selected for a transplant from a deceased donor.
- While you are on the waitlist, you will need to try and stay healthy by eating healthy and taking all of your medications.
- You will also need to do blood tests and heart tests to make sure you will still qualify for a transplant once it is your turn.
- Failure to complete these tests may jeopardize your status on the waitlist.



PATIENT EDUCATION**OVER-THE-COUNTER MEDICATIONS TO AVOID WHEN ON DIALYSIS**

Certain medications are dangerous once you start dialysis. The chart below lists over the counter medications to avoid and why. Talk to your health care team before starting any new supplements.

Medications to Avoid	Comments
Vitamin D	Over the counter Vitamin D must be activated in the kidney to work. When you are on dialysis your kidneys cannot do this activation step. You may be prescribed “activated” Vitamin D as calcitriol, doxercalciferol or alfacalcidol for high parathyroid hormone levels. These forms of Vitamin D will work for people on dialysis.
Vitamin C	Can pile up in your body and cause damage to body organs.
Vitamin A	Can pile up in your body and cause anemia as well as effect cholesterol and calcium levels.
Multivitamins	Only certain multivitamins are safe in dialysis patients. Over the counter multivitamins have too much Vitamin A and C and can hurt your organs.
Milk of Magnesia (magnesium hydroxide) or Magnesium citrate	Magnesium is removed by the kidney. The amount of magnesium is higher in patients with impaired kidneys.
Maalox, Mintox, gelusil (aluminum hydroxide/ magnesium hydroxide/ simethicone)	Many of the medications used to treat heartburn have ingredients which, if used often, can accumulate in people with kidney disease. May also cause constipation leading to intestinal blockers.
Naproxen	Painkillers reduce the blood flow to the kidney. Also, long term use with higher doses may harm whatever function is left in your kidneys.
Ibuprofen	May injure whatever function is left in your kidneys. May cause an increased risk of sudden kidney failure and even progressive kidney damage.
Fleet PhosphoSoda (for constipation—oral or enema)	Too much phosphorus and dialysis cannot remove phosphorus well.

Here is a list of over-the-counter medications to monitor.

Medications to Monitor	Comments
Aspirin	Do not use unless your medical provider says it is okay.
Ranitidine (antacid)	Ranitidine will need dose adjustments for patients on dialysis.
Herbal Supplements	Can be dangerous due to toxic build up or interfere with other medications. Always check with your medical provider before taking any new herbal product.

EDUCACIÓN DEL PACIENTE

PAUTAS ALIMENTARIAS: ENFERMEDAD RENAL CRONICA (ERC) EN ETAPA 5

Para la mayoría de las personas en etapa 5, antes de comenzar la diálisis, alimentarse se convierte en un desafío. Esto se debe a la uremia, una afección que ocurre cuando los residuos se acumulan en la sangre. Prevenir la desnutrición es la prioridad principal, ya que propende a la hospitalización e incluso la muerte antes de la diálisis o del trasplante de riñón.

He aquí cinco pautas para controlar su dieta en la etapa 5 de la enfermedad renal, antes de la diálisis o del trasplante:

1. Conozca la cantidad de proteínas para usted e intente ingerirlas cada día.

- Limitar las proteínas reduce la uremia y la acumulación de residuos en la sangre.
- Sin embargo, una dieta baja en proteínas, junto con la inapetencia, puede provocar la desnutrición.
- La cantidad recomendada de proteína cuando está en diálisis es aproximadamente el doble de la cantidad recomendada para pacientes con enfermedad renal pero no en diálisis.
- Si aún no lo ha hecho, pida que le atienda un nutricionista titulado, quien determinará la cantidad adecuada de proteínas para usted.

2. Consuma las calorías suficientes para mantener su peso, aunque tenga sobrepeso.

- Es posible que le cueste comer por problemas de apetito, cambios en el gusto, trastornos gastrointestinales, alergia a ciertas proteínas animales, inflamación crónica, medicamentos, depresión y otras afecciones médicas, como la diabetes o las cardiopatías.
- Es importante comer lo suficiente para evitar la pérdida de peso y conservar la masa muscular.
- Pregúntele a su médico o dietista por un suplemento nutricional para una dieta de ERC sin diálisis si está inapetente y baja de peso.

3. Vigile los niveles de potasio que pueden aumentar debido a la escasa producción de orina o a los medicamentos.

- El potasio se acumula en el cuerpo cuando la función renal disminuye.
- Los pacientes con ERC en etapa 5 deberían limitar la ingesta y evitar los alimentos con más potasio, así como controlar sus niveles de potasio con análisis periódicos de sangre.
- Su médico o dietista le proporcionará información adicional sobre el potasio y su dieta renal.

