NATIONAL CLINICAL GUIDELINES

The Assessment and Management of Chronic Kidney Disease in Adults

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المبادئ الإرشادية السريرية لدولة قطر
NATIONAL CLINICAL GUIDELINES FOR QATAR

وزارة الصحـــــة العامـــــة
Ministry of Public Health
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Abbreviations

The abbreviations used in this guideline are as follows:

aAPD	Assisted automated peritoneal dialysis
ACC / AHA	American College of Cardiology / American Heart Association
ACR	Albumin-to-creatinine ratio
AKI	Acute kidney injury
APD	Automated peritoneal dialysis
ASCVD	Atherosclerotic cardiovascular disease
BMI	Body mass index
BP	Blood pressure
CAPD	Continuous ambulatory peritoneal dialysis
CKD	Chronic kidney disease
CKD-EPI	Chronic Kidney Disease Epidemiology Collaboration
eGFR	Estimated glomerular filtration rate
$eGFR_{creat}$	Creatinine-based estimated glomerular filtration rate
$eGFR_{cys}$	CystatinC-based estimated glomerular filtration rate
ESRD	End-stage renal disease
GFR	Glomerular filtration rate
HBA_{1C}	Glycated haemoglobin level
KDIGO	Kidney Disease Improving Global Outcomes Group
NSAIDs	Non-steroidal anti-inflammatory drugs
PCR	Protein-to-creatinine ratio
PCV13	13-valent Pneumococcal conjugate vaccine
PPSV23	23-valent Pneumococcal polysaccharide vaccine
RBC	Red blood cell count
RCC	Renal cell carcinoma
RRT	Renal replacement therapy
SLE	Systemic lupus erythematosus

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1. Information about this Guideline

1.1 Objective and Purpose of the Guideline

The purpose of this guideline is to define the appropriate diagnosis and management of chronic kidney disease in adults. The objective is to improve appropriate investigation, prescribing, and referral of patients presenting to provider organisations in Qatar. It is intended that the guideline will be used primarily by physicians in primary care and specialist care settings.

1.2 Scope of the Guideline

Aspects of care included within the scope of the guideline are:

- The management approach to CKD in adults (aged 18 years and over), including the diagnosis, investigation, classification, and management of all stages of chronic kidney disease (CKD).

Aspects of care not included in this guidelines are:

- Screening for chronic kidney disease.
- Chronic kidney disease in pregnancy.
- Acute kidney injury (AKI)
- The detailed investigation or management of any underlying cause for CKD, e.g.:
    - Polycystic kidneys.
    - Post-renal obstruction.
    - Structural kidney disease.
    - Diabetes.
    - Hypertension.
- Specialist management of patients with renal transplant or dialysis.

1.3 Editorial Approach

This guideline document has been developed and issued by the Ministry of Public Health of Qatar (MOPH), through a process which aligns with international best practice in guideline development and localisation. The guideline will be reviewed on a regular basis and updated to incorporate comments and feedback from stakeholders across Qatar.

The editorial methodology, used to develop this guideline, has involved the following critical steps:

- Extensive literature search for well-reputed published evidence relating to the topic.
- Critical appraisal of the literature.
- Development of a draft summary guideline.
- Review of the summary guideline with a Guideline Development Group, comprised of practising healthcare professionals, subject matter experts and patient representatives, from across Qatar.
- Independent review of the guideline by the National Clinical Guidelines & Pathways Committee, appointed by the MOPH, from amongst stakeholder organisations across Qatar.

Whilst the MOPH has facilitated the development of the guideline, the MOPH has not influenced the specific recommendations made within it.

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1.4 Sources of Evidence

The professional literature has been systematically queried using specially developed, customised, and tested search strings. Search strategies are developed to allow efficient yet comprehensive analysis of relevant publications for a given topic and to maximise retrieval of articles with certain desired characteristics pertinent to a guideline.

For each guideline, all retrieved publications have been individually reviewed by a member of the Editorial Team and assessed in terms of quality, utility, and relevance. Preference is given to publications that:

1. Are designed with rigorous scientific methodology.
2. Are published in higher-quality journals.
3. Address an aspect of specific importance to the guideline in question.

Further information about the literature search and appraisal process is included in the *Appendix*.

1.5 Evidence Grading and Recommendations

Recommendations made within this guideline are supported by evidence from the medical literature and where possible the most authoritative sources have been used in the development of this guideline. In order to provide insight into the evidence basis for each recommendation, the following evidence hierarchy has been used to grade the level of authoritativeness of the evidence used, where recommendations have been made within this guideline.

Where the recommendations of international guidelines have been adopted, the evidence grading is assigned to the underlying evidence used by the international guideline. Where more than one source has been cited, the evidence grading relates to the highest level of evidence cited:

- **Level 1 (L1):**
    - Systematic reviews of randomised controlled studies.
    - Randomised controlled trials with meta-analysis.
    - Randomised controlled trials.

- **Level 2 (L2):**
    - Observational studies, examples include:
        - Cohort studies with statistical adjustment for potential confounders.
        - Cohort studies without adjustment.
        - Case series with historical or literature controls.
        - Uncontrolled case series.
    - Statements in published articles or textbooks.

- **Level 3 (L3):**
    - Expert opinion.
    - Unpublished data, examples include:
        - Large database analyses.
        - Written protocols or outcomes reports from large practices.

In order to give additional insight into the reasoning underlying certain recommendations and the strength of recommendation, the following recommendation grading has been used, where recommendations are made:

- **Recommendation Grade A (RGA):** Evidence demonstrates at least moderate certainty of a net benefit from the recommendation.
- **Recommendation Grade B (RGB):** Evidence is insufficient, conflicting, or poor and demonstrates an incomplete assessment of net benefit vs harm; additional research is recommended.
- **Recommendation Grade C (RGC):** Evidence demonstrates potential harm that outweighs benefit; additional research is recommended.
- **Recommendation of the GDG (R-GDG):** Recommended best practice on the basis of the clinical experience of the Guideline Development Group members.

1.6 Guideline Development Group Members

The following table lists members of the Guideline Development Group (GDG) nominated by their respective organizations and the National Clinical Guidelines & Pathways Committee. The GDG members have reviewed and provided their feedback and approval of the guideline document. Each member has completed a declaration of conflicts of interest, which has been reviewed and retained by the MOPH.

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[1]Dr Ahmed Babiker attended the MOPH in his capacity as a Clinical Pharmacist and advisor on the availability of medications in Qatar.

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1.7 National Clinical Guidelines & Pathways Committee Members

The following table lists members of the National Clinical Guidelines & Pathways Committee (NCGPC), appointed by the MOPH. The NCGPC members have reviewed and provided their feedback and approval of the guideline document. Each member has completed a declaration of conflicts of interest, which has been reviewed and retained by the MOPH.

