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Approval Process

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TABLE OF CONTENT

Acronyms

KDNR	Kidney Donor
MDT	Multidiciplinary Transplant Team
SQUH	Sultan Qaboos University Hospital
ESKD	End-Stage Kidney Disease
GFR	Glomerular Filtration Rate
PKD	Polycystic Kidney Disease
ECG	Electrocardiogram
ETT	Exercise Tolerance Test
HIV	Human Immunodeficiency Virus
HBV	Hepatitis B Virus
HCV	Hepatitis C Virus
CMV	Cytomegalovirus
EBV	Epstein-Barr Virus
VUR	Vesicoureteric Reflux
HUS	Hemolytic Uremic Syndrome
BMI	Body mass index
HLA	Human leukocyte antigens
PRA	Panel of reactive antibodies
SCD	Sickle cell disease
FBG	Fasting blood glucose
IFG	Impaired fasting glucose
PCR	Polymerase Chain Reaction
OGTT	Oral glucose tolerance test
IBD	Inflammatory bowel disease
PSA	Prostate specific antigen

Adult Kidney Transplantation Guideline

Introduction

The Incidence and prevalence of End-Stage Kidney Disease (ESKD) is rising worldwide and in the Sultanate (Al Ismaili et al.)[7]. Kidney transplant is the treatment of choice for most patients with ESKD across the globe. Studies shown that kidney transplantation prolongs patient lifespan relative to dialysis, across most age groups and etiologies of ESKD. Added to that, it reduces the socio-economic burden on the health services that provide care to ESKD patients. The overall risk of developing ESKD after donation remains low, occurring approximately 27 per 10,000 (0.3%) at 15 years, which is much less compared to the general (unscreened) population.

Kidney transplantation started in Royal Hospital in 1987.In order to facilitate prompt and quality service to the potential donors and recipients in a systemic safe way, this pathway and guideline was developed as shown in this document.

Purpose:

To standardize and streamline the process of living adult kidney transplantation related to the potential donors and recipients. In addition, to provide a clear systemic pathway to the concerned health care workers in order to efficiently and safely facilitate the transplantation program at a national level.

Scope:

This document is targeting all nephrology health workers and allied services that are managing patients with chronic kidney disease and end stage kidney disease on dialysis at secondary and tertiary health care facilities all over the Sultanate.

KIDNEY DONOR WORK UP PATHWAY

Referral Potential (Donor(s) for a Recipient

- A referral made indicating interested and willing potential living related donor to a recipient with basic donor (s) eligibility criteria stated below.
- **Eligibility criteria**: Willing, no coercion, Age > 18, BMI < 30, ABO Compatible, No chronic medical problems, basic hematological, renal, liver function and urine studies* are normal.
- Appointment given : **7-14 days**
- Number of potential donors: 1-3
- Note: If BMI 30-35: advice to reduce weight and maycontact KDNR** doctor for further information and discussion with nephrology concerned consultant.

KDNR Clinic Visit 1

- Eligible Donor(s): Extensive medical/ surgical history, examination, BMI, vital check, laboratory, and radiological investigations indicated in the **checklist of donor/recipient**.
- Social worker review
- Psychiatrist review
- Second visit appointment **: 7- 14 days**

KDNR Clinic Visit 2

- Vital check of the donors.
- Review the results of the donor, further blood or repeat labs if needed and radiological investigations accordingly.
- **Book for HLA/cross match for suitable donors (appointment available to SQUH Twice +/week)**
- Third visit appointment : **14-21 days**

KDNR Clinic Visit 3

- Vitals check of the most suitable donor
- Review all results including the HLA and matching test.
- Refer to the transplant surgeon for pre-surgical evaluation: time limit to be seen: 7-14 days.
- Next appointment at KDNR clinic follow up**: 7-21 days** (earlier if the recipient ready)
- **A tentative transplant appointment and MDT*** meeting 2 weeks prior to transplant date with final cross match/PRA repeat**.

Total maximum time limit: 60 days.

*Blood group, complete blood count, Liver function test, Urea and electrolytes, serum creatinine, eGFR, uninlaysis, urine protein creatinine ratio.

NOTES

- *Transplant coordinator to contact potential donors to update and also follow up specially those missed appoitments.*
- *Once transplant is done, donor will be followed in the KDNR clinic appointments regularly for **12-24**months.*

KIDNEY RECIPIEN WORK UP PATHWAY

Referal Potential (recepient with donor(s))

- Its encouraged as part of comprehensive End stage Kidney Disease patients management to initiate the process of patients education and donor(s) allocation as soon as possible (as early as chornic kidney disease stage 4). A referral with medical information made indicating interested potential kidney recipient with available related eligible donor (s) (see Donor pathway scheme)
- **Eligible potential recepient:** No active infection, malignancy, severe cardiovascular disease, active lupus/vasculitis or psychiatric illness.
- Appointment given :**7-14 days**

KDNR * clinic Visit 1

- Eligible potential recepient: Extensive medical/surgical history, examination, BMI, vitals check, laboratory and radiological investigations as indicated in **check list of donor/recepient.**
- **Consultations as per patient co morbids**
- Social worker review
- Psychiatrist review
- Second visit appoitment: **14-21 days**

KDRN Clinic Visit 2

- Vitals check of the potential recepient and any medical updates.
- Review the investigations results, further blood or repeat labs if needed and radiological tests accordingly
- Facilitate any pending vital investigations and consultations.
- **Book for HLA/cross match for suitable donors. (appoitment avaliable SQUH Twice+/week)**
- Third visit appoitment: **14-21 days**.

KDRN Clinic Visit 3

- Vitals check
- Review all results including the HLA, cross match and PRA.
- Refer to the transplant surgeon for pre-surgical evaluation: time limit to be seen: **7-14 days**.
- Next appointment at KDNR clinic follow up: **7-14 days**
- A tentative transplant appointment and MDT** meeting 2 weeks prior to transplant date with final cross match and PRA repeat.

Total maximum time limit: 60 days

NOTES

- *Transplant cordinator to contact potential recepient to update and also follow up specially those missed appoitments.*
- *Once transplant is done, the recepient will be followed in transplant clinic appoitments.*

ABSOLUTE AND RELATIVE CONTRA INDICATION

FOR LIVING KIDNEY (DONOR)

The following reasons could exclude a living donor candidate from donating based upon scientific data of medical risk, psychological assessment, and/or consensus on best practice:

1. **Age < 18 years**
2. **Uncontrolled hypertension at any age.**
    - Hypertension (i.e. BP above 130/80 mmHg) in someone younger than 50 years old.
    - Hypertension with evidence of end organ damage.
    - Hypertension in patients with positive first-degree family history of hypertensive renal disease.
3. **Diabetes (diagnosis of diabetes).**
4. **History of thrombosis or embolism.**
5. **Active Psychiatric Condition.**
6. **Obesity: BMI ≥ 35kg/m2.**
7. **Clinically significant Coronary Artery Disease.**
8. **Symptomatic heart Valvular Disease.**
9. **Significant hematological disorder (e.g.: SCD).**
10. **Chronic lung disease with impairment of oxygenation or ventilation.**
11. **Recent malignancy, or cancers with possible recurrence (e.g. breast cancer).**
12. **Urologic abnormalities of donor kidney.**