Alimentos ricos en potasio:

Aguacate	Bananas	Melón cantalupo y verde
Frutas secas	Legumbres	Naranjas/jugo de naranja
Nueces y semillas	Leche y yogur	Productos de tomate (jugo, salsa, pasta)
Calabaza y calabaza de invierno	Papas	Sustitutos de la sal y alimentos bajos en sodio que contienen aditivos de potasio



4. Es probable que los niveles de fósforo cambien naturalmente si está limitando los alimentos ricos en proteínas.

- Si sigue una dieta baja en proteínas, disminuye naturalmente la ingesta de fósforo, ya que estos van juntos.
- Los pacientes en etapas 3 a la 5 de ERC deben vigilar sus niveles de fósforo. Hable con su médico o dietista para entender sus opciones.

Alimentos ricos en fósforo:

Queso	Helado	Leche y yogur	Refrescos oscuros
Chocolate	Legumbres	Nueces y semillas	Alimentos procesados

Otras fuentes de fósforo son los aditivos de fosfato en los alimentos procesados.

Lea las etiquetas de ingredientes para evitar los aditivos con "fos" ("*phos*" en inglés).



5. Controle la retención de líquidos y la presión arterial reduciendo la ingesta de sodio (sal) y de líquidos y tomando los medicamentos recetados.

- La restricción de líquidos y de sodio (sal) necesaria varía mucho en las personas con ERC en etapa 5, por lo que su médico y dietista evaluarán sus necesidades. Por lo general, el sodio debería reducirse a menos de 2,400 mg/día.
- Pésese diariamente. El aumento de peso por retención de líquido se produce rápidamente, y puede tener hinchazón y dificultad para respirar. Una dieta alta en sodio hace que retenga más líquido y puede afectar a la presión arterial.
- Consulte a su médico o dietista sobre la cantidad de sodio que necesita cada día.

Alimentos ricos en sodio que debe evitar:

Salsa de soya	Perros calientes	Tallarines/sopa	Fiambres
Tocineta	Salchichas	Kétchup	Condimentos y mezclas de especias que contienen sal
Jamón	Mostaza	Queso	Mantequilla de maní
Salami	Pepinillos	Queso ricota	Tentempiés como papas fritas, frutos secos salados

EDUCACIÓN DEL PACIENTE**HEMODIALISIS****¿QUE ES LA HEMODIALISIS?**

Los riñones sanos limpian la sangre y eliminan el exceso de líquido en forma de orina. Cuando la enfermedad renal crónica progresa hasta la etapa 5, usted está a punto de sufrir insuficiencia renal y solo le queda entre 10 % y 15 % de la función renal. Esto significa que necesita diálisis para eliminar los residuos y el líquido en la sangre, y así mantenerse sano.

- La hemodiálisis en el centro (diálisis) requiere que visite un centro de diálisis aproximadamente 3 veces por semana.
- Durante la diálisis, una máquina le filtra la sangre y elimina las toxinas de sus riñones con un filtro especial llamado dializador (también conocido como riñón artificial).
- Para que la sangre entre en el dializador, el proveedor médico debe hacer una entrada en los vasos sanguíneos, lo que se denomina fístula. Esto se hace con una cirugía menor, generalmente en el brazo. Sin embargo, si sus vasos sanguíneos no son adecuados para una fístula, el proveedor médico puede usar un tubo de plástico blando para unir una arteria y una vena debajo de la piel. Esto se llama injerto.
- En ocasiones, el acceso se realiza mediante un tubo de plástico estrecho, llamado catéter, que se introduce en una vena grande del cuello. Este tipo de acceso debería ser temporal porque tiene un riesgo mucho mayor de infección, pero a veces se utiliza para el tratamiento a largo plazo.

¿LA DIALISIS PUEDE CURAR MI ENFERMEDAD RENAL CRONICA?

No. Cuando la enfermedad renal crónica evoluciona a insuficiencia renal con el paso del tiempo, sus riñones no mejoran y necesitará diálisis el resto de su vida, a menos que reciba un trasplante de riñón.

Los estudios han demostrado que la cantidad adecuada de diálisis mejora su salud en general, hace que se sienta mejor, lo mantiene fuera del hospital y puede ayudarlo a vivir más tiempo.

