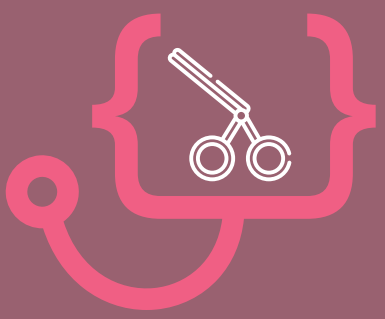
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2019 Edition, Vol. I

# STANDARD TREATMENT WORKFLOWS

*of India*

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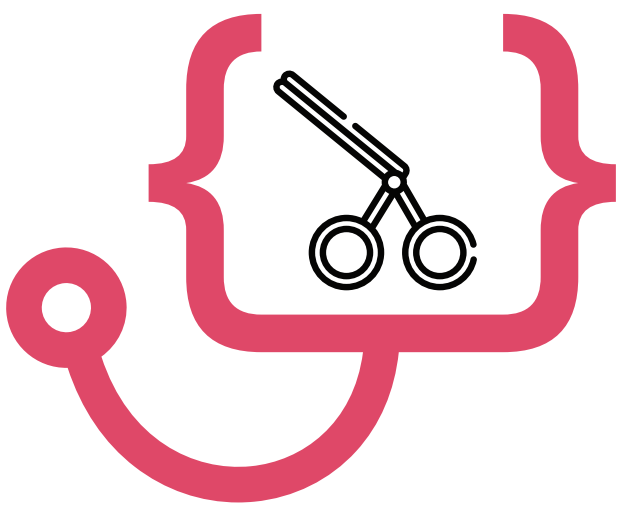
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Suggested Citation: Standard Treatment Workflows of India, 2019 Edition, Vol. 1, New Delhi, Indian Council of Medical Research, Department of Health Research, Ministry of Health and Family Welfare, Government of India

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# STANDARD TREATMENT WORKFLOWS of India

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  - HEMODIALYSIS
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# NEPHROLOGY

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# Standard Treatment Workflow (STW)

# ACUTE KIDNEY INJURY

## ICD-11-GB60

### WHAT IS AKI?

Increase in serum creatinine ≥0.3 mg/dL in 48 hours OR
≥1.5× baseline within 7 days AND/OR
urine output <0.5 mL/kg/h for 6 hours.

*Criteria should be applied after excluding urinary obstruction

### SYMPTOMS

- Reduced urine output
- Dark, concentrated urine
- Swelling over feet/face
- Breathlessness
- Nausea, vomiting, reduced appetite
- Confusion or altered sensorium

### AKI RISK INCREASES IN THE PRESENCE OF

- Hypotension
- Volume loss (eg: vomiting, diarrhea, bleeding)
- Heat exposure or heat stroke
- Low effective arterial volume (Heart failure, decompensated liver disease)
- Nephrotoxic/ indigenous drug use
- Plant and chemical toxins
- Radio contrast exposure
- Infections
- Animal bites/ stings
- In neonates - oligohydramnios/birth asphyxia, respiratory distress
- Hemolysis
- Rhabdomyolysis (Post trauma)
- Pregnancy-related complications
- Multiorgan failure

### PRINCIPLES OF ASSESSMENT

- Careful review of history and medications
- Determine whether pre-renal, renal or post-renal
- Identify and correct reversible factors
- Look out for occult causes (e.g. envenomations, poisoning)
- Determine severity of AKI
- Determine whether community acquired or hospital acquired

### PRELIMINARY ACTIONS

- Monitor urine volume & body weight
- Identify and treat complications
- Correct hydration status
- Stop nephrotoxic drugs
- Exclude urinary outflow obstruction
- Stabilize blood pressure
- Treat infection
- Assess dialysis need
- Optimize blood sugar level

### DESIRABLE ACTIONS/INVESTIGATIONS

- Stage AKI (KDIGO criteria*)
- Check electrolytes, acid-base status Including serum calcium, phosphate, and uric acid
- Urinalysis- if proteinuria, hematuria rule out glomerulonephritis
- CBC- hemolysis, low platelets- suggets TMA
- Rule out pre-existing kidney disease
- Ultrasound of KUB region
- Assessment for infection
- Laboratory investigation for specific cause
- CPK level in suspected rhabdomyolysis
- LDH, bilirubin for hemolysis
- ECG, Chest X-ray

### AKI IN SPECIFIC SETTINGS

- Neonatal - refer to paediatrician
- Pregnancy - manage complications
- Envenomations - antisnake venom, hemodynamic correction
- Poisoning - specific antidote when available
- Systemic disease - refer for investigations
- Kidney transplant recipient - refer to nephrologist

### TREATMENT OF HYPERKALEMIA

- 10 ml of 10% calcium gluconate over 2-5 minutes slow IV under ECG monitoring, can be repeated upto 3 times
- Inhaled Salbutamol : 10mg (4 respules of 2.5ml Salbutamol)
- Insulin-dextrose: 10U in 50ml of 50% dextrose or 100ml of 25% dextrose
- Avoid high potassium diet
- Withold medication likely to contribute to hyperkalemia (ACEi/ARB)
- Urgent dialysis if life threatening
- Potassium binders if dialysis unavailable

## MANAGEMENT

### PRIMARY CARE

- Detailed history and physical examination
- Identify and correct volume deficit
- Stop nephrotoxic agents
- Identify and correct bladder outlet obstruction
- Give anti-snake venom if indicated
- Identify hyperkalemia and start treatment
- IV loop diuretics if fluid overload
- Oxygen if pulmonary edema
- PD if indicated
- Timely referral after stabilisation

### SECONDARY CARE

- As in primary care
- Admit to healthcare facility, identify and correct urinary tract obstruction (USG, CT)
- Detailed investigation for infections
- Manage pregnancy complications - deliver if indicated
- Look for underlying CKD
- Dialysis (PD or HD)
- Evaluate volume status
- Viral screening for dialysis initiation
- Blood grouping and typing
- Baseline Chest X-ray and ECG
- Look for any life threatening complications
- Admission for stabilization and further evaluation

### TERTIARY CARE

- All interventions as in secondary care
- Admission for stabilisation and further evaluation
- Kidney biopsy if indicated
- Multidisciplinary consultation as indicated
- Dialysis (PD or HD or CRRT)
- Plasma Exchange where indicated

### RED FLAGS FOR URGENT REFERRAL

- Indications for dialysis
- Unexplained AKI
- Involvement of other organs
- Sepsis
- Systemic disease
- Complicated pregnancy
- Post Transplant

### INDICATIONS FOR DIALYSIS

- **A**cidosis- refractory
- **E**lectrolyte disturbance- hyperkalemia
- **I**ntoxications
- **O**verload - refractory
- **U**remic encephalopathy pericarditis

### FOLLOW-UP OF AKI

- UO > 1L, stable or falling creatinine, no symptoms: stop dialysis
- Not resolving for >2 weeks: CECT to exclude cortical necrosis; kidney biopsy as indicated
- Look for systemic diseases (e.g. vasculitis, myeloma, TMA)
- Serum creatinine and urine protein q 6-12 months for life