13. **Potential donors with measured creatinine clearance stated below should be excluded:**
    - Donor candidates with mGFR <60 ml/min/1.73 m2 should be excluded from donation.
    - If potential donor is aged 18 to 30 years: mGFR <90 mL/min per 1.73 m2.
    - If potential donor is aged 31 to 40 years: mGFR <85 mL/min per 1.73 m2.
    - If potential donor is aged 41 to 65 years: mGFR <80 mL/min per 1.73 m2.
    - If potential donor is aged >65 years: mGFR <75 mL/min per 1.73 m2.
14. **Peripheral vascular disease.**
15. **Proteinuria > 300 mg/24 hours.**
16. **Viral infection (HIV, Hep B, Hep C)** (Hep B cAB acceptable if the recipient is immunized and counselled about risk, and there is no active disease in the donor) (Gastroenterologist/ID may be consulted)
17. **First-degree relatives of individuals with diagnosed autosomal dominant polycystic kidney disease and less than 40 years in age.**

NOTES

- ***Note 1****: It is* ***not*** *recommended to accept a living donation from a genetically related donor for a recipient who is suspected to have atypical HUS as their underlying kidney disease unless the responsible mutation has been conclusively excluded in the donor.*
- ***Note 2:*** *It is better* ***not to accept*** *a mother as a potential donor for a recipient diagnosed with Alport syndrome. The risk of the potential donor to develop ESKD later might reach to 15%.*

MEDICAL ISSUES THAT WILL REQUIRE EMPHASIS DURING AN EVALUATION OF RELATIVE CONTRA INDICATIONS

❖ **Obesity (BMI 30-35)**

Donor candidates with a prior history of bariatric surgery should be assessed for risk of nephrolithiasis and nephrocalcinosis by renal imaging and 24-hour urine metabolic studies.

18. **Abnormal glucose tolerance test 2-hour OGTT ≥ 7.8 mmol**

- **Acceptance Criteria:**

☑ FBG <6.1 mmol/L on 2 occasions and A1C <6.0% x 2.

☑ IFG, FBG between 6.1 mmol/L and 6.9 mmol/L or A1C 6.0% to 6.4% on at least one occasion with 2-hour OGTT <7.8 mmol/L.

- **Exclusions Criteria:**

⌧ FBG ≥7 mmol/L on 2 occasions or A1C >6.5%

⌧ IFG, FBG between 6.1 mmol/L and 6.9 mmol/L or A1C of 6.1% to 6.4% on at least one occasion with 2-hour OGTT >7.8 mmol/L.

⌧ Potential donor with a history of gestational diabetes <10 years previously or a 2-hour OGTT >7.8 mmol/L, independent of the results of the FBG.

19. **Kidney stones** (unless single stone with normal metabolic studies and no possibility of a recurrence)

A potential donor with a history of prior stone or asymptomatic unilateral stone detected on imaging or patient with a known family history of nephrolithiasis in a first degree relative should have a 24-hour urine stone panel that include 24-hour urine collection for Ca2+, Phosphate, citrate, urate, creatinine and Na+.

- **Acceptance Criteria:**

☑ Donors with an asymptomatic small (<5mm), unilateral stone and negative metabolic workup and no history of recurrent kidney stones. The kidney with the stone is used for transplantation.

- **Exclusions for Donation:**

⌦ Donors with bilateral stones found on imaging.

⌦ 2. Donors with history of stones and metabolic predisposition to stones that is not correctable.

20. **Distant history of cancer.**
21. **Past history of psychiatric disorder**
22. **Reno Vascular Disease** (not atherosclerosis related)

i.e. Fibromuscular dysplasia of renal artery

23. **Thin basement membrane disease**
24. **Prior valve surgery**
25. **Moderate Cardiac Valvular Disease with otherwise normal echocardiographic findings**
26. **Mild sleep apnea without pulmonary hypertension**
27. **Proteinuria <300 mg/24 hours**

Potential donor with persistent Proteinuria <300 mg/day (more than three measurements with 3 months' interval) need individual assessment for their risk of living donation.

❖ **Sickle cell trait**

Can be considered if there is no other more suitable donor provided that the low potential risks explained (i.e. malignancy and ESKD) and the donor has no other detected contraindications.

28. Hematuria:

Persistent Hematuria is defined as the presence of blood in more than 50% of urine samples (more than 10 in females, and more than 8 in males in urinalysis) and to confirm by the finding of >4 RBCs per HPF on microscopy.

Donor candidates with persistent microscopic hematuria should have a thorough urological evaluation and consideration of a kidney biopsy prior to donation.

Persistent hematuria of glomerular origin as a contra-indication to living donation, because it may indicate renal disease in the donor. However, thin basement membrane disease might be an exception.

ABSOLUTE AND RELATIVE CONTRA INDICATION FOR LIVING KIDNEY DONATION (RECIPIENTS)

Absolute Contra Indication

The following reasons could exclude a living kidney transplantation candidate based upon scientific data of medical risk, psychological assessment and/or consensus on best practice:

- **Positive CDC-AHG crossmatch***.
- **Blood-type incompatibility*.**
- **Non-compliance, active substance abuse.**
- **Obesity:** BMI> 35kg/m2
    - Exception:

    ⌦ BMI 35 -45 kg/m2 if the transplant surgeon determines that the candidate's body habitus is such that it does not constitute an increased surgical risk (presence co morbid conditions may as well add to this).
- **Active infection (until resolved)**.
- **Active malignancy under treatment**:

  Depending on the type, stage, and grade of cancer, and the type of treatment given (2-5yrs post treatment (cured)).
- **Certain severe, uncontrollable medical problems:**

  poor prognosis, poor functional status (e.g.: severe, uncontrollable heart disease, lung disease, liver disease, and mental illness).
- **Pregnancy**
- **<u>NOTES</u>**

  Patients with liver cirrhosis (unless being considered for a combined liver/kidney transplant) considered absolute contra indicated.

MEDICAL ISSUES THAT WILL REQUIRE SPECIAL EMPHASIS TO THE POTENTIAL RECIPIENT RELATIVE CONTRA INDICATION

- **Extreme age**:

There is no firm upper limit cut-off; however close attention should be paid to intercurrent conditions that would increase the risk of morbidity and mortality beyond that attributable to old age alone especially post operatively.

- **Patients who are above 65 years old will be evaluated and may be excluded if the following conditions are present:**

☑ Cardiac disease that places the recipient at high risk for an adverse perioperative cardiac event.

☑ Longstanding diabetes with significant clinical complications.

☑ Obesity (BMI over 35 kg/m2).

☑ Active cigarette smoking (within six months).

☑ Chronic obstructive pulmonary disease after pulmonologist evaluation.

☑ Recurrent or recent stroke (within one year).