Es importante que haga todo lo posible para proteger lo que queda de su función renal:

- Tome los medicamentos para la presión arterial según las indicaciones de su médico, si se los ha recetado.
- Evite los medicamentos que puedan dañar sus riñones (antiinflamatorios como Motrin® o naproxeno, los AINE y ciertos antibióticos).
- Contrólese debidamente las afecciones como la diabetes y la hipertensión.

¿CUANTO DURAN LOS TRATAMIENTOS DE DIALISIS?

Los tratamientos de diálisis suelen durar unas 4 horas. El tiempo necesario para su diálisis depende de:

- Qué tan bien funcionen sus riñones.
- Cuánto peso en líquido aumente entre los tratamientos.
- La cantidad de residuos que tenga en su cuerpo.
- Su peso corporal.
- El tipo de riñón artificial que se utilice.

**¿HACE FALTA UNA DIETA ESPECIAL?**

Sí. Sus decisiones sobre lo que come y bebe mientras recibe hemodiálisis pueden marcar la diferencia en cómo se siente y hacer que sus tratamientos funcionen mejor.

- Entre las sesiones de tratamiento de diálisis, los residuos pueden acumularse en la sangre y enfermarlo. Usted puede reducir la acumulación de estos residuos controlando lo que come y bebe.
- Algunos alimentos hacen que los residuos se acumulen rápidamente entre las sesiones de diálisis. Si su sangre contiene demasiados residuos, es posible que su sesión de tratamiento no los elimine todos.
- Es importante respetar los límites de líquidos y sodio (sal) para no acumular demasiado líquido en su cuerpo entre los tratamientos de diálisis.
- Si tiene sed, pero necesita limitar los líquidos, mastique goma de mascar, chupe un caramelo duro o enjuáguese la boca con agua, pero sin tragar.
- Los pacientes que reciben diálisis deberían consumir más proteínas y disminuir la cantidad de potasio, fósforo, sodio y líquido en su dieta.
- Los pacientes con diabetes u otros problemas de salud pueden tener restricciones dietéticas adicionales.
- Hable con su dietista sobre sus necesidades dietéticas en particular.

EDUCACIÓN DEL PACIENTE

HEMODIALISIS (CONTINUACION)

¿Cuánto tiempo puede vivir en diálisis?

Si sus riñones han fallado, tendrá que someterse a diálisis por el resto de su vida, a menos que logre recibir un trasplante de riñón. La expectativa de vida en diálisis varía, dependiendo de sus otras afecciones médicas y de lo bien que siga su plan de tratamiento. El promedio es de 5 a 10 años; sin embargo, muchos pacientes han vivido bien por 20 o incluso 30 años. Hable con su equipo de salud sobre cómo cuidarse y mantenerse saludable durante la diálisis.

¿La diálisis es incómoda?

La diálisis NO debería ser dolorosa. Es posible que sienta alguna molestia cuando le coloquen las agujas en la fístula o el injerto, pero la mayoría de los pacientes no tienen problemas. La diálisis en sí es indolora. Sin embargo, algunos pacientes pueden experimentar hipotensión. Si esto ocurre, puede sentir malestar estomacal, vomitar, tener dolor de cabeza o calambres. Con tratamientos frecuentes, estos problemas suelen desaparecer.

¿Cuáles son los efectos secundarios de la diálisis?

Cuando comience la diálisis, las agujas que se colocan en su fístula o injerto pueden ser incómodas. Puede ayudarse siguiendo la dieta y los líquidos permitidos. La necesidad de eliminar demasiado líquido durante la diálisis es uno de los aspectos que podría incomodarlo durante el tratamiento.

Ingesta de líquidos

La enfermedad renal causa problemas para regular el agua. Si su cuerpo retiene demasiada agua, su corazón tendrá más trabajo para bombear sangre y aumentará su presión arterial, lo que puede filtrar líquido a los pulmones.

Otra forma de control es ver cuánto peso aumenta entre las sesiones de diálisis. Un buen objetivo es de 1.5 a 2 kilogramos (3 a 4 libras) entre las sesiones de diálisis para la mayoría de las personas. Consulte a su médico sobre el aumento de peso en líquidos que es seguro para usted.



Cuando los riñones fallan, es necesario "restringir los líquidos" (beber menos), no solo el agua. Esto abarca cualquier alimento que sea líquido a temperatura ambiente: café, té y otras bebidas, pero también sopas, hielo, helados o postres de gelatina.

¿Qué significa exactamente restringir los líquidos?