## ABBREVIATIONS

**AKI:** Acute Kidney Injury
**CECT:** Contrast-enhanced CT scan
**PD:** Peritoneal dialysis
**TMA:** Thrombotic microangiopathy
**CKD:** Chronic Kidney Disease
**HD:** Hemodialysis
**UO:** Urine output
**USG:** Ultrasonography

## REFERENCE

1. Kellum JA, Lameire N, Levin A, Stevens PE, and the KDIGO Consensus Conference participants. Harmonizing acute and chronic kidney disease definition and classification: report of a Kidney Disease: Improving Global Outcomes (KDIGO) Consensus Conference. Kidney International. 2021;100(3):516–526
2. *KIDNEY DISEASE: Improving Global Outcomes (KDIGO) Acute Kidney Injury Work Group. KDIGO Clinical Practice Guideline for Acute Kidney Injury. Kidney Int, Suppl. 2012; 2: 1–138

**STOP AKI: ACT FAST, PROTECT KIDNEYS**

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## Standard Treatment Workflow (STW)

# CHRONIC KIDNEY DISEASE (CKD)

### ICD-11-GB61

### WHAT IS CKD?

Abnormalities of kidney structure or function, present for >3 months, with implications for health

### WHEN TO LOOK FOR CKD

- History of long-standing nocturia, or constitutional symptoms
- Edema, hematuria, proteinuria or renal stones
- Long-term intake of painkillers or herbal medicines
- Longstanding diabetes, hypertension, Heart Disease, stroke, PVD, Family history of kidney disease, AKI in the past, Prediabetes, HIV, Recurrent UTI in childhood, Developmental anomalies of the Kidney
- Unexplained Anemia, Growth retardation, rickets
- Systemic diseases (eg. connective tissue disease)

### EVALUATION OF NEWLY DIAGNOSED PATIENT WITH CKD

- Serum creatinine, electrolytes, bicarbonate
- Estimate glomerular filtration rate using CKD-EPI equation (>18 yrs) or Modified Schwartz equation (<18 yrs)
- Urinalysis/examine sediment, proteinuria quantitation
- Ultrasound of kidneys and urinary tract
- Calcium, phosphate, alkaline phosphatase, albumin
- CBC including peripheral blood film
- Iron profile – Serum iron, TIBC, TSAT

### INITIAL ASSESSMENT FOR

- Confirmation of CKD diagnosis (repeat tests after 3 months)
- Staging and progression rate
- Establishing cause of kidney disease
- Identify and treat reversible factors (hypertension, volume loss, obstruction, infection)
- Look for complications (anemia, bone disease, dys-electrolytemias, CVD)

### LIFESTYLE MEASURES FOR ALL CKD PATIENTS

- Weight control/weight gain monitoring in children
- Regular physical activity
- Reduce dietary salt intake to <5 g/day
- Stop tobacco use in all forms
- Stop alcohol use
- Stop using unproven health supplements
- Do not use NSAIDS
- Avoid untested indigenous medicines

### BP CONTROL (TARGET <120/80)

- Restrict dietary salt to <5 g/day
- Use any anti-HT available in local formulary
- BP <90th percentile & <120/80 in Adolescents >13 yrs

ACE/ARB preferred*

*Caution if Potassium >5.5 mEq/L

### VACCINATION SCHEDULE FOR NEWLY DIAGNOSED CKD PATIENT

- If HBV –ve: 20 µg IM in each deltoid at 0,1,2 and 6 months
- Pneumococcal, Shingles, Annual Influenza Vaccine
- In children – complete primary vaccination schedule

### ANEMIA MANAGEMENT

- Establish iron replete state
- If not iron replete, give oral iron
- Consider IV iron for dialysis patients and those not tolerating orally
- If Iron Replete – start ESAs & titrate to keep Hb 10–11 g/dl

### MANAGEMENT OF HYPERPHOSPHATEMIA (PO4>5.5)

- Restrict Phosphate in Diet
- Start with Ca-containing binders
- Non Ca-binders can be used if serum Ca >9 mg/dl, vascular calcification or low iPTH

### DIABETES CONTROL

- Do not use metformin if eGFR <30
- SGLT2i if eGFR >20 ml/min
- Individualize HbA1c target

### NUTRITION

- Salt restriction <5 g/day and protein intake 0.8 g/kg/day.
- Do not restrict protein intake unless there is documented high protein consumption (Dairy and white meat are good protein sources; include a variety of dals)
- Restrict potassium and salt substitutes in case of hyperkalemia.
- Avoid fruit juices, coconut water, and carbonated beverages.
- For children: Ensure adequate protein intake appropriate for age, with dietary recommendations as advised by the nephrologist

### LOW POTASSIUM FRUITS/VEGETABLES

Apple, pineapple, papaya, pear, tangerine, watermelon, grape, plum, cabbage, carrot, cauliflower, onion, radish, peppers, chillies, brinjal, cucumber, green beans

### MINERAL BONE DISEASE

- Measure serum calcium, phosphorus, 25 OH vitamin D, PTH & alkaline phosphatase - if any abnormality, refer to Nephrologist
- Oral sodium bicarbonate if venous bicarbonate <18 mEq/l

## MANAGEMENT

### PRIMARY CARE

- Detailed history and physical examination
- Identify and correct reversible factors
- Stop nephrotoxic agents
- Referral after stabilization

### ADMISSION CRITERIA

- Initial evaluation or when patient presents with specific problems – like acute worsening, development of a new complication
- For creation of vascular access
- For PD catheter placement or initiation
- Initiation on HD and for kidney transplant

### TERTIARY CARE

- Detailed history and physical examination
- Investigate to ascertain cause of CKD (imaging/biopsy/genetic studies)
- Tailor treatment to cause
- Identify and manage complications
- Vaccination
- Counseling: nutrition, lifestyle, pregnancy in women of child-bearing age
- Discussion regarding RRT
- Vascular access creation/PD catheter insertion
- Work-up for transplantation
- Send patient back to community with treatment plan

### INDICATIONS FOR REFERRAL

- Initial evaluation of all newly diagnosed cases
- Rapid disease progression
- New complication
- Discussion for Renal Replacement Therapy (RRT)

ACEI/ARB, SGLT2I & Non-Steroidal MRAs retard CKD progression & reduce CV events - should be used when possible, with careful monitoring

### DISTRICT HOSPITAL

- Detailed history and physical examination
- Investigate to ascertain cause of CKD
- Tailor treatment to cause
- Identify and manage complications
- Vaccination
- Identify and correct acute factors
- Counseling: nutrition, lifestyle, pregnancy in women of child-bearing age
- Discussion regarding RRT
- Vascular access creation or PD Catheter insertion
- Send patient back to community with treatment plan