☑ Inadequate long-term social/family support.

☑ Poor functional status.

SPECIAL CONSIDERATION: POTENTIAL RECIPIENT

HEPATITIS B OR HEPATITIS C OR HIV

1. Hepatitis B or C infection may be a contraindication to kidney transplantation, especially if there is an evidence of active hepatitis or cirrhosis. Patients with quiescent disease and a benign liver biopsy can proceed with kidney transplantation, although treatment may be required prior. Hepatologist review and opinion may be required.

2. HIV per se in not a contra-indication for kidney transplantation. (1C) though this is beyond the scope of this document. Potential recipients can be enrolled when a suitable program is initiated if:

   ☑ They are compliant with treatment, particularly HAART therapy.

   ☑ Their CD4+ T cell counts are > 200/μL and have been stable during the previous 3 months.

   ☑ HIV RNA was undetectable during the previous 3 months.

   ☑ No opportunistic infections occurred during the previous 6 months.

   ☑ They show no signs compatible with progressive multifocal leuko-encephalopathy, chronic intestinal cryptosporidiosis, or lymphoma. (1C)

EVALUATION PROCESS OF KIDNEY DONOR (S)

The living kidney transplantation work-up consists of comprehensive medical, surgical, and psychosocial evaluation.

1. The potential donor should be competent (having a decision-making capacity).
2. Willing to donate, free from coercion (pressure).
3. Medically suitable.
4. Psychosocially suitable.
5. Fully informed about the alternative treatments available to the potential recipient.
6. Understands that his/her participation is completely voluntary and can be withdrawn at any time without any consequences.

NOTE:

- ***A specialized psychosocial assessment will help in validating the above.***

An informed Consent should be obtained from any potential donor covering the following points:

1. Undergoing the evaluation is not a commitment to donate; the process can stop at any time.
2. The physicians may turn down the potential donor and will inform the reason.
3. The information obtained during the course of the evaluation is confidential.
4. Tests like for HIV, Hepatitis and other infections will be obtained.
5. There are some risks and discomfort associated with some of the tests (blood draws, I.V. contrast etc.).
6. There are potential financial costs to the donor related to time off work, travel expenses etc.
7. There are potential study and research uses to the information obtained.

NOTE:

- ***A specialized psychosocial assessment will help in validating the above.***

The general goals of the medical evaluation to the potential donor is to:

1. Assess the general health and surgical risk of the donor including screening for conditions that may predict complications from having one kidney in the future.
2. Assess the anatomy and function of the kidneys.
3. Determine if there are diseases present that may be transmitted from donor to recipient.
4. Assess the immunologic compatibility of the donor to the recipient.

In the process of living kidney donor evaluation. The evaluator should be verse in the **absolute** and **relative** contraindications of donation. The risk versus benefit from donation should be objectively assessed.

The Comprehensive Medical, Surgical, and Psychosocial evaluation is composed of the following:

MEDICAL EVALUATION

A. HISTORY AND PHYSICAL EXAMINATION

Obtain complete medical/surgical history of the potential donor

1. ***Past medical conditions*** like HTN, DM, CAD, GI disease, Lung disease, autoimmune disease, neurologic disease, genitourinary disease, hematologic disorders, bleeding or clotting disorders, history of cancer including melanoma, history of infections, and allergies.
2. ***A kidney-specific history*** including (genetic kidney diseases, proteinuria, hematuria, kidney injury, diabetes, including gestational diabetes, nephrolithiasis, and recurrent UTI).
3. ***Medication history*** including (nephrotoxic medications and chronic use of pain medication).
4. ***Family history*** **like** chronic kidney disease, DM, HTN, CAD, connective tissue autoimmune or vasculitis and Cancer.
5. ***Social history*** including (occupation, employment, social support; smoking, alcohol, and drug use and abuse. psychiatric illness, depression).
6. ***Examination*** of Height, Weight, BMI, BP at least on 2 occasions or by 24-hour ambulatory blood pressure monitoring. Complete physical examination of all organ systems.

B. LABORATORY AND IMAGING TESTS

1) General Tests:

- ***Electrocardiogram (ECG)***

- ***Blood typing*****:** Blood group; Rh factor, and HLA

- ***Chemistry*****:** Na, K, Cl, CO2, Ca, PO4 urea, uric acid, albumin, AST or ALT, bilirubin, FBG, A1C, fasting lipids and Serum Creatinine with eGFR. (To be updated 1-2 weeks prior to transplantation date).

- ***Hematology*****:** CBC and INR/PTT. (to be updated 1-2 weeks prior to transplantation date) G6PD and Hemoglobinopathies to be done.

- ***Infectious diseases*****:** screening tests for HIV, HBV, HCV, CMV, EBV VZV, TB Quantiferon, syphilis, Brucella and schistosomiasis, Toxoplasmosis (considered as per geographical background and high-risk environment).
  The risk of acquiring COVID-19 from organ donation is low. Donors are screened for COVID-19 symptoms, exposure history and SARS-CoV-2 PCR not earlier than 48 hours before donation. For living donors who had recent history of COVID-19 infection, donation should be postponed for 14 to 28 days post recovery. For living donors with no h/o COVID-19 infection, vaccination should be given to all donors above 12 years old at least 6 weeks before transplantation. (May consult ID specialist).

- ***Pregnancy test*** for women of child-bearing age
- ***Urine:***
- Urinary protein— Random spot urine for PCR and or 24-hour protein.
- Hematuria—random urine sample (urinalysis, urine microscopy and mid-stream urine culture).
- 24-hour urine to assess for creatinine clearance occasions and/maybe-direct measure of GFR (e.g. DTPA scan if indicated).

- ***Imaging*:** Chest X-ray, Ultrasound abdomen and abdominal CT angiogram/MRA with specific comment on the radiology report of renal anatomy and vasculature.

2) Specific Tests

- ***Kidney focused evaluation:***
    a) Urine microscopy and culture.
    b) Protein excretion: UPCR or 24-hour urine for protein and microalbumin excretion **two** different times.
    c) Glomerular filtration rate (GFR) measurement-clearance testing, 24-hour urine for creatinine clearance measurement must be done if abnormal to repeat. If still consistently low, a nuclear glomerular filtration rate test may be required.

NOTE:

- ***Screen for Polycystic Kidney Disease (PKD) as indicated by family history. (See Absolute and relative contraindication of kidney donation)***

- ***Metabolic focused evaluation:***
    1. Fasting blood glucose, HgbA1C and 2-hours oral Glucose Tolerance test
    2. Uric acid
    3. Fasting lipid profile
    4. TSH

NOTE:

- ***If there is a history of gestational diabetes, or family history of diabetes in a first-degree relative or with prediabetes then the potential donor should be counselled regarding their increased lifetime risk for progression to diabetes and subsequent end-organ complications. Healthy lifestyle behaviors important to reduce the risk.***

- ***Cardiovascular focused evaluation***:

1. Electrocardiogram (ECG)
2. Echocardiogram (ECHO) or Exercise Tolerance Test (ETT) and any further tests as indicated by history and physical examination.