Para la mayoría de las personas que reciben diálisis, restringir los líquidos significa limitarse a 3 o 4 tazas de 8 onzas al día. Si usted expulsa algo de orina, es posible que pueda tomar un poco más. Pregunte a su equipo de diálisis cuánto líquido puede tomar cada día.

¿Cuánto es una taza?

Un problema para la mayoría de las personas es saber qué es exactamente una "taza". Todos tenemos tazas y vasos de diferentes tamaños en casa, pero la típica taza de medición para el hogar es de 8 onzas. Una taza de café puede contener 12 onzas, pero cuando se vierte en una taza térmica, que parece el doble de alta, esta contiene menos. Por lo tanto, es bueno medir los líquidos para ver la cantidad de líquido que contienen sus vasos, sus tazas de café o sus tazas.

Medir sus tazas y vasos una sola vez le permitirá saber la cantidad de líquido que contienen.

Ingesta de sodio

No obstante, el secreto para no sobrepasar la cantidad permitida de líquido no tiene nada que ver con la fuerza de voluntad ni con el líquido. Tiene que ver con la sal.

La sal da sed. Cuantos más alimentos con alto contenido de sal (también llamada sodio) consuma, más sed tendrá. Es difícil, casi imposible, limitar el líquido cuando se consumen alimentos con alto contenido de sodio. Así que el verdadero truco para mantener a raya el aumento de líquidos, para que no sufra calambres ni le baje la tensión y no se sienta mal durante y después del tratamiento, es limitar su consumo de sal a unos 1500 mg al día.



EDUCACIÓN DEL PACIENTE

NUTRICION Y HEMODIALISIS

Ahora que está comenzando la hemodiálisis, puede que haya muchos cambios en su vida diaria. Es probable que su médico le haya dicho que tal vez deba hacer algunos cambios en su dieta. El nutricionista de su centro o establecimiento de diálisis le ayudará a planificar una dieta para sus necesidades especiales.

¿Por qué necesito una dieta especial?

Debido a que sus riñones no son capaces de eliminar suficientes residuos y fluidos de su sangre y su cuerpo ahora tiene necesidades especiales, usted deberá limitar los líquidos y cambiar ciertos alimentos en su dieta. Lo bien que se sienta dependerá de que consuma el tipo y las cantidades adecuadas de alimentos y de que tome los medicamentos que le indique su médico. Muchos de sus medicamentos sirven para controlar los nutrientes en su cuerpo.

Su dieta es muy importante para sus cuidados. Es vital que cuente con la cantidad adecuada de proteínas, calorías, líquidos, vitaminas y minerales cada día. Su dietista le ayudará a planificar sus comidas para que el balance sea adecuado. Si necesita ayuda, no dude en pedirla.

Puede que su dietista o personal de enfermería observe las reservas de grasa y músculo en su rostro, manos, brazos, hombros y piernas. Su equipo de diálisis buscará cambios en su nivel de proteínas en la sangre, especialmente de la llamada albúmina, cuyo cambio puede significar que está perdiendo proteínas en su cuerpo.



¿Qué alimentos debería limitar?

Los alimentos que contienen altas cantidades de sodio, fósforo y potasio están restringidos. Su dietista le proporcionará listas de alimentos que le indicarán cuáles están menos restringidos y cuáles debería evitar o limitar.

El potasio se elimina fácilmente con la diálisis, pero cuando se acumula en la sangre entre las sesiones de tratamiento, puede causar debilidad muscular y hacer que su corazón deje de latir. Deberá restringir de su dieta ciertas frutas, verduras, productos lácteos y otros alimentos con alto contenido de potasio.

El fósforo es difícil de filtrar de la sangre para la hemodiálisis, por lo que es importante limitar los alimentos que lo contienen. El fósforo puede acumularse en grandes cantidades en el torrente sanguíneo y causar debilidad en los huesos, problemas cardíacos, dolor en las articulaciones o úlceras en la piel. Su médico también puede recetarle un medicamento llamado “aglutinante de fosfato” para mantener normales los niveles de fósforo.

El sodio (la sal) hace que el cuerpo retenga más líquido y aumenta la presión arterial. Ingerir menos sodio y beber menos líquido puede hacer que se sienta más cómodo antes y después de sus sesiones de diálisis.



¿Qué puedo comer?

Puede aumentar la cantidad de proteínas (carne magra, aves de corral, pescado y claras de huevo), si están disponibles.