National Clinical Guidelines & Pathways Committee (NCGPC) Members		
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Shk Dr Mohammed Hamad J. Al Thani	Co-Chair of NCGPC, Director of Public Health	Ministry of Public Health
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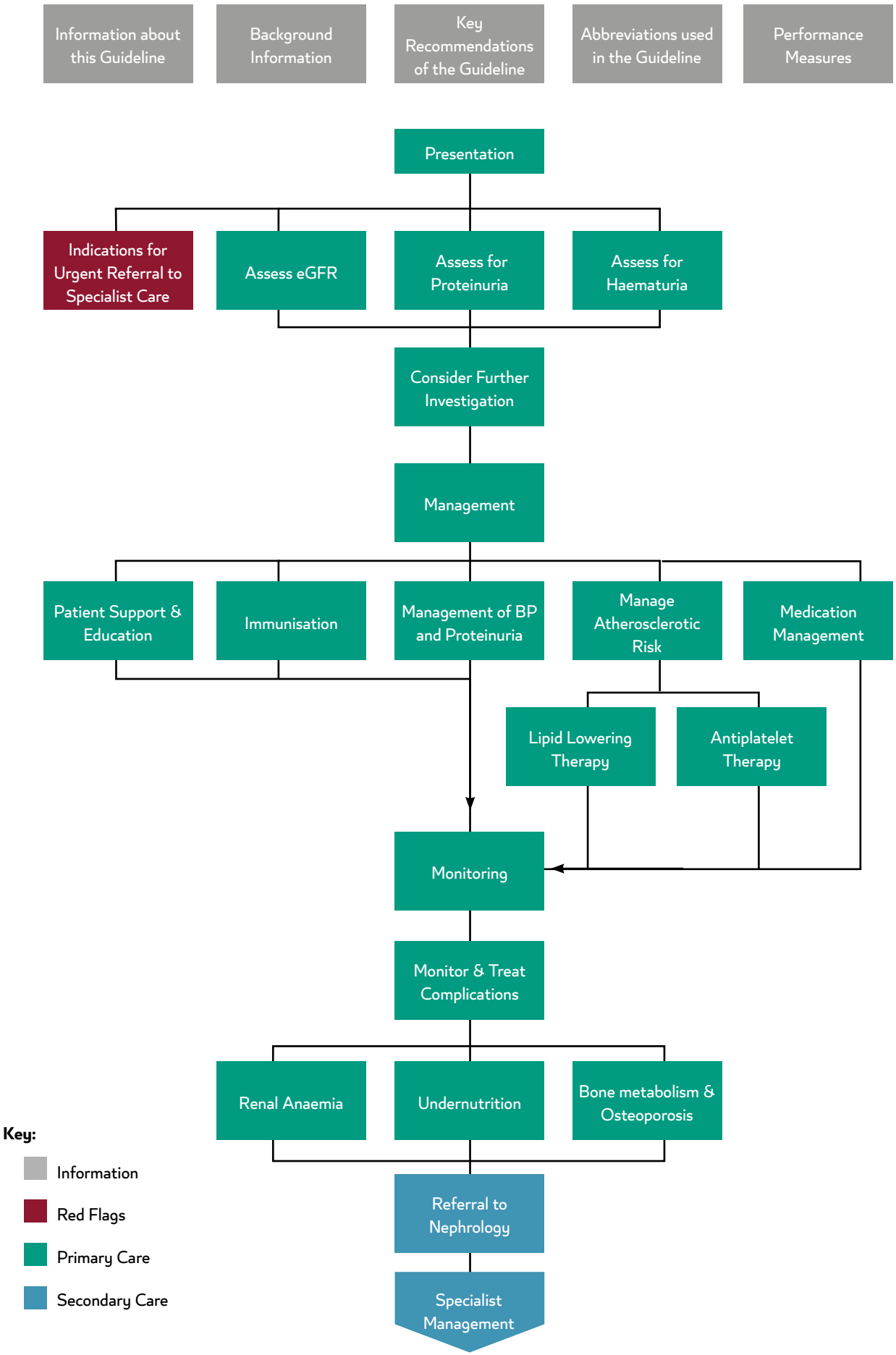
1.8 Responsibilities of Healthcare Professionals

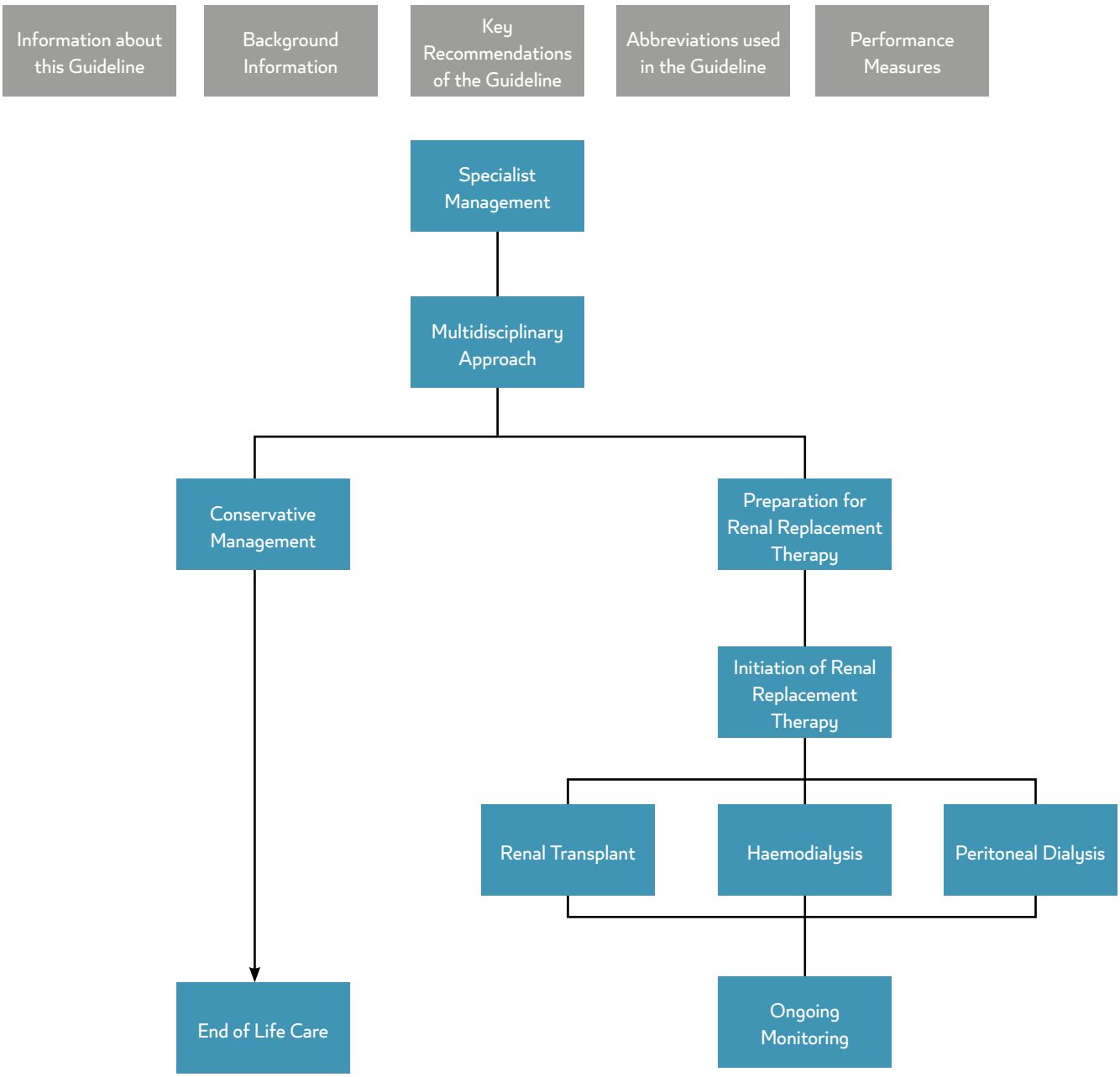
This guideline has been issued by the MOPH to define how care should be provided in Qatar. It is based upon a comprehensive assessment of the evidence as well as its applicability to the national context of Qatar. Healthcare professionals are expected to take this guidance into account when exercising their clinical judgement in the care of patients presenting to them.

The guidance does not override individual professional responsibility to take decisions which are appropriate to the circumstances of the patient concerned. Such decisions should be made in consultation with the patient, their guardians, or caregivers and should consider the individual risks and benefits of any intervention that is contemplated in the patient's care.

2. Chronic Kidney Disease Assessment and Management Pathway

Click on a box below to see the relevant page of the Pathway.





Key:

- Information
- Red Flags
- Primary Care
- Secondary Care

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3. Key Recommendations of the Guideline

The key recommendations of this guideline are:

Blood Pressure Management:

- In patients with CKD, with or without diabetes mellitus, and an ACR of < 3 mg/mmol, aim to keep the BP at the following levels [1]:
    - Systolic BP ≤ 140 mmHg; and diastolic BP ≤ 90 mmHg.
- In patients with CKD, with or without diabetes mellitus, and an ACR of ≥ 3 mg/mmol, aim to keep the BP at the following levels [1]:
    - Systolic BP ≤ 130 mmHg; and diastolic BP ≤ 80 mmHg.
- Treatment with a renin-angiotensin antagonist is indicated in the following patients with CKD [2]:
    - Patients with diabetes mellitus with a urinary ACR of 3-30 mg/mmol.
    - Non-diabetic hypertensive patients and a urinary ACR of ≥ 3 mg/mmol.