- ***Respiratory focused evaluation***:

1. Chest x-ray
2. Pulmonary function test especially when clinically indicated.

- ***Infections focused evaluation***:

All potential donors should be screened for:

1. Human Immunodeficiency Virus (HIV)
2. Hepatitis B Virus (HBV)
3. Hepatitis C Virus (HCV)
4. Cytomegalovirus (CMV)
5. Epstein-Barr Virus (EBV)
6. Treponema pallidum (Syphilis)
7. Mycobacterium tuberculosis (MTB).
8. Some further tests can be done and is determined by the history, geographical /environmental factors (e.g.: Brucella)
9. SARS-CoV-2

In general, donor risk factor and microbiological screening should be performed or updated as close to donation as possible. For HIV, a reasonable update would be 3 to 6 months compared to HBV and HCV which should be updated within **1 to 3 months prior to donation**. As for the Microbiological screening, it should be updated within **14 days** prior to donation as indicated.
For COVID-19, PCR should be done not more than 48 hours prior to the transplant.

- **Autoimmune/Vasculitis focused evaluation:**

Depending on the history and examination including

1. ANA/AntiDsDNA
2. ANCA
3. IgA
4. ESR/CRP
5. Complements.

SPECIAL CONSIDERATIONS WHILE EVALUATING A POTENTIAL DONOR

- **MALIGNANCY RISK RELATED EVALUATION:**

Testing for malignancy is to be performed depending on medical history and family history with **referral to the concerned specialty if needed.**

Potential donors with treated cancer may be accepted on a case-by case basis if the risk of transmission or recurrence is deemed to be low, as determined by the oncology team.

- **SURGICAL RELATED EVALUATION**

All potential donors should have renal imaging (such as a CT angiogram) to assess renal anatomy prior to nephrectomy. Any further required tests should be at the discretion of the evaluating transplant surgeon and need to be arranged by them.

- **PSYCHOSOCIAL EVALUATION**

Evaluation for any psychosocial issues, including mental health issues that might complicate the living donor's recovery. Review of the living donor's history of smoking, alcohol, and drug use, abuse, and dependency.

Determination that the living donor understands the short- and long-term medical and psychosocial risks for both the living donor and recipient associated with living donation.

Assessment of whether the decision to donate is free of inducement, coercion, and other undue pressure by exploring the reasons for donating and the nature of the relationship, if any, to the transplant candidate.

Assessment of the living donor's ability to make an informed decision and the ability to cope with the major surgery and related stress.

Review of the living donor's occupation, employment status, heath and living arrangements, and social support.

EVALUATION PROCESS OF KIDNEY RECIPIENT

The Living kidney transplantation work-up consists of comprehensive medical, surgical, and psychosocial evaluation. In the process of living kidney recipient evaluation, the evaluator should be verse in the absolute and relative contraindications of transplantation. The risk versus benefit from the transplantation should be objectively assessed. During the evaluation process, many at times it might be necessary to seek expert opinion from different medical/surgical disciplines.

A. The general goals of the medical evaluation to the potential recipient is to:

1. To ensure transplantation is technically possible;
2. To ensure the recipient's chances of survival are not compromised by transplantation;
3. To ensure that graft survival is not limited by premature death.
4. To ensure pre-existing conditions are not exacerbated by transplantation.
5. To identify measures to be taken to minimize peri- and post-operative complications.
6. To inform the recipient of the likely risks and benefits of transplantation.

B. An informed Consent should be obtained from any potential recipient comprehending the following points:

1. A donor should be available and willing to initiate the process of evaluation.
2. The evaluation will be comprehensive as per the international guidelines.
3. The physicians may turn down the recipient and will inform the reason.
4. The information obtained during the course of the evaluation is confidential.
5. Tests like for HIV, Hepatitis and other infections will be obtained.
6. There are some risks and discomfort associated with some of the tests (blood draws, I.V. contrast etc.).
7. There are potential financial costs to the recipient related to time off work, travel expenses etc.
8. There are potential study and research uses to the information obtained
9. The surgical technique and possible complications.
10. The expected graft survival after transplantation according to native kidney disease and other co morbid conditions present.

11. The possibility of kidney rejection despite measures that will be taken to prevent or minimize it.
12. The possibility of recurrence of native or de-novo glomerular disease post kidney transplantation
13. The possible increase in incidence of infection or malignancy in comparison to normal population as the recipient will be on immunosuppressive medications
14. The measures that will be taken to minimize peri- and post-operative complications.

The Comprehensive medical, surgical, and psychosocial composed as follow:

C. History And Physical Examination

Obtain complete medical/surgical history of the potential recipient. The primary kidney disease of the recipient to be stated and assessment of its activity to be considered.

1. ***Past medical conditions*** (like: HTN, DM, CAD, GI disease, Lung disease, autoimmune disease, neurologic disease, genitourinary disease, hematologic disorders, bleeding or clotting disorders, history of cancer including melanoma, history of infections, and allergies)
    a. Compliance history is also important.

2. ***A kidney-specific history*** including (genetic kidney diseases, proteinuria, hematuria, kidney injury, diabetes, including gestational diabetes, nephrolithiasis, and recurrent UTI).
3. ***Medication history:*** complete medication history to be obtained.
4. ***Family history:*** (Coronary artery disease, cancer, kidney disease, DM, HTN, connective tissue, autoimmune or vasculitis).
5. ***Social history:*** including (occupation, employment, social support; smoking, alcohol, and drug use and abuse. psychiatric illness, depression).
6. ***Examination:*** Height, Weight, BMI. BP at least in 2 occasions or by 24-hour ambulatory blood pressure monitoring. Complete physical examination of all organ systems.

D. Laboratory And Imaging Tests:

- ***Initial workup:***

1. **Hematology:** CBC Iron profile and coagulation profile, G6PD and Hemoglobinopathies screen.
2. **Chemistry:** Na, K, Cl, CO2, Ca, PO4, PTH, Vit - D urea, uric acid, albumin, AST or ALT, bilirubin, FBG, HgbA1C, fasting lipids and Creatinine with eGFR.
3. **Immunology** (Blood Group, HLA, PRA)
4. **Infections related:** (CMV, EBV, HIV, VZV, HCV serology, HBV serology, VDRL, TB Quantiferon).
5. **Electrocardiogram (ECG).**
6. **Echocardiography.**
7. **CXR.**
8. **Abdominal /CT-Angiography for all potential recipients specially if the following conditions present:**
    i. Long standing diabetic patients either Type I or II
    ii. Patient with IHD or with clinical evidence of PVD.
    iii. Patient with tertiary Hyperparathyroidism with possible calciphylaxis (calcific uremic arteriolopathy)
    iv. Patient with longstanding Femoral. Permanent Catheter or multiple femoral vein access.
    v. Patient on dialysis more than 1 year.

If the potential recipient not on dialysis and the intended transplant is pre-emptive, USG doppler can be ordered with consultation of the transplant surgeon.