Vitaminas

Aunque las vitaminas no aportan calorías, son importantes porque brindan acceso a los nutrientes de los alimentos. Algunas vitaminas en los suplementos de venta libre pueden acumularse hasta alcanzar niveles tóxicos en los pacientes en diálisis. Si recibe diálisis, su dietista puede recomendarle un multivitamínico adecuado. Consulte siempre a su dietista o a su médico antes de añadir un suplemento. Si le recetan un suplemento vitamínico renal, tómelo después de la sesión de diálisis para evitar que se pierda.



¿Y si tengo diabetes?

Cuenta con las mismas recomendaciones para controlar los carbohidratos que antes de comenzar la diálisis. Cuanto mejor controle sus niveles de azúcar en la sangre, mejor se sentirá. Es posible que necesite cambios en sus medicamentos una vez que esté en diálisis.

EDUCACIÓN DEL PACIENTE
PROBLEMAS COMUNES CUANDO RECIBE DIALISIS
Hipotensión: Los síntomas pueden incluir mareos, aturdimiento o cansancio. Debe estar atento a estos síntomas e informar a su equipo médico si los experimenta. Su equipo médico podría ajustar el tiempo que pasa en diálisis y recomendar restricciones en la ingesta de líquidos.
Náuseas y vómitos: Pueden ser causados por la uremia (acumulación de toxinas en la sangre) u otros factores. Si tiene náuseas o vómitos, hable con su equipo médico.
Síndrome de las piernas inquietas (SPI): Algunos pacientes en diálisis pueden padecer SPI, en el que uno necesita seguir moviendo las piernas porque los nervios y los músculos crean sensaciones incómodas, como hormigueo, cosquilleo o picazón. Se produce cuando se está sentado o acostado y puede interrumpir el sueño. Son varias las causas, como algunas formas de enfermedad renal, uremia, deficiencia de hierro o neuropatía (daño nervioso). Es importante hablar con el equipo médico para obtener un diagnóstico y una receta para tratar la causa específica.
Calambres musculares: Se desconoce la causa exacta, pero se cree que tienen que ver con la eliminación de líquido hacia el final de la sesión de diálisis. El tratamiento abarca estiramientos, compresas calientes en la zona afectada o medicamentos. Hable con su equipo médico si experimenta calambres musculares.
Piel seca y con picazón: Muchos pacientes en diálisis tienen problemas con la piel seca o con picazón. Esto se llama <i>prurito urémico</i> . La picazón en la piel es diferente para cada persona y puede ocurrir en cualquier momento del día, en cualquier parte del cuerpo. Lo importante es tratar de entender qué puede estar causándola y encontrar la mejor manera de controlarla. ¿Qué causa la piel seca y con picazón? Una combinación de factores hace que la piel pique y se reseque. Algunos problemas son: <ul style="list-style-type: none"> • Ingesta limitada de líquidos: la diálisis elimina el exceso de agua de su cuerpo y la ingesta limitada de líquidos entre las sesiones puede causar sequedad y picazón en la piel. • Fósforo no manejado: a menudo, la picazón es causada por los altos niveles de fósforo en la sangre, que pueden unirse con el calcio y ocasionar la sensación de picazón. Si su médico le ha dado aglutinantes de fosfato, le ayudará tomarlos según las instrucciones y a la misma hora todos los días. • Diálisis insuficiente: a veces, una cantidad excesiva o insuficiente de diálisis provoca síntomas como sequedad y picazón en la piel. Hable con su equipo médico sobre sus síntomas y averigüe si está recibiendo la cantidad adecuada de diálisis. • Alergias y otras causas: asegúrese de que no es sensible a los jabones, detergentes para la ropa, lociones o perfumes que esté utilizando. A veces, los tintes y las fragancias en estos productos causan reacciones alérgicas que provocan picazón en la piel. Además, ducharse con agua demasiado caliente puede reseca mucho la piel y provocar picazón. Consejos útiles: <ul style="list-style-type: none"> • Averigüe la causa de la picazón. ¿Hay momentos en que está mejor que en otros? ¿Qué ayuda o la empeora? Informe a su equipo médico de los cambios que siente y observe en su piel. • Encuentre una buena rutina de cuidado de la piel, con limpieza e hidratación diarias. Pregunte a su equipo médico qué cremas hidratantes funcionan mejor para sus síntomas. • ¡No se rasque! Rascarse tiende a empeorar la picazón, e incluso puede dañar la piel y provocar una infección. • Siga la dieta que le ha ordenado su equipo médico junto con sus aglutinantes de fosfato.
Demasiado líquido entre las sesiones de diálisis: Si tiene demasiado líquido en el cuerpo, puede necesitar sesiones de hemodiálisis más largas o más frecuentes. Existe un límite en la cantidad de líquido que se puede eliminar de forma segura durante cada sesión. ¿Cómo le afecta la sobrecarga de líquidos? <ul style="list-style-type: none"> • Hinchazón: en los pies, los tobillos, las muñecas y el rostro es un signo de que hay demasiado líquido en su cuerpo. Esto se llama edema. • Molestias: los calambres, el dolor de cabeza y la hinchazón estomacal pueden hacer que se sienta incómodo. • Hipertensión: el exceso de líquido en el torrente sanguíneo dificulta el mantener una presión arterial saludable. • Dificultad para respirar: el exceso de líquido en su cuerpo puede entrar en sus pulmones y dificultar la respiración.
Cardiopatías: El exceso de líquido puede afectar la frecuencia cardíaca, los músculos cardíacos y el tamaño del corazón. Para evitar la sobrecarga de líquido: <ul style="list-style-type: none"> • Vigile la ingesta de líquidos. • La mayoría de los pacientes en hemodiálisis no debe beber más de 32 onzas al día. Pregunte a su equipo médico qué cantidad de líquido es adecuada para usted y si debe seguir una dieta renal. • Evite los alimentos salados. La sal hace que su cuerpo retenga más líquido. Además, le dará más sed, lo que dificulta el control de la ingesta de líquidos entre tratamientos. • Lleve un registro de su peso diario. Es importante que controle su peso entre las sesiones de diálisis. Si observa un aumento de peso repentino entre las sesiones debe comunicárselo a su médico inmediatamente.