### PREPARATION FOR RENAL REPLACEMENT THERAPY

- eGFR <30: Preserve veins in the non-dominant arm for AV fistula
- eGFR <30: Discuss RRT options
- Counsel for AVF
- Dialysis start: To be decided by Nephrologist based on symptoms and complications of renal failure

### CONSERVATIVE CARE

- If life expectancy limited, multiple comorbidities/personal preference
- Decision-making should be shared with patient/family

## ABBREVIATIONS

**ACEI:** Angiotensin Converting Enzyme Inhibitor
**AKI:** Acute Kidney Injury
**ARB:** Angiotensin Receptor Blocker
**AV Fistula:** Arterio-Venous Fistula
**BP:** Blood Pressure
**Ca:** Calcium
**eGFR:** Estimated Glomerular Filtration Rate
**ESA:** Erythropoiesis Stimulating Agents
**Hb:** Haemoglobin
**HbA1c:** Haemoglobin A1c
**HBV:** Hepatitis B Virus
**HIV:** Human Immunodeficiency Virus
**iPTH:** Intact Parathyroid Hormone
**IV:** Intravenous
**NSAIDs:** Non-Steroidal Anti-Inflammatory Drugs
**PD:** Peritoneal Dialysis
**PO4:** Phosphate
**PVD:** Peripheral Vascular Disease
**RRT:** Renal Replacement Therapy
**SGLT2I:** Sodium Glucose Transporter 2 inhibitor
**TIBC:** Total Iron Binding Capacity
**TSAT:** Transferrin Saturation
**UTI:** Urinary Tract Infection

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1. Kidney Disease: Improving Global Outcomes (KDIGO) CKD Work Group. KDIGO 2024 Clinical Practice Guideline for the Evaluation and Management of Chronic Kidney Disease. Kidney Int. 2024 Apr;105(4S):S117-S314. doi: 10.1016/j.kint.2023.10.018. PMID: 38490803

**EARLY RECOGNITION. DECISIVE ACTION. PREVENT COMPLICATIONS**

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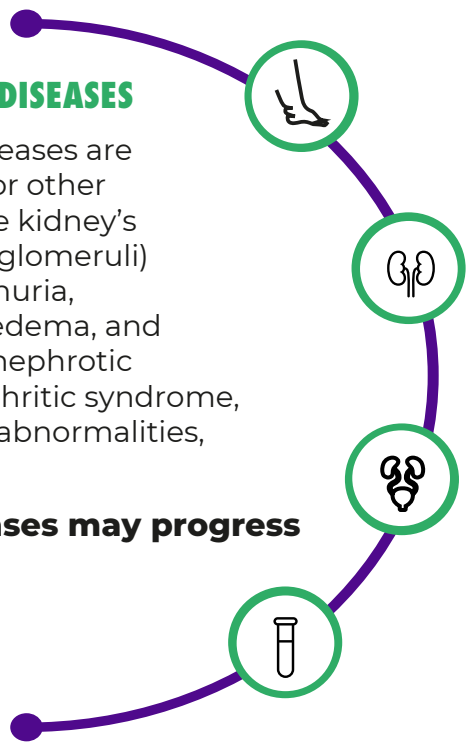
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# Standard Treatment Workflow

# GLOMERULAR DISEASES

## ICD-11-N005.9



### GLOMERULAR DISEASES

Glomerular diseases are inflammatory or other disorders of the kidney's filtering units (glomeruli) causing proteinuria, hematuria, or edema, and presenting as nephrotic syndrome, nephritic syndrome, RPGN, urinary abnormalities, AKI, or CKD.

**Untreated cases may progress to ESKD**

### IDENTIFY THE SYNDROME

| Syndrome | Key Features |
|---|---|
| Nephrotic Syndrome | Edema, frothy urine, hypoalbuminemia, hyperlipidemia.<br>**Proteinuria (Nephrotic Range):**<br>**Adults:** >3.5 g/1.73 m²/day or spot urine PCR >3 g/g<br>**Children:** > 1000 mg/m2 per day or spot urine PCR >2 g/g |
| Nephritic Syndrome | Cola-coloured urine, oliguria, edema, hypertension,<br>Hematuria (± RBC casts), no or mild proteinuria |
| Rapidly Progressive Glomerulonephritis | Rapid increase of Serum Creatinine within days to weeks.<br>May have constitutional symptoms, e.g. pulmonary hemorrhage, fever, joint pains |
| Asymptomatic Urinary Abnormalities | Isolated proteinuria or hematuria, usually detected on screening.<br>Repeat urine microscopy, dipstick, proteinuria quantification<br>Refer to nephrologist if abnormalities persist |

## NEPHROTIC SYNDROME

**Common Causes**

**Children:** Minimal Change Disease (most common, steroid-responsive)

**Adults:** Minimal Change Disease, FSGS, Membranous Nephropathy, Diabetic Nephropathy, Lupus Nephritis

**Key Tests**

- Urine Microscopy
- Proteinuria quantification
- Serum albumin
- Lipid profile
- ANA, anti-dsDNA, C3, C4
- Anti-PLA2R
- Hepatitis B/C, HIV
- Myeloma profile (SPEP, serum free light chain assay)
- Blood Sugar F/PP
- Kidney Biopsy: as per indication
- Other tests as per clinical context

**Management PHC Level/CHC Level**

- Salt restriction
- Loop diuretics for edema (monitor Na+/K+; consider loop + thiazide for resistant edema; aim for 0.5–1 kg/day weight loss in adults)
- ACEi/ARB for proteinuria reduction Statins for dyslipidemia

**District hospital/Tertiary level**

- Steroid Protocol: To be done by specialised team
- Children: Prednisolone 2 mg/kg/day (max 60 mg) × 6 weeks → 1.5 mg/kg (max 40 mg) on alternate days × 6 weeks
- Adults: Treatment should be done as per kidney biopsy reports
- Thromboprophylaxis if albumin <2.5 g/dL

**Special Paediatric Precautions**

- Screen for TB before steroid initiation (Mantoux, CXR)
- Avoid live vaccines during and 3 months after steroids
- Regular growth and BP monitoring
- Avoid ACEi/ARB in steroid-sensitive cases with normal kidney function
- Relapses may occur, hence look for proteinuria during intercurrent illness
- Steroids in intercurrent ilness

## NEPHRITIC SYNDROME

**Common Causes**
Post-infectious GN, HSP (children) IgA nephropathy, lupus nephritis, vasculitis

**Key Tests**
Urinalysis (RBCs, RBC cast, protein)
Serum creatinine
C3/C4, ANA, anti-dsDNA
ASO titre (if H/o sore throat or skin lesions)

**Management PHC Level/CHC Level**
BP control (<130/80 adults; <95th percentile children)
Supportive fluid management
Avoid NSAIDs/nephrotoxins
Treat underlying cause
Refer if unresponsive or atypical