Lipid Management:

- Initiate statin therapy in the following patients [2,3,4,5]:
    - All patients with established ASCVD.
    - All patients aged ≥ 50 years with an eGFR < 60 mL/min/1.73m^2, but not treated with dialysis or kidney transplantation.
    - All patients aged ≥ 50 years with an eGFR ≥ 60 mL/min/1.73m^2, but who have albuminuria or other manifestations of CKD (e.g. polycystic kidney disease).
    - All patients aged < 50 years with CKD and a 10-year ASCVD risk of > 7.5% (assessed using ACC/AHA Pooled Cohort Equations).
    - All patients aged > 18 years with CKD and diabetes mellitus.

Antiplatelet Therapy:

- Antiplatelet therapy is indicated in the following patients [1,3–5]:
    - All patients with established ASCVD.
    - All patients with CKD who at risk of ASCVD, unless there is an increased bleeding risk that needs to be balanced against the possible cardiovascular benefits

Monitoring Patients with CKD:

- See *Section 7.6* for recommendations on the frequency of monitoring by stage of CKD.
- Monitor for progression of CKD [1]:
    - Progression of CKD is defined as a fall in eGFR category accompanied by a ≥ 25% decline in eGFR from baseline.
    - Rapid progression is defined by a sustained decline in eGFR of > 5 mL/min/1.73m^2 within one year.
- Monitor and treat complications, including [1,6,7]:
    - Renal anaemia.
    - Undernutrition.
    - Abnormalities of bone metabolism

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Referral to Nephrology:

- See *Section 7.8* for criteria for routine and urgent referral to nephrology.

Specialist Management:

- Patients with progressive CKD should be managed in a multidisciplinary care setting with a multidisciplinary team [1,8].

Renal Replacement Therapy:

- Patients with ESRD who are likely to need RRT within 6 months should be referred urgently to receive education and information, and to prepare for RRT [**R-GDG**].
- There is no good evidence for the superiority of one RRT option over another [9,10].
- Decisions on which intervention to use will depend upon patient preferences, availability, and clinical contraindications [9,10].

Renal Transplant:

- Renal transplantation should be the RRT of choice for patients with ESRD who are fit for renal transplant [11] [**L2, RGA**].
- Consideration for renal transplant should be addressed on an individualised basis [**R-GDG**].

Peritoneal Dialysis:

- May be delivered safely and effectively at home or another location of the patient's choice [10].
- Treatment modalities include [10]:
    - Assisted automated peritoneal dialysis (aAPD).
    - Automated peritoneal dialysis (APD).
    - Continuous ambulatory peritoneal dialysis (CAPD).

Conservative Management:

- Conservative management should be provided to patients with advanced CKD who opt not to have dialysis [1,9].

Palliative Care:

- Recognise patients struggling to cope on long term dialysis due to a deterioration of underlying clinical problems or a sudden catastrophic clinical event. Either may indicate an imminent or immediate need of end of life care [9] [**L2, RGA**].
- Decisions to discontinue dialysis should be made jointly by the patients and their consultant and should involve relatives and care-givers and other members of the team [9] [**L2, RGA**].

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4. Background Information

4.1 Definition

Chronic kidney disease (CKD) is defined as:

- Abnormalities of kidney structure or function, present for more than 3 months, with implications for health [1,8,12].

Criteria for CKD (any of the following present for more than 3 months) [1,8]:

- Markers of kidney damage (one or more):
  - Albuminuria (albumin-to-creatinine ratio (ACR) ≥ 3 mg/mmol).
  - Urine sediment abnormalities.
  - Electrolyte and other abnormalities due to tubular disorders.
  - Abnormalities detected by histology.
  - Structural abnormalities detected by imaging.
  - History of kidney transplantation.
- Decreased GFR:
  - GFR < 60 mL/min/1.73m^2 (GFR categories G3a-G5).

4.2 Epidemiology

Incidence and prevalence in Qatar [13,14]:

- Diabetes mellitus, hypertension, and CKD are major emerging epidemics.
- The incidence of end-stage renal disease (ESRD) is 202 patients/million/year.
- The prevalence of ESRD is 624 patients/million.
- Diabetic nephropathy is the commonest cause of ESRD (48%), followed by hypertensive glomerulonephropathy and primary glomerulonephritis [15].

4.3 Staging

To identify the rate of progression in a newly diagnosed CKD patient, it is recommended to obtain a minimum of three eGFR measurements over a period of not less than 90 days [12] [**L2**]. If a large and unexplained fall in eGFR is observed, more frequent monitoring is needed.

Staging of CKD [12,16]:

- Staging of CKD is based upon the 5 stages of GFR as well as the 3 categories of albuminuria.
- An increased risk of adverse outcomes is associated with increased ACR and decreased GFR.
- Increased ACR and decreased GFR in combination multiply the risk of adverse outcomes.

GFR categories [12]:

Category	Description	GFR
G1	Normal or increased GFR	≥ 90 mL/min/1.73m^2
G2	Mild reduction	60-89 mL/min/1.73m^2
G3a	Mild to moderate reduction	45-59 mL/min/1.73m^2
G3b	Moderate to severe reduction	30-44 mL/min/1.73m^2
G4	Severe reduction	15-29 mL/min/1.73m^2
G5	Established renal failure	< 15 mL/min/1.73m^2

ACR categories [12]:

Category	Description	ACR
A1	Normal to mildly increased ACR	< 3 mg/mmol
A2	Moderately increased ACR	3-30 mg/mmol
A3	Severely increased ACR	> 30 mg/mmol

4.4 Natural History

Causes of CKD include [12]:

- Conditions associated with intrinsic kidney disease, e.g.:
  - Hypertension.
  - Diabetes mellitus.
  - Glomerulonephritis.
- Conditions associated with urinary outflow obstruction, e.g.:
  - Structural renal tract disease.
  - Recurrent renal calculi.
  - Prostatic hypertrophy.
- Nephrotoxic drugs, e.g.:
  - Non-steroidal anti-inflammatory drugs (NSAIDs).
  - Lithium.
- Multi-system diseases that may involve the kidney:
  - Systemic Lupus Erythematosus (SLE).
  - Vasculitis.
  - Autosomal dominant polycystic kidney disease.
  - Alport syndrome.

Prognosis [12,17,18]:

- CKD can progress to ESRD in a small but significant number of patients.
- Patients with CKD are 20 times more likely to die of atherosclerotic cardiovascular disease (ASCVD) than progress to ESRD.
- Patients with CKD are at greater risk of ASCVD than their age- and sex-matched contemporaries.
- The GFR and ACR staging categories are used to indicate risk of adverse outcomes, such as [12]:
  - The progression of CKD.
  - AKI.
  - All-cause mortality.
  - Cardiovascular events.
- In predicting risk for outcome of CKD, identify the following variables [1,8]:
  - Cause of CKD.
  - GFR category.
  - Albuminuria category.
  - Other risk factors and comorbid conditions.
  - Estimated risk of concurrent complications and future outcomes should be used to guide decisions for testing and treatment for CKD complications.

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Prognosis of CKD by GFR and Albuminuria Categories: KDIGO 2012				Persistent albuminuria categories Description and range		
				A1	**A2**	**A3**
				Normal to mildly increased	Moderately increased	Severely increased
				<3 mg/mmol	3-30 mg/mmol	>30 mg/mmol
GFR categories (ml/min/ 1.73 m^2);	**G1**	Normal or high	≥90			
	G2	Mildly decreased	60-89			
Description and Range	**G3a**	Mildly to moderately decreased	45-59			
	G3b	Moderately to severely decreased	30-44			
	G4	Severely decreased	15-29			
	G5	Kidney failure	<15			
	Green: Low risk (if no other markers of kidney disease, no CKD); Yellow: Moderately increased risk Orange: High risk; Red: Very high risk.					