EDUCACIÓN DEL PACIENTE

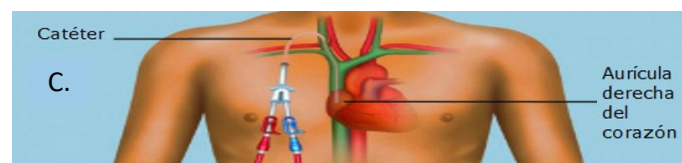
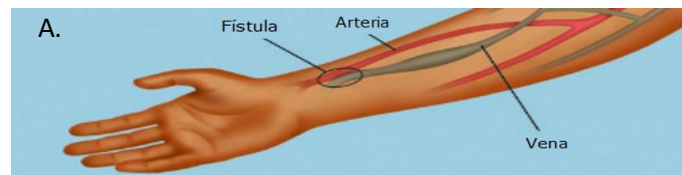
ACCESO VASCULAR PARA LA HEMODIALISIS

Cómo funciona su acceso vascular

El acceso para hemodiálisis, o acceso vascular, es una forma de llegar a la sangre para realizar a hemodiálisis. El acceso permite que la sangre viaje a través de tubos blandos hasta la máquina de diálisis, donde se limpia al pasar por un filtro especial, llamado dializador.

El acceso se coloca en cirugía menor. Usted tendrá uno de los siguientes:

- **Fístula (imagen A):** acceso vascular que se realiza mediante la unión de una arteria y una vena de su brazo. La mejor opción si sus vasos sanguíneos son lo suficientemente fuertes. Da menos problemas y dura más.
- **Injerto (imagen B):** acceso vascular que se realiza con un tramo de tubo blando que imita una vena del brazo. La segunda mejor opción.
- **Catéter (imagen C):** tubo blando que se coloca en una vena grande, normalmente en el cuello. Suele ser temporal, pero a veces es la única opción. Nos esforzamos por no utilizarlo, salvo en casos de emergencia o por muy poco tiempo. Estos catéteres conllevan un riesgo muy alto de infección y otros problemas graves.



Si su acceso es una fístula o un injerto, su enfermero o técnico colocará dos agujas al principio de cada tratamiento. Estas agujas están conectadas a tubos blandos que llegan a la máquina de diálisis. Su sangre fluye a la máquina a través de uno de los tubos, se limpia en el dializador y regresa a usted a través del otro tubo. Si su acceso vascular es un catéter, puede conectarse directamente a los tubos de diálisis sin necesidad de utilizar agujas.

Cuidado de su acceso vascular

Un acceso vascular que no funcione bien puede disminuir la cantidad de diálisis que recibe y, por lo general, resulta en una ida al hospital. He aquí algunos consejos que debería seguir para que la fístula o el injerto duren más tiempo:

Fístula o injerto:

- Lávese con un jabón antibacteriano todos los días, siempre antes de la diálisis.
- No se rasque la piel ni se arranque las costras.
- Revise si hay enrojecimiento, sensación de calor excesivo o alguna espinilla en cualquier zona de su acceso vascular.
- Pida a su equipo de diálisis que rote las agujas cuando se someta a su tratamiento.