- ***Further workup and conditions:***

Depending on age, co morbid conditions and risk stratification. These might require referral to the allied specialized care for in depth assessment and clear clearance for kidney transplantation.

1. **Evaluation related to cause of kidney disease:**

Identifying the cause of kidney disease can be critical in pre-transplant counseling and assessment. For example, primary FSGS recurs in approximately 40 % of patients, leading to graft failure in close to 50 % of these recurrences. Patients with recurrent FSGS in a first kidney transplant have an approximately 70 % risk of recurrence in a second graft repeat transplantation of a patient who lost a first graft to recurrent FSGS should only be performed with careful informed consent.

2. **Obesity*:***

If BMI >35, patient should be encouraged strongly to lose weight. Obesity increases the risk of wound complications, DGF, NODAT and probably slightly reduces graft survival. Obesity also increases the risk of mortality and cardiovascular disease.

3. **Cardiology disease related:**

All patients should be assessed for the presence of IHD before kidney transplantation. The minimum required investigations include history, physical examination, ECG, and echocardiogram. Further testing based on risk stratification and referral to cardiologist for such is required. The following is just a reference guideline:

Low risk	Those not for filling **Intermediate risk criteria.**
Intermediate risk	**Those not filling Intermediate** Multiple risk factors for CAD (three or more): ▪ Age >50 years ▪ Prolonged duration of chronic kidney disease ▪ Family history of CAD (first-degree relative) ▪ Significant smoking history ▪ Dyslipidemia (high-density lipoprotein level <0.9 mmol/L or total cholesterol >5.2 mmol/L), BMI ≥30 kg/m^2 ▪ History of hypertension
High risk	Patients with positive noninvasive test, or all patients with anginal Symptoms, cardiomyopathy with decrease EF, DM 1 with Diabetic nephropathy.

4. **Kidney transplantation is contraindicated in patients with IHD in the following situations:**

- Patients with progressive symptoms of angina (Grade A)
- Patients with a myocardial infarction within six months (Grade A)
- Patients without an appropriate cardiac work-up (Grade C)
- Patients with severe diffuse disease, especially with positive noninvasive tests in whom intervention is not possible and in whom expected survival is sufficiently compromised so that transplantation is not reasonable (Grade C).

Patients with a negative noninvasive stress test who have diabetes or a previous history of CHD should undergo repeat noninvasive testing annually. In patients without diabetes or a previous history of CHD who have a left ventricular ejection fraction of ≤ 40 percent, peripheral vascular disease, or ≥2 traditional risk factors, we repeat noninvasive testing every two years.

5. **Left Ventricular dysfunction:**

Patients with severe irreversible (non-uremic) cardiac dysfunction is not candidate for kidney transplant alone and should be considered for combined heart-kidney transplants (Grade C).

Patient with LV dysfunction need to be seen by cardiologist to rule out irreversible causes of cardiac dysfunction before listing him for transplantation.

6. **Cerebrovascular disease related:**

Patients with a history of stroke/TIA should be evaluated by a neurologist and receive carotid Doppler studies. If carotid surgery is indicated, it should be done prior to transplantation. Defer Transplant for 6 months in patient with stroke /TIA (stroke recurrence risk is 7-11 %/year).
For patients with ADPKD, MRA Versus CTA might be needed if there is a history of headaches or a family history of aneurysm/CVA or Sudden death. Neurosurgical evaluation prior to transplant warranted if aneurysm found.

7. **Peripheral vascular related disease:**

This should be carefully assessed by vascular and transplant surgeon in every transplant candidate, particularly those with diabetes, cardiovascular disease, or history of PVD. Options to assess the vasculature include Doppler ultrasound and abdominal CT angiography. Severe bilateral iliac or lower extremity arterial disease or large abdominal aneurysms that are not amenable to intervention are contradictions to transplant.

8. **Pulmonary related disease:**

Pulmonary function test and review by pulmonologist might be needed

Patient not candidate for kidney transplantation if they are:

- On home oxygen therapy.
- Uncontrolled asthma.
- Severe cor pulmonale or uncorrectable moderate to severe pulmonary hypertension.

9. **Gastrointestinal disease related:**

- All patients should get OGD done prior. An evaluation by gastroenterologist might be obtained.
- Patients with active peptic ulcer disease should not be transplanted until the disease is successfully treated.
- Patient with history of Active hepatitis is a Relative contraindication. Patients with history of chronic liver disease need to be assessed by Hepatologist. Patient with bridging fibrosis or cirrhosis are not candidates for kidney transplant alone and should be considered for combined liver-kidney transplant.
- All transplant candidates infected with HBV should be assessed for evidence of viral replication by testing for serum transaminases, hepatitis B e-antigen (HBeAg) and HBV PCR. They may also undergo liver biopsy (Grade C).
- Acute Pancreatitis and Active IBD within **6/12** are contraindication for transplantation.
- Patients with known colonic polyps, diverticular disease, inflammatory bowel disease, or at high risk for colon cancer (i.e., family history of colon cancer or familial adenomatous polyposis) should be evaluated with a CT colonography or colonoscopy (see malignancy section)
- Patients with previous cholecystitis or suggestive symptoms should be considered for cholecystectomy before kidney transplantation.

10. **Hematology related:**

A hematologist review is recommended in cases if abnormalities detected for example (thrombophilia, hypercoagulability, monoclonal gammopathy, persistently abnormal blood counts).

Patients who are on long-term anticoagulation **for any reason** and are candidates for kidney transplantation but require a clear perioperative anticoagulation plan. This should be developed as part of the transplant assessment.

11. ***Malignancy related:***

- Patient should be tumor free before proceeding with transplantation.
- Age appropriate screening for colon cancer, prostate, cervical and breast cancer.
- **Breast:** Mammogram for age more than 40 years old, earlier if there is a family history.
- **Cervical:** Pap smear for age more than 21.
- **Prostate:** PSA for patient more than 50 years old.
- **Bladder:** cystoscopy should be considered for high-risk patients with past exposure to cyclophosphamide or those with analgesic nephropathy
- **Colon:** for patient older than 45 years or younger age with family history, several screening options are available, including fecal occult blood, CT colonography and colonoscopy, each of which has its own advantages and disadvantages. A referral to gastroenterology is recommended for colon cancer screening and clearance.
- **Lung:** CT chest as lung cancer screening may be recommended for individuals who are at high risk, such as chronic heavy smokers.