## RAPIDLY PROGRESSIVE GLOMERULONEPHRITIS (RPGN)

**Definition:**
Rapid renal decline (doubling of creatinine within days–weeks)

**Causes:**
ANCA vasculitis, anti-GBM disease, lupus nephritis, severe IgA nephropathy , Pauci-immune Glomerulonephritis

**Key Tests:**
Urinalysis, serum creatinine
ANCA (anti PR3, anti MPO titres), anti-GBM, ANA, anti-dsDNA, complements C3, C4, CXR
Look for coexisting diseases

**Management**
**PHC Level/CHC Level**
Immediate nephrology referral
**District hospital/Tertiary level**
Kidney Biopsy
IV methylprednisolone 500–1000 mg × 3 days
Cyclophosphamide/rituximab ± plasmapheresis

## REFERRAL TO NEPHROLOGIST (DISTRICT HOSPITAL OR NEAREST AVAILABLE CENTRE)

**Immediate – Same Day (Red Flag Signs)**

**Rapidly Progressive Glomerulonephritis**

**Pulmonary-renal syndrome**

**Suspected peritonitis in nephrotic syndrome**

**Hypertensive emergency**

**Pregnancy**

### Red Flag Signs

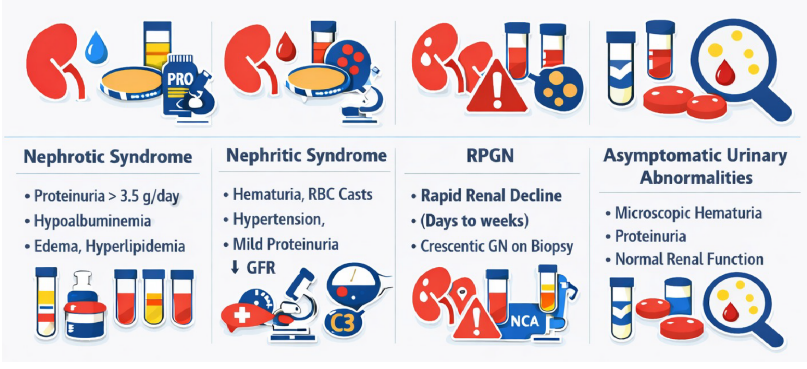
- Respiratory distress
- Severe abdominal pain
- Unilateral limb swelling
- Oliguria or anuria
- Seizures
- Hypotension
- Acute febrile illness

### Look for complications

- Malnutrition
- Hypovolemia
- AKI
- Thromboembolism
- Infections

### General Management Principles

- Maintain BP target <130/80 mmHg (adults) or <95th percentile (children)
- Restrict salt (unless paediatric without edema)
- Reverse edema gradually to prevent hypovolemia
- Avoid NSAIDs and aminoglycosides
- Maintain adequate nutrition and encourage physical activity




### Infection Prevention

- Update Vaccinations before starting immunosuppressive therapy, if possible
- Pneumococcal and annual inactivated influenza vaccines are safe and recommended
- Maintain strict hygiene (handwashing, safe food and drinking water)
- While on immunosuppressive therapy, avoid crowded areas and wear mask

### Monitor regularly

- BP & weight - each visit
- Urine Examination - monthly
- Serum creatinine and eGFR- (1–3 month) (more often in active disease)
- Monitor growth in children every 6 months
- Eye evaluation for posterior subcapsular cataract every 6 months

## ABBREVIATIONS

**ACR:** Albumin-to-Creatinine Ratio
**AKI:** Acute Kidney Injury
**ANA:** Antinuclear Antibody
**ACEi:** Angiotensin-Converting Enzyme Inhibitor
**C3/C4:** Complement C3 and C4
**CKD:** Chronic Kidney Disease
**dsDNA:** Double-Stranded DNA
**eGFR:** Estimated Glomerular Filtration Rate
**ESKD:** End-Stage Kidney Disease
**FSGS:** Focal Segmental Glomerulosclerosis
**HSP:** Henoch-Schonlein Purpura
**MCD:** Minimal Change Disease
**NSAIDs:** Non-Steroidal Anti-Inflammatory Drugs
**RPGN:** Rapidly Progressive Glomerulonephritis
**SPEP:** Serum Protein Electrophoresis

## REFERENCES

1. KDIGO 2021 Clinical Practice Guidelines for the management of Glomerular Diseases, available at www.kdigo.org

## GLOMERULAR DISEASES: DETECT EARLY, TREAT TIMELY, PREVENT CKD/ESKD

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# Standard Treatment Workflow (STW)

# URINARY TRACT INFECTIONS

## ICD-11-GC08

### TYPES OF UTI

**UNCOMPLICATED UTI**

Infection confined to urinary bladder in afebrile patients

- At least 3 symptoms - dysuria, frequency, urgency, suprapubic pain
  **OR**
- If less than three symptoms:
  - Dipstick +ve for leukocyte esterase and nitrite **OR**
  - >10 WBC /HPF in centrifuged sample **OR**
  - Urine culture with $10^5$/ml colony count in mid stream urine culture

**COMPLICATED UTI/PYELONEPHRITIS**

Infection extending beyond bladder or associated with systemic illness.

- Fever
- Flank pain
- Features of sepsis- chills, rigors, hemodynamic instability
- Costovertebral angle tenderness
- Perineal pain and tenderness

### WHEN NOT TO DO URINE CULTURE

All uncomplicated UTIs
Asymtomatic urinary catheters

### HIGH RISK GROUP FOR COMPLICATED UTI

UTI in presence of:

- Stones
- Urinary tract obstruction
- Congenital anomalies of urinary tract
- Immunosuppression/ immunocompromised individual
- Pregnant individuals
- Chronic kidney disease
- Recent urological instrumentation/procedure

### RED FLAG SIGNS

- Fever > 100˚F
- Chill and rigors
- Tachycardia
- Tachypnea
- Hypotension
- Costovertebral tenderness
- Obtundation

### MANAGEMENT

**PRIMARY CARE/SECONDARY CARE**

**HISTORY**

- Confirm diagnosis
- Exclude complicated UTI
- Look out for high risk groups

**EXAMINATION**

- Temperature
- Blood pressure, Pulse
- Respiratory rate
- Renal Angle/costovertebral tenderness
- Perineal tenderness
- Look for red flag signs

**TREATMENT**

- Nitrofurantoin 100 mg PO BD for 5 - 7 days
- Trimethoprim sulphamethoxazole DS PO tablet BD for 3 -5 days
- Fosfomycin 3 gm single dose, either empty stomach after dinner and passing urine
- Norfloxacin 400 BD or Levofloxacin 250 BD PO for 5 days

### SYMPTOMATIC TREATMENT

- Drink Plenty of water
- Urine alkalizer recommended eg citrate based solutions
- Avoid if patient on nitrofurantoin
- Phenazopyridine 200mg tid for 2 days
- Paracetamol for pain

### WHEN TO REFER

- Complicated UTI
- Presence of red flag signs
- Recurrent UTI
- UTI after recent instrumentation

### TERTIARY LEVEL

- Send for culture
- Imaging necessary
- Urology services if obstruction
- Rx
  - Complicated UTI
  - Pregnancy UTI
  - Prostatitis
  - Recurrent UTI
  - Non-resolving UTI