Catéter:

- Mantenga limpio y seco el apósito del catéter.
- Asegúrese de que la zona del acceso se limpie y el apósito se cambie en cada sesión de diálisis.
- Mantenga un kit de apósitos de emergencia en su celda en caso de que necesite cambiarlos entre las sesiones.
- Nunca abra el catéter al aire.

Proteja su acceso vascular:

- Revise el flujo sanguíneo varias veces al día sintiendo una vibración, también llamada pulso. Si no lo siente, o si se produce un cambio, consulte a su equipo médico.
- No lleve ropa ajustada ni joyas en el brazo donde está el acceso vascular.
- No lleve nada pesado ni haga nada que pueda ejercer presión sobre el acceso vascular.
- No duerma con la cabeza sobre el brazo que tiene el acceso vascular (está bien dormir de lado que tiene el brazo con el acceso).
- No permita que le coloquen el tensiómetro ni que se le extraiga sangre en el brazo del acceso.
- Aplique una presión suave en el lugar del acceso vascular después de retirar la aguja. Demasiada presión detendrá el flujo de sangre a través del acceso y la sangre puede coagularse.

Si tiene una hemorragia después de la diálisis, aplique una presión suave en el lugar de la aguja con una toalla o gasa limpia. Si la hemorragia no se detiene en 30 minutos, notifique a su equipo de atención médica, vaya al Centro de Tratamiento Correccional (CTC) o a su centro de diálisis.

EDUCACIÓN DEL PACIENTE**TRASPLANTES DE RINON****¿QUE ES EL TRASPLANTE DE RINON?**

Es un procedimiento quirúrgico que consiste en colocar el riñón de un donante dentro del cuerpo, para que realice el trabajo que sus riñones ya no hacen.

El trasplante de riñón trata la enfermedad renal avanzada y la insuficiencia renal, pero no es una cura. Algunas formas de enfermedad renal pueden reaparecer después del trasplante.

**RIESGOS**

Pueden surgir complicaciones graves de la cirugía:

- Hemorragias y moretones que ocurren con mayor facilidad.
- Coágulos de sangre
- Aumento de peso
- Fugas del tubo que une el riñón con la vejiga
- Infecciones (pueden ser graves)
- Insuficiencia del riñón donado
- Rechazo del riñón donado
- Ataque cardíaco
- Accidente cerebrovascular
- Muerte



Los medicamentos DEBEN tomarse todos los días después del trasplante. Tienen efectos secundarios graves, como:

- Pérdida ósea o daño óseo
- Diabetes
- Hirsutismo o calvicie
- Hipertensión
- Altos niveles de colesterol
- Mayor riesgo de cáncer
- Impidiendo que el sistema inmunológico funcione, lo que puede resultar en infecciones que pueden ser graves y peligrosas
- Hinchazón
- Aumento de peso
- Acné

**BENEFICIOS**

- De tener éxito, el trasplante de riñón mejora su calidad de vida y reduce la mortalidad.
- Ya no necesitará diálisis.
- ¡Es posible que experimente más energía y un fuerte apetito!



EDUCACIÓN DEL PACIENTE

TRASPLANTES DE RINON (CONTINUACION)

¿Cómo sé si cumpla con los requisitos para un trasplante de riñón?

Cumplir los requisitos para un trasplante de riñón es un proceso muy detallado que tarda mucho. No todas las personas que desean un trasplante de riñón pueden conseguirlo.

Debe estar lo suficientemente sano como para someterse a la cirugía y no padecer afecciones graves, como el cáncer o problemas de órganos importantes, como cardiopatías, enfermedades hepáticas o pulmonares. Su médico debe rellenar muchos formularios y realizar muchas pruebas, que incluirán información como:

- Historia clínica detallada
- Consentimiento del paciente
- Evaluación de la salud mental
- Examen físico exhaustivo
- Examen dental
- Múltiples análisis de sangre, exploraciones de imagen y otras pruebas



Su equipo de cuidados primarios trabajará con los especialistas para revisar todos los resultados de sus pruebas y formularios y decidir si un trasplante de riñón será seguro y beneficioso para usted.

Es importante que cumpla con todas las pruebas y evaluaciones ordenadas por su equipo de cuidados para no retrasar el proceso de revisión.