Table 1: Prognosis of CKD by GFR and albuminuria categories from KDIGO 2012 Guideline [1,8]

('Risk' relates to the risk of poor prognosis and outcomes).

4.5 Higher Risk Groups

Risk factors for developing CKD include (Should be the target of screening measures) [8,12]:

- Diabetes mellitus.
- Hypertension.
- ASCVD.
- Obesity with metabolic syndrome.
- History of AKI.
- Use of nephrotoxic medication.
- Recurrent renal calculi.
- Structural renal tract disease, including untreated urinary outflow tract obstruction and prostatic hypertrophy.
- A family history of ESRD or hereditary kidney disease.
- Multisystem diseases with potential kidney involvement – e.g., systemic lupus erythematosus.

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5. Presentation

CKD is usually:

- Asymptomatic in earlier stages [1,12].
- Detected as a consequence of screening or monitoring of high-risk patients, e.g. patients with [12]:
    - Diabetes mellitus.
    - Hypertension.
    - Opportunistic detection of haematuria or proteinuria.
    - Accidental radiological findings of CKD, like: bilateral small and echogenic kidneys or multiple bilateral renal cysts with enlarged kidneys suggestive of polycystic kidney disease.

Symptoms are usually due to complications of decreased kidney function [1] but may also be due to co-morbid conditions [19].

A presentation with specific symptoms associated with CKD is rare. Where this occurs, the manifestations can include [12]:

- Oedema secondary to salt and fluid retention.
- Lethargy and fatigue often exacerbated by anaemia.
- Nausea and vomiting can occur with advanced CKD – Stage 5.
- Overt uraemia, e.g. encephalopathy, neuropathy, or pericarditis, in a patient not known to have CKD is very rare.

6. Investigations

6.1 Initial Tests for CKD

Offer testing for CKD using eGFR and ACR to patients with any of the following risk factors 1,12 [L2, RGA]:

- Diabetes mellitus.
- Hypertension.
- History of AKI.
- ASCVD – includes those with ischaemic heart disease, chronic heart failure, peripheral vascular disease, or cerebral vascular disease.
- Structural renal disease.
- Recurrent renal calculi.
- Prostatic hypertrophy.
- Multisystem diseases that may affect kidneys – e.g. SLE.
- Family history of ESRD or hereditary kidney disease.
- Nephrotoxic drugs.
- Incidental detection of haematuria.
- Gout[20]

It is not recommended to use age, gender, or ethnicity as risk markers to test patients for CKD. It is not recommended to use obesity alone as a risk marker to test patients for CKD in the absence of a metabolic syndrome, diabetes mellitus, or hypertension [12] [**L2**, **RGA**].

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6.1.1 Estimated Glomerular Filtration Rate (eGFR)

Serum creatinine is usually used to calculate eGFR [12] [**L2, RGA**]:

- Use the CKD Disease Epidemiology Collaboration (CKD-EPI) creatinine equation to estimate GFR.
- Always compare creatinine and eGFR with baseline measures, where available [18].

The reliability of eGFR may be reduced and results should be interpreted with caution in patients with the following [12]:

- AKI
- Pregnancy.
- Oedematous states.
- Extremes of muscle mass, e.g.:
    - In bodybuilders.
    - In patients with muscle wasting disorders or amputation.
    - NB: Reduced muscle mass will lead to overestimation, and increased muscle mass to underestimation, of the GFR.
- Malnourishment.
- Certain ethnic groups:
    - eGFR has not been well validated in certain ethnic groups, e.g. in people of South Asian family origin.

6.1.1.1 Cautions in Interpretation of eGFR

Consider the following factors, which may influence interpretation of eGFR [12] [**L2, RGA**]:

- Interpret reported values of eGFR of ≥ 60 mL/min/1.73m^2 with caution – because:
    - As the true GFR increases, eGFR becomes less accurate.
- If the eGFR is > 90 mL/min/1.73m^2, an increase in serum creatinine concentration of > 20% indicates a significant reduction in kidney function.
- When interpreting changes in the eGFR, allow for a +/-5% variability of serum creatinine.
- If eGFR is < 60 mL/min/1.73m^2 in a patient not previously tested and AKI is not suspected, repeat the eGFR within 2 weeks to exclude analytical and biological causes of variation.
    - Timing of repeat testing depends on clinical judgement and more urgent action may be required if AKI is suspected [1,12].

NB: If there is doubt about whether a patient has worsening CKD or acute-onset CKD, it should be considered acute and managed appropriately [**R-GDG**].

6.1.2 Assess for Proteinuria

Measure urinary ACR (or urinary protein loss) in the following groups of patients [12]:

- Patients with diabetes mellitus.
- If there is a strong suspicion of CKD in patients with an eGFR of ≥ 60 mL/min/1.73m^2
- Patients with an eGFR of < 60 mL/min/1.73m^2.
- Children and young people without diabetes and with creatinine above the upper limit of the age-appropriate reference range.

If the urinary ACR is [12]:

- 3-70 mg/mmol:
    - Confirm with a subsequent early morning sample to determine if the abnormality is persistent.
- ≥ 70 mg/mmol:
    - There is no need to repeat the test, as this is considered to be significant proteinuria and requires referral to a nephrologist.

NB: Regard a confirmed ACR of ≥ 3 mg/mmol as clinically important.

Use the urinary ACR in preference to the protein-to-creatinine ratio (PCR) [1,12] [**L2, RGB**]:

- It has a greater sensitivity for low levels of proteinuria.
- For quantification and monitoring of high levels of proteinuria (i.e. an ACR of ≥ 70 mg/mmol), PCR can be used as an alternative to ACR.
- ACR is the recommended method for patients with diabetes mellitus.

NB: Reagent strips are not recommended for use as an initial test, as they are unreliable for identifying small amounts of proteinuria and are unable to reliably quantify the degree of proteinuria [12] [**L2**].

6.1.2.1 Cautions in Interpretation of ACR

The following conditions can cause variability in measured ACR levels without changes in the level of kidney damage [8]:

- Transient elevation in albuminuria:
    - Menstrual blood contamination.
    - Symptomatic UTI.
    - Exercise.
    - Upright posture (orthostatic proteinuria).
    - Other conditions increasing vascular permeability (e.g. septicaemia).
- Non-renal causes of variability in creatinine excretion:
    - Age (lower in children and older people).
    - Race (lower in Caucasian than black people).
    - Muscle mass (e.g. lower in people with amputations, paraplegia, muscular dystrophy).
    - Gender (lower in women).
- Changes in creatinine excretion:
    - Non-steady state for creatinine (e.g. AKI).
- Other causes of variability:
    - Degradation of albumin before analysis.
    - Intrinsic biological variability.
    - Genetic variability.

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6.1.3 Assessing for Haematuria

When testing for haematuria [12]:

- Reagent strips should be used rather than urine microscopy.
- Further evaluation is recommended if there is a result of 1+ or more – use:
    - Urine culture.
    - Imaging of the urinary tract.

When assessing haematuria in the absence of proteinuria, persistent haematuria is considered to be present if 2 of 3 dipstick tests show ≥ 1+ of blood [12].

If a patient is found to have isolated microscopic haematuria [12,21]:

- Evaluate for UTI.
- Evaluate for urinary tract malignancy in appropriate age groups.
- Repeat testing annually for haematuria, proteinuria, eGFR, and of blood pressure (BP) for as long as the haematuria persists.

6.2 Consider Further Investigations

Other blood tests may be considered when monitoring for complications, such as [12]:

- Calcium.
- Phosphate.
- Vitamin D.
- Parathyroid hormone.
- Haemoglobin.

Renal ultrasound [6]:

- Is the first imaging study for evaluating previously undiagnosed CKD if clinically indicated.
- Ultrasound differentiates between obstruction and intrinsic parenchymal disease.
- Helps separate chronic ESRD from potentially reversible kidney injury by defining:
    - Renal size.
    - Echogenicity.
    - The presence or absence of hydronephrosis.
    - The presence of cystic renal disease.