Minimum waiting time after successful Cancer treatment range between 2 years to more than 5 years before transplantation:

Breast	Early Advanced	At least 2 years At least 5 years
Colorectal	Dukes A/B Duke C Duke D	At least 2 years 2-5 years At least 5 years
Bladder	Invasive	At least 2 years
Kidney	Incidentaloma (< 3 cm) Early Large and invasive	No waiting time At least 2 years At least 5 years
Uterine	Localized Invasive	At least 2 years At least 5 years
Cervical	Localized Invasive	At least 2 years At least 5 years
Lung	Localized	2-5 years
Testicular	Localized Invasive	At least 2 years 2-5 years
Melanoma	Localized Invasive	At least 5 years Contraindicated
Prostate	Gleason ≤6 Gleason 7 Gleason 8-10	No waiting time At least 2 years At least 5 years
Thyroid	Papillary/Follicular/ Medullary Stage 1 Stage 2 Stage 3 Stage 4 Anaplastic	 No waiting time At least 2 years At least 5 years Contraindicated Contraindicated
Hodgkin Lymphoma	Localized Regional Distant	At least 2 years 3-5 years At least 5 years
Non-Hodgkin Lymphoma	Localized Regional Distant	At least 2 years 3-5 years At least 5 years
Post-transplant lymphoproliferative disease	Nodal Extranodal and cerebral	At least 2 years At least 5 years

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Rational for waiting post cancer treatment:

For most cancers, post-transplant recurrence rate increases as the waiting time from treatment to transplantation is reduced. For example, the cancer recurrence rate was 54% in those who waited less than 2 years from cancer treatment to renal transplantation, 33% for those who waited 2–5 years and 13% in those who waited more than 5 years before transplantation.

12. **Urology related diseases:**

- Bladder dysfunction in children should be identified and treated before proceeding with renal transplantation. Voiding cystourethrogram and urodynamic studies should be included as part of the transplant evaluation in all patients with congenital obstructive uropathy or known bladder dysfunction, history of urinary tract infection, vesicoureteric reflux (VUR) or renal hypoplasia–dysplasia and in young children where the cause of ESRD is unknown.
- High-grade VUR predisposes patients to infection post transplantation, and corrective surgery should be considered before transplantation.
- Kidney transplantation is not contraindicated in patients with a dysfunctional bladder. Most patients can be managed without surgery using self-catheterization, if necessary. A surgical approach, if needed, should be individualized.
- Patients with an ileal conduit require a loopogram to document the course and length of the conduit before transplantation. Consideration should be given to urinary undiversion before transplantation in selected patients.
- Native nephrectomy may be required in some cases like patient with ADPKD who have massive kidneys that would preclude surgical placement of the allograft or in the presence chronic parenchymal infection, infectious stones or obstructive uropathy complicated by chronic infections.

13. **Infections related conditions: (ID consultation might be needed)**

- The patient should be free of all active infection before transplantation.
- The patient should be evaluated and treated adequately for tuberculosis before undergoing transplantation.

- Dental infections should be treated prior to transplantation and patient with a history of dental infection should be assessed by dentist.
- There are no data to recommend an optimum infection-free interval before transplantation, but documentation of the eradication of infection after completion of antibiotic therapy is appropriate.
- All patients being assessed for kidney transplantation should be screened for HIV infection. Transplantation in HIV positive patient need special consideration and this *is beyond the scope of this document.*
- Re-transplantation should be delayed after graft loss due to BK virus nephropathy until viral replication is absent.
- Appropriate transplant recipients should be immunized against influenza, pneumococcus, hepatitis B, and varicella if antibody negative. Vaccination for *Haemophilus B influenzae* and meningococcus should be considered in asplenic individuals and those who may require therapy with Rituximab or eculizumab (High risk transplant). In addition, covid19 vaccine should be given to all recipient above 12 years of age at least 6 weeks before transplantation. For recipient less than 12 years of age, COVID-19 vaccination should be decided by their pediatrician.

NOTES

- Base line HBV DNA for the patient with HB core IgG positive and negative HBsAg and HBsAb is necessary with three monthly in first year then 6 monthly in the 2nd year then yearly.
- Patients with low HBsAb titer, Negative HB core IgG/M and HbsAg can be given booster dose of hepatitis B vaccination if there is enough time and if not and the risk is high then to be given 2000 IU of HB Ig if HBs Ab titer < 10 IU/mL.
- Potential exposure history should also prompt testing and appropriate treatment for parasitic infections such as strongyloidiasis and endemic mycoses such as histoplasmosis and coccidiomycosis, brucellosis, toxoplasmosis and schistosomiasis.

PRE TRANSPLANT IMMUNIZATION

Pre-transplant immunization is an important strategy to decrease post-transplant viral infections co morbidity. All potential transplant recipients should have been immunized before transplant according to past immunization history. Antibody levels are determined at time of referral and patients are referred to public health for the appropriate vaccinations and boosters.

Patients should receive the following vaccinations prior to transplant:

1) Td or Tdap for (Tetanus, Diphtheria and Pertussis).
2) IPV (for Polio).
3) Hepatitis B.
4) Meningococcal (conjugate).
5) Pneumococcal (conjugate and/or polysaccharide).
6) Hib.
7) Influenza.
8) MMR for (Measles, Mumps and Rubella).
9) Varicella.

Live vaccines (MMR and varicella) administered before the transplant must be completed at least six weeks before transplantation.

Yearly influenza immunization is indicated for all immunosuppressed individuals.

Donor Anti-HBc	Recipient HBsAg	Recipient Anti- HBs	Post transplant HBV Prophylaxis strategy
+	+	-	Nucleoside/nucleotide analog and HBIg (combination); generally life long
+	-	+	Short course of HBIg with or without Nucleoside/nucleotide
+	-	-	HBIg monotherapy or in combination with Nucleoside/nucleotide, prolong treatment but may not be life ling

Anti- HBc positive Donor: Recipient Prophylaxis strategies

PSYCHO SOCIAL EVALUATION:

Psychosocial Evaluation:

The goals of the psychosocial evaluation are to identify behavioral, social, and/or financial issues that may influence compliance and outcomes after transplant.

Patients with a history of psychiatric disease, such as depression or schizophrenia, should be evaluated by a specialist, to ensure that the disease is well controlled before proceeding with transplantation and that follow-up care is adequate.

Active drug abuse, especially of nephrotoxins such as cocaine and heroin, is an absolute contraindication to transplantation; however, successful treatment of drug abuse may permit future transplantation.

Other important considerations:

1) Renal transplant candidates with primary hyperoxaluria should be considered for isolated renal transplantation if they are pyridoxine-sensitive and have minimal oxalate deposition. Combined liver–kidney transplantation should be considered in patients with severe systemic oxalosis.

2) Renal transplant candidates with sickle-cell disease should be considered for renal transplantation if the systemic disease is not severe.

3) Renal transplant candidates with anti-glomerular basement membrane (anti-GBM) disease should be considered for renal transplantation if the circulating anti-GBM antibody is undetectable and they have quiescent disease (off cytotoxic agents) for at least 6 months' post-treatment.

4) Renal transplant candidates with amyloidosis (primary or secondary) should be considered for renal transplantation if there is no evidence of cardiac involvement. Patients with primary amyloidosis should not undergo renal transplantation if there is associated multiple myeloma. Patients with secondary amyloidosis should not undergo renal transplantation until the underlying inflammatory condition is in remission.

5) Renal transplant candidates with systemic lupus erythematosus should be considered for renal transplantation if they have clinically quiescent disease for at least 6 months off cytotoxic agents.