### COMPLICATED UTI

Empiric Therapy:
- Urine c/s
- Blood culture

Option 1
- Initial dose of a parenteral agent
- Gentamicin 5mg/kg IV/IM one dose OR Amikacin 15 mg/kg IM/IV one dose followed by
- Cefurixime 500 PO every 12 hr

OR
- Trimethoprim Sulfamethoxazole 800-160 mg every 12 hr

OR
- Ciprofloxacin 500 PO every 12 hr
- Levofloxacin 750 mg PO daily

Option 2
- Ceftriaxone 1-2 gm IV daily
- Cefoperazone Sulbactam 2-4 gm IV daily
- Piperacillin Tazobactam 4.5 gm IV every 8 hr

- Duration of treatment 7-14 days
- Adjust as per culture sensitivity report and local sensitivity patterns

### PREGNANCY UTI

- Screening urine culture in first antenatal visit
- Asymptomatic bacteriuria/ Uncomplicated UTI:
  - Nitrofurantoin 100 mg PO BD for 5 days

OR
- Amox/Clav 625 PO TDS or Cephalexin 500 mg PO QID

OR
- TMP/SMX DS Tab PO BD for 5 days

- Repeat urine culture after treatment not essential
- Recurrent UTI antibiotic prophylaxis till term
  - Nitrofurantoin 50 mg or Cephalexin 250 mg at bed time

### CAUTI

- Do not perform urine analysis/culture in asymptomatic patients
- Remove urinary catheters as soon as possible
- Replace latex coated every 3-4 weeks or Silicone catheter every 12 weeks
- Symptomatic CAUTI: features of Complicated UTI
  - Change catheter
  - Rx as complicated UTI
- No role of routine antibiotic prophylaxis for prevention

### PROSTATITIS

- UTI symptoms+ pelvic pain/ fever
- Digital rectal exam- tender prostate
- Urine culture
- Empirical treatment similar to complicatead UTI
- Adjust treatment as per culture report
- Duration of treatment 2-4 weeks
- Urology evaluation desirable

### RECURRENT UTI

- Uncomplicated RUTI

Post coital voiding and post coital antibiotic

Single dose cephalexin 250/ Co-trimoxazole (400/80) /Nitrofurantoin 100 mg

LONG TERM PROPHYLAXIS
- Low dose nitrofurantoin 50 mgX 6 months
- Single strength Septran SS/ Co-trimoxazole (400/80) x 6 months
- Cephalexin 250mg
- Vaginal estrogen cream in post menopausal

Complicated RUTI
- Urology referral
- Cystoscopy
- Urodynamics

### ASYMPTOMATIC BACTERIURIA

- No symptoms of UTI and Urine culture with > 100000 CFU/ml
- No treatment required
- Treatment indicated
  - Pregnancy
  - Planned urological procedure

### CHILDREN

**SYMPTOMS**
- Neonates and Infants < 1yr- Fever,vomiting, diarrhoea, jaundice, Poor urinary stream
  - Older children same as adults

**TREATMENT**
- Infants <3months as upper UTI (PN) with IV antibiotics
- Older children
- Upper UTI- IV antibiotics gentamicin, amikacin, ceftriaxone
- Lower UTI- oral cefixime, ofloxacin, ciprofloxacin, amoxyclav
- Duration of Rx
  - Upper UTI- 10-14 days
  - Lower UTI 7-10 days

**REFER**
- Upper UTI(PN), infants with UTI, recurrent UTI
- Bowel bladder Dysfunction and known CAKUT OR VUR
- Further imaging- DMSA+/- MCUG if abnormal USG, recurrent UTI

### ABBREVIATIONS

**CAKUT:** Congenital Anomalies of the Kidney and Urinary Tract)
**CAUTI:** Catheter-Associated Urinary Tract Infection
**DMSA:** Dimercaptosuccinic Acid
**HPF:** High-Power Field
**MCUG:** Micturating Cystourethrogram
**USG:** Ultrasonography
**VUR:** Vesicoureteral Reflux
**WBC:** White Blood Cells

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**☛ UTI IS A CLINICAL DIAGNOSIS - DO NOT CULTURE ROUTINELY**


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# Standard Treatment Workflow

# HEMODIALYSIS

## ICD-11-N005.9

### WHEN TO START HD — REMEMBER "AEIOU"

- A - Acidosis: severe metabolic acidosis not responding to treatment
- E - Electrolytes: refractory hyperkalaemia/ECG changes.
- I - Intoxication: a dialysable poison or drug.
- O - Overload: fluid overload / pulmonary oedema not responding to diuretics.
- U - Uraemia: uraemic pericarditis, encephalopathy, bleeding or intractable symptoms.
- Planned CKD start: for uraemic symptoms as function declines (≈ eGFR 5–10) — not by a number alone; decide with nephrology **P** **S**

### RED FLAGS — STABILISE & REFER

URGENT - stabilise & arrange emergency dialysis / refer:

- Refractory hyperkalaemia/ECG changes - give IV calcium, insulin – dextrose, salbutamol, then dialyse
- Pulmonary oedema not responding to diuretics; severe acidosis/uraemic emergency
- Air embolism, haemolysis, anaphylaxis (intradialytic emergencies)
- Clotted/failing access (no thrill) or uncontrolled access bleeding; CRBSI/ sepsis

Also refer (non-urgent):

- Access creation / salvage & vein mapping
- Inadequate dialysis or repeated intradialytic hypotension; transplant work-up

### INFRASTRUCTURE

- Trained staff (nephrology nurses/technicians)
- Water purification system for dialysate
- Waste management (biomedical waste protocol)

### BASELINE WORKUP

- CBC, RFT, LFT; Ca, Phosphate, iPTH
- Hepatitis B & C and HIV status
- Blood group
- Others as clinically indicated

### SHARED DECISION MAKING

- Elicit goals of care
- Choose KRT modality - including conservative kidney management (CKM)
- If choosing HD → consider HDF and dialyser type (low- or high-flux)

### SELECTION & ACCESS

Kidney failure/AEIOU indication **P** **S**

- No → Plan access early- Fistula First-refer for AVF when dialysis is fore-seeable. Preserve veins **P** **S**
- Yes → Stabilise + urgent dialysis/refer (temporary catheter if no access) **T**

↓

Access order: AVF > AV graft > tunnelled catheter > temporary catheter (IJV; avoid subclavian) **T**

↓

Vein preservation: no IV/venipuncture/ BP cuff on the fistula arm-mark "Save This Arm" **P** **S**

↓

Start vaccination for HBV. Anemia, bone mineral disease, nutrition, BP, glycaemia reviewed **P** **S**

### A SAFE SESSION

Before session: weight & weight gain, BP, breathlessness, oedema; examine access **P** **S**

↓

AVF/Graft- look, feel thrill, listen bruit, check redness. Catheter exit site- clean/dry, aseptic handling **S** **T**

↓

Machine & circuit checks; right patient/ dialyser/dialysate; hand hygiene; aseptic cannulation/connection **S** **T**

↓

Start — prescription set by nephrology: blood flow, dialysate, time (~4 h ×3/wk), UF to dry weight, anticoagulation **S** **T**

↓

New, severely uraemic patient → start short, gentle sessions to avoid disequilibrium **S** **T**

### MONITOR & ADEQUACY

Monitor every 30–60 min: BP, pulse, symptoms, access/circuit; keep UF rate safe (avoid very high UF) **P** **S**

↓

Access pressure, circuit clotting watch -post dialysis needle site bleeding **T**

↓

Any intradialytic problem?