Renal ultrasound is recommended for all patients with CKD who also have [12]:

- Accelerated progression of CKD:
    - A sustained fall in eGFR of ≥ 25% and a change in GFR category within 12 months; or
    - A sustained decrease in eGFR of ≥ 15 mL/min/1.73m^2 per year.
- Frank or persistent microscopic haematuria.
- Urinary tract obstructive symptoms.
- A family history of polycystic kidney disease and the patient is ≥ 20 years old.
- The need for a renal biopsy as determined by a nephrologist.

NB: Patients with a family history of inherited kidney disease should be advised about the implications of an abnormal ultrasound scan result before it is arranged [12].

Further investigation, as directed by a nephrologist, may include [6]:

- Further imaging of the renal tract.
- Renal scintigraphy.
- Percutaneous renal biopsy.

7. Management

The principles of management of CKD are [1,12]:

- Patient support and education.
- Managing BP and/or proteinuria.
- Managing diabetes mellitus and proteinuria.
- Primary and secondary prevention of ASCVD.
- Monitoring for progression and conditions associated with CKD, such as anaemia.
- Recognising and managing deterioration.
- Managing causes and risk factors for progression.
- Immunisation where appropriate.
- Specialist referral when appropriate.
- Preparing for and managing renal replacement therapy when appropriate.

NB: Do not determine the management of CKD solely on the basis of the patient's age [12] [**L1, RGA**].

7.1 Patient Support and Education

Patient education should consist of information on severity, cause, complications, and prognosis of CKD [12]:

- Psychological aspects such as coping with CKD must be considered. Support groups, counselling, or a specialist nurse are examples of appropriate support.
- This may include support with:
    - Personal needs.
    - Family.
    - Financial needs.
    - Employment.
    - Social needs.

Lifestyle advice – encourage patients with CKD to [12]:

- Exercise.
- Achieve a healthy weight.
- Stop smoking.

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Dietary interventions [12] [**L1**]:

- Offer dietary advice – appropriate to the severity of CKD – about intake of:
    - Potassium.
    - Phosphate.
    - Calories.
    - Salt.
    - Protein.
- Dietary intervention should ensure that malnutrition is prevented by including education, detailed dietary assessment, and supervision.

Self-management:

- Patients with CKD should be informed of their diagnosis and be able to share in decision making about their care [12] [**L2, RGA**].
- Help and encourage self-management by giving patients access to their medical data, including diagnosis, co-morbidities, test results, treatments, and correspondence [12] [**L3, RGA**].
- Advise anyone with CKD about the increased risk of AKI if they become acutely ill [**R-GDG**].
- Advise patients not to use herbal remedies [1] [**L2, RGA**]:
    - There is a lack of evidence to support alternative or complementary medicines and these may have nephrotoxic effects.

Consider referral to [12]:

- A physiotherapist if there is a reduction in exercise capacity that impacts the patient's daily life.
- An occupational therapist if there are problems with activities of daily living.
- A dietician for specialist dietary advice, in all patients with an eGFR of <60ml/min/1.73m^2.

7.2 Management of Blood Pressure and Proteinuria

A reduction in BP reduces the progression of CKD and ASCVD risk [1,12] [**L1**]:

- In patients with CKD, with or without diabetes mellitus, and an ACR of < 70 mg/mmol, aim to keep the BP at the following levels [1]:
    - Systolic BP ≤ 140 mmHg; and Diastolic BP ≤ 90 mmHg.
- In patients with CKD, with or without diabetes mellitus, and an ACR of ≥ 70 mg/mmol, aim to keep the BP at the following levels [1]:
    - Systolic BP ≤ 130 mmHg; and Diastolic BP ≤ 80 mmHg.

7.2.1 Pharmacological Management

Treatment with a renin-angiotensin antagonist is indicated in the following patients with CKD 1:

- Patients with diabetes mellitus with a urinary ACR of ≥ 3 mg/mmol.
- Non-diabetic hypertensive patients and a urinary ACR of ≥ 70 mg/mmol.
- Hypertensive patients with or without diabetes mellitus and a urinary ACR of < 3 mg/mmol should be managed according the *MOPH National Guideline for Hypertension.*

Renin-angiotensin system antagonist prescribing considerations [1,12]:

- A combination of renin-angiotensin system antagonists should not be routinely offered to patients with CKD.

- Before commencing treatment, measure the eGFR and serum potassium [12] [**L1**]:
    - Repeat after 1-2 weeks of treatment and after each dose increase.
- If pre-treatment serum potassium is > 5.0 mmol/L [12] [**L1**]:
    - Do not routinely start ACE inhibitors or ARBs.
    - Exclude and treat other factors that promote hyperkalaemia, and re-check serum potassium.
- ACE inhibitors should only be initiated under specialist supervision in the following groups of patients – if in doubt, discuss with a nephrologist [12]:
    - Receiving multiple or high-dose diuretic therapy (e.g. ≥ 80 mg of furosemide daily or its equivalent).
    - Receiving concomitant angiotensin-II receptor antagonist.
    - With a plasma sodium concentration < 130 mmol/L.
    - With severe or unstable heart failure.
    - Known renovascular disease.
- If the patient is taking medication that promotes hyperkalaemia, more frequent monitoring may be required [12].
- If serum potassium rises to ≥ 6.0 mmol/L and hyperkalaemia-promoting medications have been stopped – discontinue renin-angiotensin system antagonists [12].
- Sodium zirconium cyclosilicate is recommended as an option for treating hyperkalaemia for chronic kidney disease patients stage 3b to 5 (not on dialysis) with persistent hyperkalaemia if they have a confirmed serum potassium level of at least 6.0 mmol/litre and because of hyperkalaemia, are not taking an optimised dosage of reninangiotensin-aldosterone system (RAAS) inhibitor. Stop sodium zirconium cyclosilicate if RAAS inhibitors are no longer suitable [22].
- Patiromer is recommended as an option for treating hyperkalaemia for chronic kidney disease patients stage 3b to 5 (not on dialysis) with persistent hyperkalaemia if they have a confirmed serum potassium level of at least 6.0 mmol/litre and because of hyperkalaemia, are not taking an optimised dosage of renin-angiotensin-aldosterone system (RAAS) inhibitor. Stop Patiromer if RAAS inhibitors are no longer suitable [23].
- If there is a decrease in eGFR of < 25% or there is a serum creatinine increase of < 30% following introduction or dose increase of renin-angiotensin system antagonists [12] [**L1**]:
    - Do not modify the dose.
    - Repeat tests in 1-2 weeks.
- If the eGFR decrease is > 25% from baseline or the plasma creatinine increase is > 30% [12]:
    - Investigate alternative causes of renal function deterioration, e.g. volume depletion or other medication.
    - If there is no other cause:
        - Stop the renin-angiotensin system antagonist, or reduce to a previously tolerated dose; and
        - Add alternative antihypertensive medication if needed.
- To treat patients with type 2 diabetes (T2D), CKD, and an eGFR ‡20 ml/ min per 1.73 m2 with an SGLT2i and if patients are already being treated with other glucose-lowering agents, an SGLT2i can be added to the current treatment regimen [24]
- To withhold SGLT2i during times of prolonged fasting, surgery, or critical medical illness to avoid risk of ketosis [24]
- Transient decrease in eGFR is not an indication of SGLT2i discontinuation [24]
- SGLT2i use is not recommended in kidney transplant patients [24].
- Consider mineralocorticoid receptor antagonist for diabetic adults type 2 with eGFR >25 ml/min per 1.73 m^2, normal serum potassium concentration and ACR ≥ 3 mg/mmol despite maximum dose of renin-angiotensin antagonists[37–39]

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7.3 Manage atherosclerotic cardiovascular risk

Cardiovascular mortality accounts for ≈40% to 50% of all deaths in patients with advanced CKD (stage 4) as well as end-stage kidney disease (stage 5) [25].

Vascular comorbidities that are more common in patients with CKD include [1,12]:

  - Hypertension.
  - Peripheral vascular disease.
  - Heart failure.
- Cardiovascular events, e.g. myocardial infarction and strokes are also more common.