6) Renal transplant candidates with scleroderma should be considered for renal transplantation if they have quiescent disease for at least 6 months off cytotoxic agents and have limited extrarenal disease.

7) Renal transplant candidates with vasculitis should be considered for renal transplantation if they have quiescent disease for at least 12 months off cytotoxic agents.

8) Patients with thrombotic microangiopathy or hemolytic uremic syndrome (HUS) should be considered for renal transplantation if they have quiescent disease.

9) Pretransplant parathyroidectomy has been recommended for those with symptomatic hyperparathyroidism and those with hypercalcemia and severe bone disease.

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1. All documents should contain a document history and version control table on the final page (before any appendices).
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REFERENCES

1- KDIGO CLINICAL PRACTICE GUIDELINE ON THE EVALUATION AND FOLLOW-UP CARE OF LIVING KIDNEY DONORS, Nov/2015.
2- European Renal Best Practice Guideline on kidney donor and recipient evaluation and perioperative care. Nephrol Dial Transplant (2015) 30: 1790–1797 doi: 10.1093/ndt/gfu216.
3- OPTN (Organ Procurement and Transplantation Network)/UNOS (United Network for Organ Sharing).
4- Simms RJ, Travis DL, Durkie M et al, Genetic testing in the assessment of living related kidney donors at risk of autosomal dominant polycystic kidney disease . Transplantation 2015: 99: 1023 -1029
5- AST/ASTS/NATCO/UNOS Joint Societies Work Group. Evaluation of the living kidney donor - A consensus document from the AST/ASTS/NATCO/UNOS Joint Societies Work Group (2011). http://optn.transplant.hrsa.gov/PublicComments/pubcommentPropSurveyExhibit_38.pdf (Accessed on August 18, 2015).
6- Clinical guidelines for kidney transplantation 2018 British Columbia Transplant, Vancouver
7- Al Ismaili F, Al Salmi I, Al Maimani Y, Metry AM, Al Marhoobi H, Hola A, et al. Epidemiological transition of end-stage kidney disease in Oman. Kidney Int Rep 2017;2(1):27–35
8- Arabi Z, Theaby A, Farooqui M, Abdalla M, Hajeer A, Abdullah K. The National Guard Health Affairs guidelines for the medical management of renal transplant patients. Saudi J Kidney Dis Transpl 2018;29:1452-69.
9- BTS/RA Living Donor Kidney Transplantation Guidelines 2018.
10- Bryce A. Kiberd, Meteb M AlBugami, Romuald Panek Karthik Tennankore. Contraindications to kidney transplantation:uneven grounds? Kiberd et al. Transplantation Research (2015) 4:2
11- Axelrod DA, McCullough KP, Brewer ED, et al. Kidney and pancreas transplantation in the United States, 1999-2008: the changing face of living donation. Am J Transplant 2010; 10:987.
12- Pascual J, Abramowicz D, Cochat P, et al. European renal best practice guideline on the management and evaluation of the kidney donor and recipient. Nefrologia 2014; 34:293.
13- Boudville N, Isbel N, CARI. The CARI guidelines. Donors at risk: impaired glucose tolerance. Nephrology (Carlton) 2010; 15 Suppl 1:S133.
14- Northwestern memorial hospital kidney transplant guidelines 2010
15- http://pathways.nice.org.uk/pathways/organ-donation-for-transplantation NICE Pathway last updated: 21 December 201
16- Alexander RT, Hemmelgarn BR, Wiebe N, et al. Kidney stones and kidney function loss: a cohort study. BMJ 2012; 345: e5287.
17- Mandelbrot DA, Pavlakis M, Danovitch GM, et al. The medical evaluation of living kidney donors: a survey of US transplant centers. Am J Transplant 2007; 7:2333.
18- Kido R, Shibagaki Y, Iwadoh K, et al. Persistent glomerular hematuria in living kidney donors confers a risk of progressive kidney disease in donors after heminephrectomy. Am J Transplant 2010; 10:1597.
19- Meier-Kriesche HU, Arndorfer JA, Kaplan B. The impact of body mass index on renal transplant outcomes: a significant independent risk factor for graft failure and patient death. Transplantation 2002;73(1):70-4.
20- Lentine KL, Costa SP, Weir MR, et al. Cardiac disease evaluation and management among kidney and liver transplantation candidates: a scientific statement from the American Heart Association and the American College of Cardiology Foundation. J Am Coll Cardiol 2012; 60:434.
21- Kasiske BL, Malik MA, Herzog CA. Risk-stratified screening for ischemic heart disease in kidney transplant candidates. Transplantation 2005; 80:815.

22- K/DOQI Workgroup. K/DOQI clinical practice guidelines for cardiovascular disease in dialysis patients. Am J Kidney Dis 2005; 45:S1.
23- Bunnapradist S, Danovitch GM. Evaluation of adult kidney transplant candidates. Am J Kidney Dis 2007; 50:890.
24- Chen KJ, Chen CH, Cheng CH, et al. Risk factors for peptic ulcer disease in renal transplant patients--11 years of experience from a single center. Clin Nephrol 2004; 62:14.
25- Kao LS, Flowers C, Flum DR. Prophylactic cholecystectomy in transplant patients: a decision analysis. J Gastrointest Surg 2005; 9:965.
26- Knoll G, Cockfield S, Blydt-Hansen T, et al. Canadian Society of Transplantation consensus guidelines on eligibility for kidney transplantation. CMAJ 2005; 173:1181.
27- Heidenreich S, Junker R, Wolters H, et al. Outcome of kidney transplantation in patients with inherited thrombophilia: data of a prospective study. J Am Soc Nephrol 2003;14(1):234-9
28- Friedman GS, Meier-Kriesche HU, Kaplan B, et al. Hypercoagulable states in renal transplant candidates: impact of anticoagulation upon incidence of renal allograft thrombosis. Transplantation 2001;72(6):1073-8
29- Passweg J, Thiel G, Bock HA. Monoclonal gammopathy after intense induction immunosuppression in renal transplant patients. Nephrol Dial Transplant 1996;11 (12):2461-5.
30- Roslyn J. Simms,1,2,3 Debbie L. Travis,4 Miranda Durkie,4 Gill Wilson,4 Ann Dalton,4 and Albert C.M. Ong Genetic Testing in the Assessment of Living Related Kidney Donors at Risk of Autosomal Dominant Polycystic Kidney Disease. Transplantation 2015;99: 1023–1029
31- Knoll G, Cockfield S, Blydt-Hansen T, et al. Canadian Society of Transplantation consensus guidelines on eligibility for kidney transplantation. CMAJ 2005; 173:1181.
32- Kasiske BL, Cangro CB, Hariharan S, et al. The evaluation of renal transplant candidates: clinical practice guidelines. Am J Transplant 2001;1 suppl 2:3-95.
33- Buell JF, Beebe TM, Gross TG, et al. Re-transplantation after post-transplant lymphoproliferative disorder (abstract 1084). Am J Transplant 2003;3(suppl 5):429.
34- Buell JF, Woodle ES, Beebe TM, et al. Recurrence risk of pre-existing breast cancer after solid organ transplantation (abstract 518). Am J Transplant 2003;3(suppl 5):284.
35- Shandera KC, Rozanski TA, Jaffers G. The necessity of voiding cystourethrogram in the pre transplant urologic evaluation. Urology 1996;47(2):198-200.195.
36- Glazier DB, Whang MI, Geffner SR, et al Evaluation of voiding cystourethrography prior to renal transplantation. Transplantation 1996;62(12):1762-5.196.
37- Gill IS, Hayes JM, Hodge EE, et al. Clean intermittent catheterization and urinary diversion in the management of renal transplant recipients with lower urinary tract dysfunction. J Urol 1992;148(5):1397-400.197.
38- Brazda E, Ofner D, Riedmann B, et al. The effect of nephrectomy on the outcome of renal transplantation in patients with polycystic kidney disease. Ann Transplant 1996;1(2):15-8.
39- Green M, Avery RK, Preiksaitis J (editors). Guidelines for the prevention and management of infectious complications of solid organ transplantation. Am J Transplant 2004;4(suppl 10):5-166.
40- Yamalik N, Avcikurt UF, Caglayan F, et al. The importance of oral foci of infection in renal transplantation. Aust Dent J 1993;38(2):108-13.
41- Apaydin S, Altiparmak MR, Serdengecti K, et al. Mycobacterium tuberculosis infections after renal transplantation. Scand J Infect Dis 2000;32(5):501-5.
42- Rubin RH. Infectious disease complications of renal transplantation. Kidney Int 1993;44(1):221-36.
43- Ramos EL, Kasiske BL, Alexander SR, et al. The evaluation of candidates for renal transplantation: the current practice of U.S. transplant centres. Transplantation 1994;57(4):490-7.
44- Kasiske BL, Cangro CB, Hariharan S, et al. The evaluation of renal transplant candidates: clinical practice guidelines. Am J Transplant 2001;1 suppl 2:3-95.
45- Cibrik DM, Kaplan B, Arndorfer JA, et al. Renal allograft survival in patients with oxalosis. Transplantation 2002;74(5):707-10.