- No → Complete session; record UF, postweight, BP; review **P** **S**
- Yes → Manage per complications panel →escalate if severe **T**

↓

Adequacy: track Kt/V or URR periodically - if inadequate, refer for prescription review **S** **T**

TIP- counsel on cost if needed and transport

## MANAGING COMPLICATIONS

### A. Hypotension — the commonest event

◆ * Fall in BP ± dizziness, cramps, nausea?

↓

Stop/reduce UF · lay head-down · give saline 100–250 mL · reduce blood flow · oxygen if needed. Find cause: too-fast UF, dry weight too low, cardiac, sepsis, eating, BP meds **P** **S**

↓

Not improving / chest pain/arrhythmia → refer **T**

### B. Intradialytic hypertension

Paradoxical BP rise during/after dialysis → check fluid status & dry weight, review drug adherence; consider a short-acting antihypertensive **P** **S**

### C. Cramps/nausea/headache & disequilibrium

Cramps/nausea/headache — usually from hypotension/fast UF → reduce UF, give saline. Disequilibrium (new severe uraemia: confusion ± seizures) → prevent with short gentle starts; if it occurs → slow/stop, support, refer. **S** **T**

### D. Air embolism — EMERGENCY

Clamp venous line, STOP pump. Lay on left side, head-down; give oxygen; resuscitate; refer now. **T**

### E. Haemolysis — EMERGENCY

Port-wine blood, chest/back pain. Stop dialysis; DO NOT return blood. Support; check $K^+$; refer **T**

### F. Fistula/graft problems

No thrill / no bruit, or new pain & swelling?

↓

Possible clotted/failing access → refer urgently (salvage is time-sensitive). Post-needle bleeding → firm pressure; if not stopping → refer. **T**

### G. Catheter bloodstream infection (CRBSI)

Fever/rigors during or after dialysis in a catheter patient?

↓

Blood cultures (catheter + peripheral). Start empirical IV antibiotics covering gram-positive (incl. MRSA) + gram-negative per local protocol.
Refer - catheter may need removal. **S** **T**

### H. Bloodborne infection control — every session

Hand hygiene & gloves; no shared multidose vials/supplies; clean station between patients.
Dedicated machine / area for HBsAg-positive; safe sharps; staff HBV vaccination. **P** **S**

### VASCULAR ACCESS CARE

- Prepare the site properly before cannulation
- Use the rope-ladder cannulation technique (rotate sites)
- Ensure post-HD haemostasis (stop needle-site bleeding)
- Wear a mask for central venous catheter (CVC) use

### INFECTION CONTROL

- Proper use of PPE (gloves, gown, mask, eye protection)
- Protocols for cleaning & disinfecting surfaces and equipment between patients

### AUDITS

Track and review regularly:

- Infection rates & vaccination uptake
- Hospitalisations, drop-outs & deaths
- Complications (intradialytic & access)

### PATIENT & CAREGIVER EDUCATION

Attend every session and control fluid - this matters most

- Don't skip sessions (risk: high K, overload)
- Limit fluid between sessions
- Diet: low potassium & phosphate, less salt
- Adequate protein; binders with food
- BP/anaemia/bone medicines as advised
- Protect the access arm; feel thrill daily
- Keep catheter dry & covered
- Warning signs: breathlessness, swelling, bleeding, no thrill, fever → seek care

### INTERDIALYTIC CARE, INFECTION CONTROL & FOLLOW-UP

Access care

- Feel the thrill daily; report loss of thrill, pain, redness or bleeding at once **P** **S**
- Keep catheter dry & covered; aseptic handling only

Between sessions

- Keep to fluid & diet limits; take medicines; attend every session **P** **S**

Infection control & monitoring

- Clean station; no shared vials; HBsAg-positive on a dedicated machine.
- Periodic viral markers, Kt/V/URR, haemoglobin, Ca–$PO_4$–PTH, dry-weight review **S** **T**

### HD IN ACUTE/LIMITED SETTINGS

Track and review regularly

- For unstable patients, SLED or gentler settings reduce hypotension **S** **T**
- If HD not available & patient can't be moved: stabilise hyperkalaemia & overload medically (calcium, insulin–dextrose, salbutamol, restrict fluid) & refer
- Consider acute peritoneal dialysis as a bridge **P** **S**

### ABBREVIATIONS

**AKI:** Acute Kidney Injury
**AVF:** Arteriovenous Fistula
**CKD:** Chronic Kidney Disease
**CRBSI:** Catheter-Related Bloodstream Infection
**ESA:** Erythropoiesis-Stimulating Agent
**HBsAg/HCV/HIV:** Viral Markers
**HD:** Haemodialysis
**IJV:** Internal Jugular Vein
**KRT:** Kidney Replacement Therapy
**Kt/V & URR:** Adequacy Measures
**P/S/T:** Primary/Secondary/Tertiary
**PD:** Peritoneal Dialysis
**SLED:** Slow Low-Efficiency Dialysis
**UF:** Ultrafiltration

### A ROADMAP FOR SAFE, EFFECTIVE AND STANDARDIZED HEMODIALYSIS

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# Standard Treatment Workflow

# PERITONEAL DIALYSIS

## ICD-11-QB94.2

### WHY & WHEN TO CONSIDER PD

- PD is as effective as haemodialysis (HD) in properly selected patients.
- Prefer PD when the patient still passes good urine (>200-500 mL/day-good residual kidney function).
- Often the only maintenance option (besides home HD) when all HD access has failed or for home-bound patients.
- Home-based therapy done by patient/caregiver after training-suits long travel, cost and HD slot limitation
- Counselling is the key to PD being chosen and continued **P** **S**

### RED FLAGS - ACT & REFER

- REFER NOW - treat catheter removal as an EMERGENCY when
- Peritonitis not responding by ~5 days
- Peritonitis with exit-site / tunnel infection together
- Tunnel infection (usually needs catheter removal)
- Recurrent / relapsing peritonitis, or culture-negative & not improving (think TB / fungal)

**Also refer (non-urgent):**

- Catheter insertion & structured PD training
- Poor ultrafiltration / uraemia → prescription change
- Mechanical problem or pleuro-peritoneal shunt; decision to switch to HD

## CLINICAL PATHWAY

### PATIENT SELECTION

Kidney failure needing maintenance KRT **P** **S**
↓
Assess PD suitability: abdomen, home support, comorbidities **P** **S**
↓
Any contraindication to PD?