7.3.1 Assess Cardiovascular Risk

Assess ASCVD risk:

- Record the patient's history of and risk factors for ASCVD [26] [**L1, RGA**].
- Baseline laboratory tests to assess ASCVD risk include [27,28] :
  - Lipid profile.
  - HBA_{1C}.
  - Liver function tests.
  - Thyroid-stimulating hormone.
  - eGFR
  - Albuminuria

7.3.2 Lipid-Lowering Therapy

Dyslipidaemia is suggested as a risk factor for CKD [12].

Increased levels of cholesterol and triglyceride can cause kidney function to rapidly decline.

Lipid-lowering may slow disease progression [29].

Initiate statin therapy in the following patients [2–5]:

- All patients with established ASCVD.
- All patients aged ≥ 50 years with an eGFR < 60 mL/min/1.73m2 but not treated with dialysis or kidney transplantation.
- All patients aged ≥ 50 years with an eGFR ≥ 60 mL/min/1.73m2 but who have albuminuria or other manifestations of CKD.
- All patients aged < 50 years with CKD and a 10-year ASCVD risk of 10-year incidence of coronary death or non-fatal myocardial infarction >10%
- All patients aged > 18 years with CKD and diabetes mellitus.
- All renal transplant recipient, especially aged ≥ 30 years.

Statin or statin/ezetimibe combination therapy need not to be initiated in dialysis patients; however, these agents can be continued during dialysis in patients who are receiving them at the time of dialysis initiation[2].

Recommended statin doses in patients at GFR categories G3a-G5, selected for lipid-lowering therapy [2]:

- Atorvastatin 20 mg
- Rosuvastatin 10 mg
- Simvastatin/ezetimibe 20 mg/10 mg
- Pravastatin 40 mg
- Simvastatin 40 mg

Patients at GFR categories G1-G2 should be initiated at doses as recommended in the *MOPH National Guidelines for Dyslipidaemia.*

Before initiating treatment with a statin [27,28]:

- Transaminase levels should be measured to establish a baseline level.
- In the event of chronic, generalised, and unexplained muscle pain, measure creatine kinase regardless of use of statin therapy.
- Discuss the risks and benefits with the patients, including:
    - Advantages of lifestyle modifications.
    - Patient personal preference.
    - Comorbidities.
    - Effect of polypharmacy.
    - General frailty condition.
    - Life expectancy while on statin therapy.

7.3.2.1 Monitoring Treatment

In patients initiated on a statin, further monitoring of lipid levels is not required, except to support adherence to treatment [2].

7.3.3 Antiplatelet Therapy

Impaired renal function is associated with a bleeding risk that increases with severity of CKD [12].

Antiplatelet therapy is indicated in the following patients [1,3–5]:

- All patients with established ASCVD.
- All patients with CKD who at high risk of ASCVD, unless there is an increased bleeding risk that needs to be balanced against the possible cardiovascular benefits.

7.4 Medication Management

Considerations when prescribing for patients with CKD [1]:

- Many drugs undergo renal excretion and their dosage may need to be reduced to avoid toxicity.
- Advise patients to seek advice before using over-the-counter preparations.
- Advise patients not to use herbal remedies.
- All patients taking nephrotoxic agents should have their eGFR, electrolytes, and drug levels regularly monitored.
- If a patient becomes acutely unwell:
    - Review medication [12] [**L1, RGA**].
    - Temporarily discontinue potentially nephrotoxic and renally excreted drugs in patients with an eGFR of < 60 mL/min/1.73m^2 who have a serious intercurrent illness that increases the risk of AKI [1] [**L2, RGA**].

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7.5 Immunisation

CKD is associated with major infectious complications [1]:

- Infection is the second leading cause of death following ASCVD [1].

The MOPH Public Health Department recommends the following immunisations in patients with established CKD, unless contraindicated [30]:

- Hepatitis B vaccination course.
- Pneumococcal conjugate vaccine (PCV13) once.
- Pneumococcal polysaccharide vaccine (PPSV23), repeated once after 5 years to a maximum of 3 times.
- Annual influenza vaccination.

7.6 Monitoring

7.6.1 Frequency of Monitoring

The frequency of monitoring of patients is determined by the stage of CKD. The table below outlines the recommended frequency of follow-up in number of reviews per year [1].

Frequency of monitoring in CKD by GFR and Albuminuria Categories: KDIGO 2012				**Persistent albuminuria categories Description and range**		
				A1	**A2**	**A3**
				Normal to mildly increased	Moderately increased	Severely increased
				< 3 mg/mmol	3-30 mg/mmol	> 30 mg/mmol
GFR categories (mL/min/ 1.73 m^2); Description and Range	**G1**	Normal or high	≥ 90	1 if CKD	1	2
	G2	Mildly decreased	60-89	1 if CKD	1	2
	G3a	Mildly to moderately decreased	45-59	1	2	3
	G3b	Moderately to severely decreased	30-44	2	3	3
	G4	Severely decreased	15-29	3	3	4+
	G5	Kidney failure	< 15	4+	4+	4+

Table 7.6.1: Recommended frequency of review in number of times per year [1].

7.6.2 Assessment for and Management of Progression

Progression of CKD [1]:

- Progression of CKD is defined as a sustained fall in eGFR accompanied by a ≥ 25% decline from baseline eGFR.
- Rapid progression is defined by a sustained decline in eGFR of > 5 mL/min/1.73m2 within one year.

NB: Small fluctuations in eGFR are common and not necessarily indicative of progression. Obtain a minimum of 3 eGFR measurements over a period of not less than 90 days [1,12].

In those patients with CKD progression [1] [**L2**]:

- Review current management.
- Examine for reversible causes of progression.

7.7 Monitor and Treat for Other Complications

Complications of CKD include [1,6,7]:

- Anaemia.
- Hypertension.
- Acidosis.
- Hyperphosphataemia.
- Hypoalbuminaemia.
- Hyperparathyroidism.
- Vitamin D deficiency.
- Malnutrition.
- Acquired cystic renal disease:
    - A complication of acquired cystic renal disease is renal cell carcinoma (RCC).

7.7.1 Renal Anaemia

As CKD progresses, the kidney produces less erythropoietin, and patients can become anaemic [12].

Measure haemoglobin concentrations in the following patients [1]:

- When clinically indicated, in people with an eGFR of ≥ 60 mL/min/1.73 m^2.
- At least annually in people with eGFR of 30-59 mL/min/1.73 m^2.
- At least twice per year in people with eGFR of < 30 mL/min/1.73 m^2.

NB: If the eGFR is ≥ 30 mL/min/1.73m^2, it is more likely that the anaemia is related to another underlying cause than renal failure [**R-GDG**].

7.7.2 Undernutrition

Undernutrition [7,12]:

- Is present in 20%-40% of patients with stage 4-5 CKD [31].
- Is sometimes due to poor appetite secondary to uraemia.
- Can increase vulnerability to disease and infection.
- Is associated with reduced patient survival.

Screening for undernutrition [7]:

- Insufficient energy intake
- Weight loss

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- Loss of muscle mass
- Loss of subcutaneous fat
- Fluid accumulation that can sometimes mask weight loss
- Diminished "functional status" as measured by hand grip strength.

The presence of two or more of these would lead to a diagnosis of undernutrition.

7.7.3 Bone Metabolism and Osteoporosis

Alterations in calcium and phosphate homeostasis occur early in the course of CKD and progress as kidney function decreases, which may result in [12]:

- Abnormalities of metabolism of:
    - Calcium.
    - Phosphate.
    - Parathyroid hormone.
    - Vitamin D.
- Abnormalities of bone turnover, growth, and strength.
- Vascular or soft tissue calcification.

The below table outlines the frequency of testing for markers of bone metabolism by stage of CKD [32].

CKD Stage	GFR Range	Measurement of PTH	Measurement of Calcium/ Phosphorus
3	30-59	Every 12 months	Every 6-12 months
4	15-29	Every 6-12 months	Every 3-6 months
5	< 15 or dialysis	Every 3-6 months	Every 1-3 months

Table 7.7.3: Frequency of testing bone metabolism in CKD Stage 3-5 [32,33,34].