46- Ojo AO, Govaerts TC, Schmouder RL, et al. Renal transplantation in end-stage sickle cell nephropathy. Transplantation 1999;67(2):291-5.
47- Pasternack A, Ahonen J, Kuhlback B. Renal transplantation in 45 patients with amyloidosis. Transplantation 1986;42(6):598-601.
48- Stone JH, Millward CL, Olson JL, et al. Frequency of recurrent lupus nephritis among ninety-seven renal transplant patients during the cyclosporine era. Arthritis Rheum 1998;41(4):678-86.
49- Chang YJ, Spiera H. Renal transplantation in scleroderma. Medicine 1999;78(6): 382-5.
50- Nachman PH, Segelmark M, Westman K, et al. Recurrent ANCA-associated small vessel vasculitis after transplantation: a pooled analysis. Kidney Int 1999;56(4):1544-50.
51- Ducloux D, Rebibou JM, Semhoun-Ducloux S, et al. Recurrence of hemolytic-uremic syndrome in renal transplant recipients: a meta-analysis. Transplantation 1998;65(10):1405-7.
52- Loirat C, Niaudet P. The risk of recurrence of hemolytic uremic syndrome after renal transplantation in children. Pediatr Nephrol 2003; 18(11):1095-101.
53- Kasiske BL, Cangro CB, Hariharan S, et al. The evaluation of renal transplant candidates: clinical practice guidelines. Am J Transplant 2001;1 suppl 2:3-95.
54- https://www.med.umich.edu/lrc/coursepages/m1/HGD/GeriatricFunctionalAssess.pdf
55- https://kdigo.org/guidelines/transplant-candidate/

Annex-1: THE RECIPIENT INVESTIGATIONS CHECKLIST

Investigation Report -Recipient		
Recipient name: **MRN:**		**Ht:** **Wt:** **BMI:**
Investigation	**Result**	**Remarks**
BLOOD GROUP		
Haemoglobinopathies		
G6PD		
HBsAgAnti HBcAb Anti HBs Ab, HepB PCR**		
Anti HCV**		
HIV**		
CMV: IgG /IgM		
Syphilis/TPHA		
BRUCELLA & if South Schistosomiasis		
EBV		
VZV		
QuantiFERON Gold		
ANA/AntiDs DNA		
C3/C4		
ESR/C-RP*		
COAGULATION PROFILE*		
UREA /CREAT /GFR		
SODIUM/ POTASSIUM		
CALCIUM*/ PHOSPHATE/ PTH		
GLUCOSE/ OGTT		
BILIRUBIN/ ALT*		
ALB/ALP*		
CK/URIC ACID		
HDL/LDL/TGL		
TSH		
Iron Profile*		
HB/WBC/PLATELETS*		
URINALYSIS		
URINE P/C ratio		
Blood and Urine Cultures*		
CXR		
ECG		
ECHO		
USG-KUB		
CTA		
OGD		
Others		

*** To be updated every 3-6 months and to be repeated 14 days before transplant date. This is especially important if the recipient has a dialysis line.**

**** To be repeated 3-6/12 before transplantation date.**

Ensure that the recipient with a dialysis line had Echo at least 3 months prior to transplantation date.

Annex-2: THE - INVESTIGATIONS CHECKLIST

INVESTIGATIONS REPORT : DONOR		
Donor name: **MRN:** **Relationship to recipient:**		**Ht:** **Wt:** **BMI:**
Investigation	**Result**	**Remarks**
BLOOD GROUP		
Haemoglobinopathies		
G6PD		
HBsAg,Anti HB cAb, Anti HBs Ab / Anti HCV/ HIV***		
CMV: IgG/ IgM		
Syphilis/ TPHA		
BRUCELLA & if South Schistosomiasis		
EBV		
VZV		
ANA/ AntiDs DNA		
C3/ C4		
ESR/ C-RP		
COAGULATION PROFILE*		
UREA/ CREAT/ eGFR*		
SODIUM/ POTASSIUM*		
24 Hrs.Creat. CLEARANCE		
CALCIUM/ PHOSPHATE		
GLUCOSE/ OGTT		
BILIRUBIN/ALT		
ALB/ ALP		
CK/ URIC ACID		
HDL/ LDL/ TGL		
TSH		
FERRITIN / IRON/ TRANSF' SAT		
HB/ WBC/ PLATELETS*		
URINALYSIS		
URINE Prot/Cr' ratio		
Urine Alb/Cr ratio		
Urine mic, C & S**		
CXR		
ECG		
Isotope scan(DMSA/DTPA)		
CT Renal Angiography		
Quanteferon TB		
Others		

***Need to be repeated every 3-6/12 and updated 1-2 weeks prior to surgery**

**** To be done at least 2/52 prior to surgery.*** HIV to be updated 3-6/12, HCV and HBV 1-3/12 prior to surgery.**