- No → Counsel patient & family; take informed consent **P** **S**
- Yes → Consider HD/other KRT, or refer nephrology to re-evaluate

↓
Refer to a centre with an established PD programme for catheter insertion & training **T**

### INSERTION & START

PD catheter inserted **S** **T**
↓
Urgent need & no HD access? (or bloody effluent / adhesion risk)

- No → Wait ~2 weeks for exit-site & insertion to heal, then start
- Yes → Early-start PD — low volumes, supine; nephrology-led **T**

↓
Peri-catheter leak at any time → rest the catheter 2–4 weeks **S** **T**

### START & MONITOR

Start PD prescription — begin with the lowest dextrose concentration **S** **T**
↓
Serial clinical + biochemical review. Track weight, urine output, symptoms (optimising may take up to 4 weeks) **P** **S**
↓
Worsening uraemia or fluid overload (poor UF)?

- No → Continue current prescription; keep monitoring **P** **S**
- Yes → Refer nephrologist for prescription change **T**

### SELECTION CHECKLIST

**Suitable for PD if**

- Wants home therapy / lives far from a unit
- Willing, able caregiver or can self-perform
- Clean space, water & storage at home
- Good residual urine; or HD access exhausted

**Caution /re-evaluate if**

- Abdominal wall defect / large hernia / ostomy
- Active abdominal sepsis or inflammation
- Severely distorted anatomy / many adhesions
- No home support & cannot self-perform

**INDIA Most are relative — discuss with nephrology first. Most CKD here is diabetic (PD usually still fine — watch glucose). Screen/treat abdominal TB before starting; counsel on monthly cost & supply**

### PRE-PROCEDURE PREP

**Before insertion**

- Confirm modality & consent **P** **S**
- Choose insertion method based on training & skills: Percutaneous (Nephrologist) in naïve abdomen or surgical method (preferred if prior surgery/adhesions/reinsertion)
- Chest X-ray before insertion
- Treat constipation; empty bladder; mark exit site

**At insertion-infection control**

- Prophylactic IV antibiotic just before/during - e.g. Inj. Vancomycin 1 g IV **S** **T**
- Strict aseptic technique throughout

### HOME MONITORING SHEET

**Patient/caregiver records daily — bring to every visit:**

- Body weight
- Ultrafiltration (UF) — fluid removed each exchange
- Urine output
- Blood pressure & swelling (fluid-overload signs)
- Effluent appearance — clear vs cloudy

**TIP: If a lab is far, teach the family to photograph a cloudy bag and call early — cloudy effluent = suspect peritonitis**

### MANAGING COMPLICATIONS

**A. Peritonitis — catch early**

Cloudy effluent and/or abdominal pain ± fever?
↓
1. Send effluent for cell count + culture if lab available. 2. Start empirical antibiotics without delay per local protocol - intraperitoneal (IP) preferred; IV if severe sepsis **P** **S** **T**
↓
Always examine exit site & tunnel at the same time **P** **S**
↓
Not better by ~5 days, recurrent, or exit/tunnel also infected?

- No → Complete full antibiotic course; review
- Yes → Refer — may need catheter removal (EMERGENCY) **T**

**B. Exit-site infection**

Discharge / redness at exit site → oral antibiotics (e.g. ciprofloxacin). Not settling or tunnel involved → refer.

**INDIA Relapsing or culture-negative peritonitis not responding → think tuberculous or fungal peritonitis → refer**

**C. Tunnel infection**

Redness/swelling/tenderness over tunnel → Refer - usually needs catheter removal **T**

**D. Poor inflow/outflow**

Treat constipation first (common cause). Do a quick in/out test — in 10–20 min, out 20–30 min, most fluid returns → obstruction unlikely. Abnormal / suspected → refer **P** **S**

**E. Pleuro-peritoneal shunting**

Poor UF + new/worsening pleural effusion → diagnose by pleural tap showing very high glucose (use diluted samples) → refer **S** **T**

**F. Catheter malposition/omental wrap**

Tip wandered out of pelvis or omentum wrapped → common cause of poor flow → usually needs surgery → refer **T**

**Catheter re-insertion after removal**

- Removed for infection → re-insert after treatment + 4-week wait (selected treated repeat-peritonitis: same-sitting exchange — nephrology decision).
- Removed for mechanical reason → can re-insert in the same sitting **T**

### PATIENT & CAREGIVER EDUCATION

**Training is the cornerstone of successful PD.**

**Every patient/caregiver must learn**

- Hand hygiene before every exchange
- Clean exchange technique
- Daily exit-site care & dressing

**Re-train after**

- Any peritonitis / catheter infection
- A long break from therapy
- Keep the monitoring sheet
- Spot warning signs: cloudy bag, pain, fever, exit redness
- Store fluids; know whom to call
- Any change of caregiver
- Any technique error seen

### DAILY CARE, INFECTION CONTROL & FOLLOW-UP

**Daily catheter care**

- Hand hygiene before handling the catheter; clean, dry exit-site care.
- Report redness, discharge, pain or cloudy effluent early **P** **S**

**Intercurrent illness/procedures**

- Do procedures on an empty abdomen (drain PD fluid first).
- Prophylactic antibiotics before invasive procedures that breach mucosa (dental, endoscopy) **P** **S**

**When to switch PD → HD**

- UF failure not fixable by prescription change; or unfavourable membrane after repeated peritonitis **S** **T**

### PD IN ACUTE SETTINGS

**A life-saving skill for AKI/CKD patients who cannot be referred — disasters, conflict, or unfit to transport**

- A stiff or soft peritoneal dialysis catheter can be placed at the bedside **S** **T**
- Use clean technique; start low volumes and watch for leak/pain

### ABBREVIATIONS

**AKI:** Acute Kidney Injury
**CKD:** Chronic Kidney Disease
**HD:** Haemodialysis
**IP:** Intraperitoneal
**ISPD:** International Society for Peritoneal Dialysis
**IV:** Intravenous
**KRT:** Kidney Replacement Therapy
**P:** Primary
**PD:** Peritoneal Dialysis
**S:** Secondary
**T:** Tertiary
**TB:** Tuberculosis
**UF:** Ultrafiltration

### REFERENCES

1. ISPD Guidelines - International Society for Peritoneal Dialysis https://ispd.org/guidelines

### CLEANING YOUR BLOOD, CLEARING THE WAY FOR A BETTER LIFE

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# INTRODUCTION

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Ministry of Health and Family Welfare, Government of India

## GOAL

To empower the primary, secondary and tertiary care physicians/surgeons towards achieving the overall goal of Universal Health Coverage with disease management protocols and pre-defined referral mechanisms by decoding complex guidelines