Vitamin D Supplements:

- In the absence of deficiency, do not routinely offer supplements of vitamin D to manage or prevent CKD-mineral and bone disorders [1] [**L1, RGB**].

Osteoporosis:

- Do not routinely perform tests for bone mineral density in patients with an eGFR of < 45 mL/min/1.73m^2, as information may be misleading or unhelpful [1].
- Bisphosphonates should not be offered routinely to patients with a eGFR of < 30 mL/ min/1.73m^2 without a strong clinical rationale [1].

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7.8 Referral to Nephrology

7.8.1 Consider Referral to a Nephrologist

Referral to a nephrologist for specialist assessment and management is normally required for patients with CKD, and [1,8,12,35]:

- AKI
- A sustained eGFR of < 60 mL/min/1.73m^2.
- A consistent finding of significant albuminuria (ACR of ≥ 30 mg/mmol or AER of ≥ 300 mg/24 hours; approximately equivalent to PCR of ≥ 50 mg/mmol or a PER of ≥ 500 mg/24 hours):
    - Despite appropriate treatment; or
    - Associated with haematuria and other risks factors, such as ASCVD or declining eGFR.
- Persistent abnormalities of serum potassium.
- Urinary red cell casts with red blood cell count (RBC) > 20 per high power field, which is sustained and not readily explained.
- Hereditary kidney disease.

7.8.2 Indications for Urgent or Immediate Referral

Consider immediate referral to hospital or discussion with a specialist if [12,35]:

- The eGFR is < 20 mL/min/1.73m^2.
- The patient has AKI.
- Urgent medical intervention is required, such as for treatment of:
    - Hyperkalaemia.
    - Severe uraemia.
    - Acidosis.
    - Fluid overload.

Refer to a urologist [12]:

- If the patient has evidence of urinary tract obstruction.
- For investigation of urinary tract malignancy for patients in appropriate age groups with persistent haematuria, regardless of the presence of proteinuria.

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8. Specialist Management

8.1 Renal Replacement Therapy

For patients with progressive CKD, who are most likely to require renal replacement therapy (RRT) within one year, it is advisable to manage care within a multidisciplinary care setting, which includes [1,8]:

- Dietary counselling
- Education and counselling about different RRT modalities
- Transplant options
- Vascular access surgery
- Ethical, psychological, and social care.

8.1.1 Preparation for Renal Replacement Therapy

Most patients with an eGFR of < 20 mL/min/1.73m^2 should be provided with timely and personalised information regarding renal failure and RRT [2]. Patients with ESRD who are likely to need RRT within 6 months should be referred urgently to receive education and information and to prepare for RRT [R-GDG].

Preparation for RRT includes [9,10,36]:

- Education aimed at improving the patient's knowledge and understanding of their condition, and to help them choose among the options for treatment.
- Counselling with regard to modality choices, including conservative care, offering descriptions of and including information on:
    - Efficacy.
    - Risks.
    - The potential benefit based on the patient's prognosis.
    - The potential side effects and their severity.
    - Changing the modality of dialysis and the possible consequences.
- Transplant assessment and potential pre-emptive listing
- Physical preparation for the chosen modality/modalities, e.g. definitive vascular access.
- Discussion of social and psychological issues, including:
    - The patient's and/or carer's ability to perform and adjust the treatment.
    - Integration with daily activities such as work, school, hobbies, family commitments, and travel for work or leisure.
    - Opportunities to maintain social interaction.
    - The impact on body image.
    - How the dialysis access point on the body may restrict physical activity.
    - If their home will need to be modified.
    - Distance and time spent travelling for treatment.
    - Flexibility of treatment regimen.
    - Any additional support or services that might be needed from others.
- Education on forearm vein preservation.
- In order to preserve site, avoid unnecessary venepuncture in the upper limb intended for creation of vascular access.

Planning for renal transplant:

- The advantages of pre-emptive transplantation should be discussed with all suitable individuals [9] [**L2**].
- Efforts should be made to identify a potential donor to allow pre-emptive transplantation before the need for RRT [9] [**L2**].

Where pre-emptive transplantation is not possible, a timely referral for either definitive vascular access formation or peritoneal dialysis catheter placement should be made [9].

The exact timing of vascular access placement should be determined by [36] [**L1, RGA**]:

- The rate of renal function decline.
- Co-morbidities.
- The surgical pathway.

Pre-operative assessment:

- Clinical assessment and, when appropriate, imaging of both arteries and veins of upper arms should be performed to assess vessel suitability for access creation [36] [**L1, RGA**].
- Imaging to exclude central vein stenosis may be considered in all patients with previous central venous cannulation [36] [**L2, RGA**]

8.1.2 Initiation of Renal Replacement Therapy

There is no good evidence for the superiority of one dialysis option over another [9,10]:

- Decisions on which intervention to use will depend upon patient preferences, availability, and clinical contraindications.
- A patient's priorities will not necessarily be the same as the healthcare professional's clinical priorities.

Consider initiation of dialysis when one or more of the following are present. This often but doesn't always occur when the eGFR is between 5-7 ml/min/1.73m^2 [1] [**L2, RGA**]:

- Symptoms or signs of renal failure are present, such as:
- Acid base or electrolytes abnormalities.
- Inability to control volume status or BP.
- Deterioration in nutritional status, unresponsive to dietary interventions.
- Cognitive impairment.

8.1.3 Renal Transplant

Renal transplantation should be the RRT of choice for patients with ESRD who are fit for renal transplant [11] [L2, RGA]. Consideration for renal transplant should be addressed on an individualised basis [R-GDG].

8.1.4 Peritoneal Dialysis

Peritoneal dialysis [10]:

- May be delivered safely and effectively at home or another location of the patient's choice.
- Treatment modalities include:
    - Automated peritoneal dialysis (APD).
    - Continuous ambulatory peritoneal dialysis (CAPD).
- Offer all patients a choice, if appropriate, between the different treatment modalities.

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8.1.5 Haemodialysis

Haemodialysis [10]:

- Treatment may take place:
    - In a dialysis centre.
    - In a hospital setting.
    - At the patient's home.

8.2 Conservative Kidney Management

Conservative management [9,10]:

- Conservative kidney management should be provided to patients with advanced CKD who will not benefit or opt not to have dialysis.
- Conservative management focuses on:
    - Slowing the decline in renal function.
    - Actively managing symptoms.
    - Advance care planning.
    - Provision of palliative care.

8.3 Consider Palliative Care at the Appropriate Stage

Recognizing need for end of life care [9] [**L2, RGA**]:

- Recognise patients struggling to cope on long term dialysis due to a deterioration of underlying clinical problems or a sudden catastrophic clinical event. Either may indicate an imminent or immediate need of end-of-life care.
- Offer the opportunity to create an Advance Care Plan with patients who are:
    - Deteriorating despite dialysis; or
    - Undergoing conservative management.

Dialysis withdrawal [9] [**L2, RGA**]:

- Decisions to discontinue dialysis should be made jointly by the patients and their consultant and should involve relatives and carers and other members of the team.
- Carry out an assessment of competence.
- Exclude depression.

Principles of care in the last days of life include [9]:

- Symptom relief.
- Psychological, spiritual, and cultural support.
- Good communication with the patient and their family.
- Care wherever possible in their preferred place of care.

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9. Key Considerations for Patient Preferences

Patient preferences refer to patient perspectives, beliefs, expectations, and goals for health and life, and to the steps employed by individuals in assessing the potential benefits, harms, costs, and limitations of the management options in relation to one another. Patients may have preferences when it comes to defining their problems, identifying the range of management options and selecting or ranking the outcomes used to compare these options.

It is important for healthcare professionals to develop an understanding of the patient as an individual and the unique way in which each person experiences a condition and its impact on their life.

The following recommendations are therefore made for physicians and other healthcare professionals regarding general principles of patient care in Qatar. All clinicians and health care practitioners involved in patients' care in the State of Qatar should:

- **Respect Patients:** Treat patients with respect, kindness, dignity, courtesy and honesty. Ensure that the environment is conducive to discussion and that the patient's privacy is respected, particularly when discussing sensitive, personal issues. Ask the patient how they wish to be addressed and ensure that their choice is respected and used.