¿Quiénes no optan al trasplante de riñón?

Puede que no reciba ningún trasplante de riñón si presenta alguno de los siguientes:

- Tiene cardiopatía grave u otra enfermedad grave de larga duración
- Tiene cáncer activo o padeció cáncer recientemente
- Tiene demasiado sobrepeso
- Bebe demasiado alcohol o consume drogas
- Tiene una enfermedad mental no controlada que su proveedor de salud mental cree que no está controlada
- Tiene antecedentes de no tomar los medicamentos según lo recetado
- No acude a sus citas
- Le cuesta cooperar y llevarse bien con los demás o controlar la ira como es evidente en su historial médico a través de sus interacciones con profesionales de la atención médica o altercados con otros residentes.



¿De dónde puede venir un riñón?

- El riñón puede venir de un donante vivo (familiar o amigo) o de un donante fallecido.
- Si no se recurre a un donante vivo, puede pasar por un proceso para entrar en una lista de espera de riñón de un donante fallecido.
- La llamada Red Unida para Compartir Órganos (United Network for Organ Sharing, UNOS) mantiene esta lista. Cuando hay un riñón disponible, la UNOS decide quién es el siguiente en la lista para obtenerlo. Existen muchas reglas que la UNOS debe seguir.
- La mayoría de las personas pasan, al menos, entre 6 y 9 años en la lista antes de ser seleccionadas para un trasplante de un donante fallecido.
- Mientras esté en la lista de espera, tendrá que mantenerse sano con una alimentación saludable y la tomarse todos los medicamentos.
- También tendrá que hacerse análisis de sangre y pruebas del corazón para verificar que siga cumpliendo los requisitos para recibir un trasplante cuando le llegue el turno.
- Si no se realizan estas pruebas, su situación en la lista de espera puede peligrar.



EDUCACIÓN DEL PACIENTE**MEDICAMENTOS DE VENTA LIBRE A EVITAR CUANDO SE RECIBE DIALISIS**

Algunos medicamentos son peligrosos una vez que inicia la diálisis. La siguiente tabla muestra los medicamentos de venta libre que se deben evitar y por qué. Hable con su equipo médico antes de empezar a tomar cualquier suplemento nuevo.

Medicamentos a evitar	Comentarios
Vitamina D	La vitamina D de venta libre debe activarse en el riñón para que funcione. Cuando recibe diálisis, sus riñones no pueden realizar esta activación. Se le puede recetar vitamina D "activada" en forma de calcitriol, doxercalciferol o alfalcidol para los niveles altos de la hormona paratiroidea. Estas formas de vitamina D funcionan para las personas que reciben diálisis.
Vitamina C	Puede acumularse en el cuerpo y dañar los órganos.
Vitamina A	Puede acumularse en el cuerpo y causar anemia, así como afectar los niveles de colesterol y calcio.
Multivitamínicos	Solo ciertas multivitamínicos son seguros para los pacientes de diálisis. Los de venta libre tienen demasiada vitamina A y C, y pueden dañar sus órganos.
Leche de magnesia (hidróxido de magnesio) o citrato de magnesio	Los riñones eliminan el magnesio. La cantidad de magnesio es mayor en los pacientes con riñones deficientes.
Maalox, Mintox, Gelusil (hidróxido de aluminio/ hidróxido de magnesio/ simeticona)	Muchos de los medicamentos que se usan para tratar la acidez estomacal tienen excipientes que, si se consumen con frecuencia, pueden acumularse en personas con enfermedad renal. También pueden causar estreñimiento, lo que provoca obstrucción intestinal.
Naproxeno	Los analgésicos reducen el flujo sanguíneo al riñón. Además, su uso prolongado en dosis elevadas puede dañar lo que quede de su función renal.
Ibuprofeno	Puede dañar lo que quede de su función renal. Puede elevar el riesgo de insuficiencia renal repentina e, incluso, daño renal progresivo.
Fleet Fosfosoda (para el estreñimiento; vía oral o enema)	Demasiado fósforo; la diálisis no puede eliminar bien el fósforo.

He aquí una lista de medicamentos de venta libre que debe supervisar.

Medicamento a supervisar	Comentarios
Aspirina	No las consuma, a menos que lo indique su médico.
Ranitidina (antiácido)	Deberá ajustarse la dosis en los pacientes con diálisis.
Suplementos herbales	Pueden ser peligrosos debido a la acumulación de toxinas, o interferir con otros medicamentos. Consulte siempre a su médico antes de tomarlos.