## OBJECTIVES

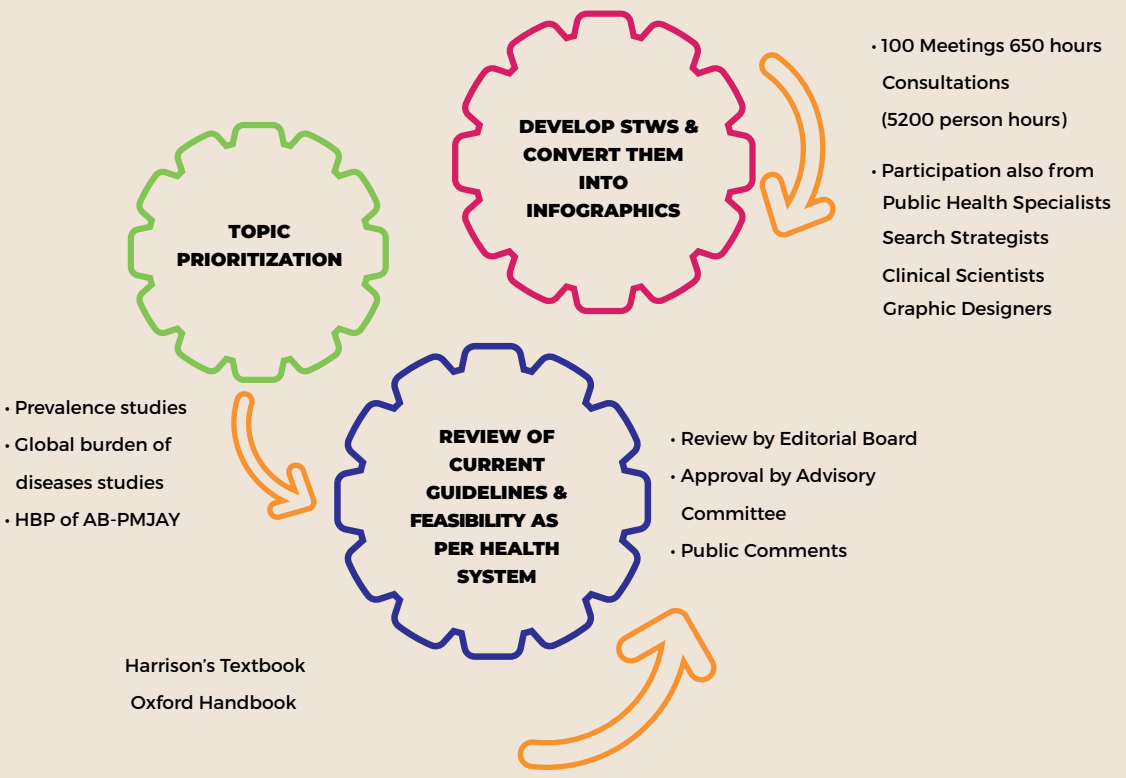
***Primary Objective:***
To formulate clinical decision making protocols for common and serious medical/ surgical conditions for both OPD and IPD management at primary, secondary and tertiary levels of healthcare system for equitable access and delivery of health services which are locally contextual

***Secondary Objective:***
To facilitate PMJAY arm of Ayushman Bharat with secondary and tertiary level management of all surgical and medical conditions covered under the scheme.

## METHODOLOGY




## PROCESS OVERVIEW



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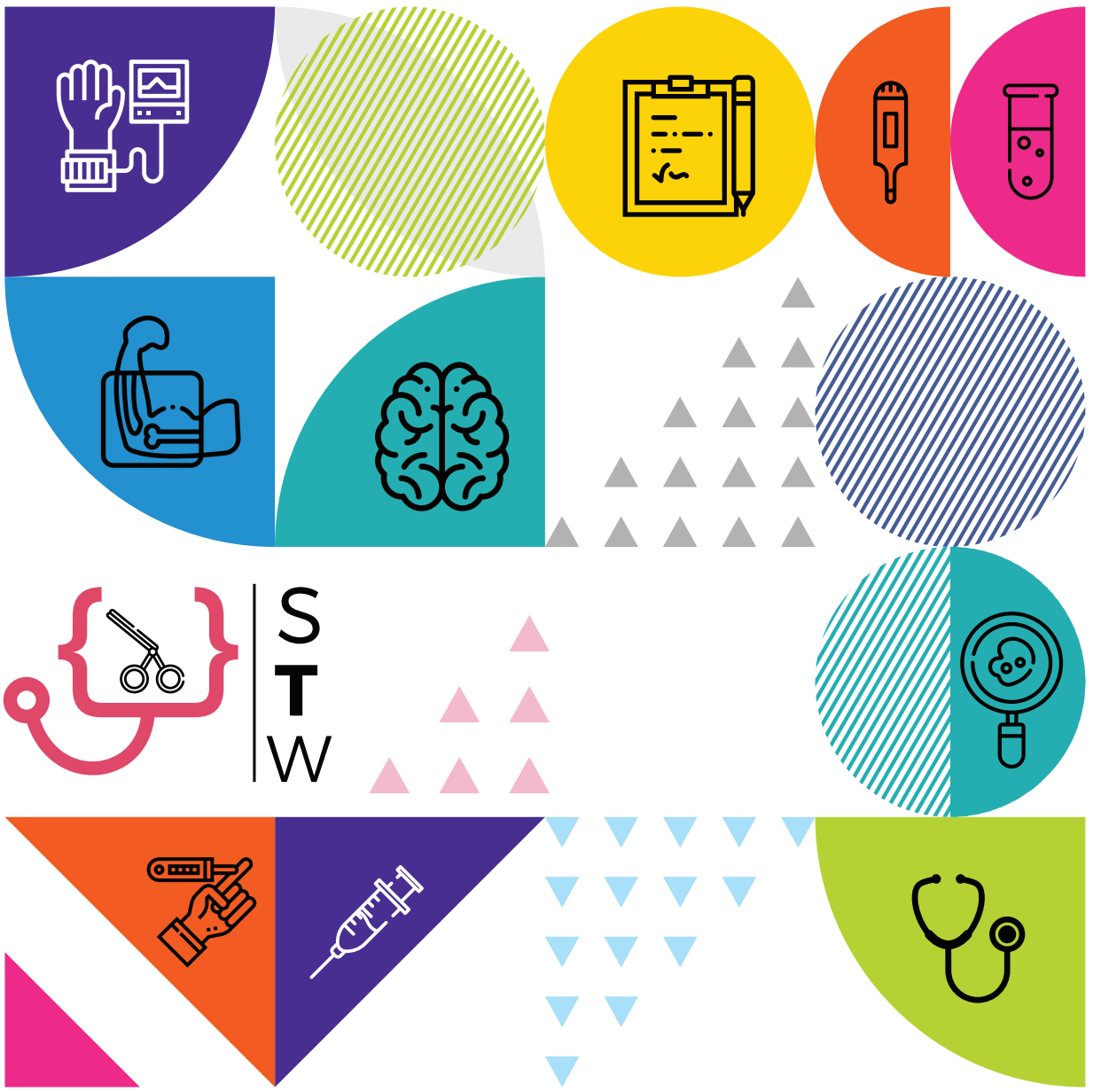
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2019 EDITION

VOLUME I