- **Maintain Confidentiality:** Respect the patient's right to confidentiality and avoid disclosing or sharing patients' information without their informed consent. In this context, students and anyone not directly involved in the delivery of care should first be introduced to the patient before starting consultations or meetings, and let the patient decide if they want them to stay.

- **Clarify Third-Party Involvement:** Clarify with the patient at the first point of contact whether and how they like their partner, family members or carers to be involved in key decisions about their care or management and review this regularly. If the patient agrees, share information with their partner, family members or carers.

- **Obtain Informed Consent:** Obtain and document informed consent from patients, in accordance with MOPH policy and guidance.

- **Encourage Shared Decision Making:** Ensure that patients are involved in decision making about their own care, or their dependent's care, and that factors that could impact the patient's participation in their own consultation and care including physical or learning disabilities, sight, speech or hearing impairments and problems with understanding, reading or speaking English are addressed.

- **Disclose Medical Errors:** Disclose errors when they occur and show empathy to patients.

- **Ensure Effective Communication:** Explore ways to improve communication including using pictures, symbols or involving an interpreter or family members. Avoid using medical jargon. Use words the patient will understand and confirm understanding by asking questions.

- **Ensure Continuity of Care:** Provide clear and timely sharing of patient information between healthcare professionals especially at the point of any transitions in care.

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10. Performance Measures

A list of performance measures is given in the table below. Healthcare organizations are encouraged to monitor service performance using the indicator definitions below.

Number	Numerator	Denominator
KD01	Number of adults with CKD who had eGFR creatinine testing in the past year	Total number of adults with CKD.
KD02	Number of adults with CKD without diabetes and with an ACR below 70 mg/mmol whose systolic BP is between 120–140 mmHg and their diastolic BP below 90 mmHg.	Total number of adults with CKD without diabetes and with an ACR below 70 mg/mmol.
KD03	Number of adults with CKD and diabetes whose systolic BP is between 120–130 mmHg and their diastolic BP below 80 mmHg.	Total number of adults with CKD and diabetes.
KD04	Number of adults with CKD and an ACR of 70 mg/mmol or more whose systolic BP is between 120–130 mmHg and their diastolic BP below 80 mmHg.	Total number of adults with CKD and an ACR of 70 mg/mmol or more.
KD05	Number of adults with CKD who receive atorvastatin 20 mg.	Total number of adults with CKD.
KD06	Number of patients with cardiovascular disease among adults with CKD.	Total number of adults with CKD
KD07	Number of adults with end-stage kidney disease.	Total number of adults with CKD.
KD08	Number of adults with CKD with a greater than 40% reduction in non-high-density lipoprotein cholesterol.	Total number of adults with CKD.

Table 11.1: Performance measures.

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Appendix: Detailed Description of the Literature Search

A systematic search for existing literature on CKD was performed in the period March 2020 – July 2023.

All existing references were evaluated and where necessary and applicable, the latest version of the specific manuscript was used to update the guideline and replace the older reference. The search for clinical practice guidelines on chronic kidney disease diagnosis and/or management was performed in the *PubMed* database and websites of relevant organizations and societies including the *UK NICE*, the *American College of Cardiology*, the *American Heart Association*, the *National Kidney Foundation* and the *Renal Association*. The present guideline is primarily based on NICE and KDIGO guidelines and is supplemented with other relevant studies.

Peer-reviewed scientific publications were found in PubMed and via *Google Scholar* Internet search engine. Non-peer reviewed studies were identified in *bioRxiv*. Books were checked on *Amazon* and via *Google* and *Google Scholar* search engines.

The included publications were identified using the terms "chronic kidney disease" and specified with the following terms in combinations:

guideline, epidemiology, definition, prevalence, risk factors, screening, diagnosis, differential diagnosis, symptoms, stage, management, investigation, proteinuria, haematuria, treatment, blood pressure, cardiovascular, referral, specialist, emergency, pharmacological therapy, statin, antiplatelet, anaemia, osteoporosis, renal replacement, transplant, dialysis, peritoneal, haemodialysis, follow-up, end-stage, palliative care, conservative management.

Figure A.1 on the next page demonstrates graphically the results of the search and application of exclusion criteria.

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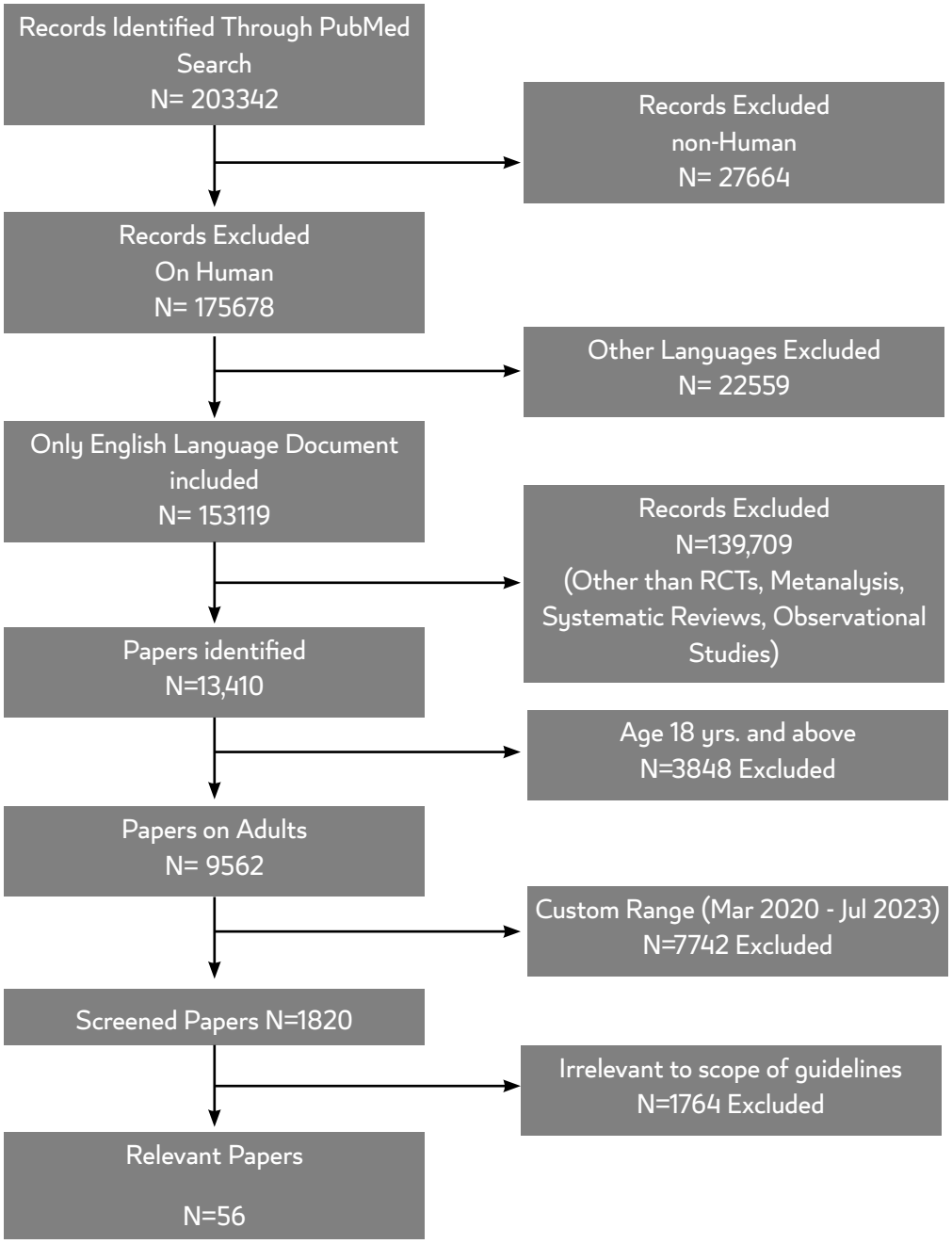

Fig A.1: Literature search results and application of exclusion criteria.

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