STUDENT WORKBOOK IN NEPHROLOGY

Department of Medicine
Faculty of Medicine
Sabaragamuwa University of Sri Lanka

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Sabaragamuwa University of Sri Lanka

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CLINICAL APPOINTMENT IN NEPHROLOGY

1. Name of the student

……

2. Year passed GCE Advanced level Examination.

……

3. Duration of the appointment

From……/……/……. To ……../……/…….

4. Name of the consultant

……

CONTENTS

PREFACE

Students of the Faculty of Medicine, Sabaragamuwa University of Sri Lanka, study nephrology as a separate appointment of one week at Teaching Hospital Ratnapura. During this period, they will be attached to the nephrology unit under the consultant Nephrologist appointed by the Ministry of Health.

This workbook in nephrology is compiled to help students achieve essential knowledge and skills in nephrology expected from an undergraduate when they qualify to work in medical wards as intern house officers. Thus, the workbook will guide the student during their nephrology short appointment.

This Workbook is a joint effort between academic staff of the Department of Medicine, SUSL and the current Consultant Nephrologist of the Teaching Hospital Ratnapura. Students are expected to organize their classes and do self-studies in order to complete the tasks set out in the Workbook.

We value your feedback to improve the Workbook.

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CHAPTER 1

INTRODUCTION

Dear Students,

We have prepared a series of workbooks to guide you during your medical appointments. These include 3rd year workbook, 4th year workbook and workbook for each short appointment and a workbook for the professorial appointment.

The appointments in finer specialties are organized based on the University Grants Commission guidelines and according to the needs of the Ministry of Health.

The short appointment in Nephrology will give you the opportunity to study Nephrology with exposure to specific case scenarios in more detail. This workbook is prepared to provide guidance to the students during the Nephrology appointment to cover the essential areas expected from an undergraduate. You are expected to learn the management plans in further detail. This includes the investigation, treatment of common medical conditions, management of common emergencies, which are essential clinical topics for an intern medical officer. This knowledge, skills and experience you gather during the short appointments will help you to understand patient problems in greater depth.

Your continuous assessments will be based on these workbooks.

Learning Outcomes in Nephrology

At the end of the appointment students should be able to

1. Describe the anatomy and physiology of the nephron-urological system, pathogenesis of its disorders and scientific basis of their management.

2. Obtain histories, elicit physical signs and interpret physical signs, describe pathophysiology, principles of management and prognosis of patients having the following conditions.
    a. Acute kidney injury,
    b. Chronic Kidney disease including
    c. Diabetic nephropathy
    d. CKD of unknown origin
    e. Glomerulonephritis
    f. Nephritic and nephrotic syndrome
    g. Infections of urinary tract
    h. Systemic diseases with renal manifestation
    i. Malignancies of Genito-urinary system *(Part of this will be covered during Urology and oncology appointments)*
    j. Disorders of fluid, electrolyte and acid base disorders.

3. Arrive at a clinical diagnosis of disorders of the nephro-urological system.

4. Describe the indications, limitations and be able to interpret findings of investigations that are relevant.
    a. urinalysis
    b. urine culture
    c. blood urea and serum creatinine estimation
    d. creatinine clearance
    e. X-ray Kidney-Ureter-Bladder (KUB)
    f. Ultrasound scanning of the abdomen
    g. Intravenous urogram
    h. CT of the renal system
    i. Renal biopsy

The following investigations will be covered in Radiology and Urology appointment

    j. Micturating cysto-urethrogram (MCUG)
    k. DTPA/DMSA scan
    l. basic cystoscopy findings
    m. Renal arteriogram

5. Describe the indications, preparations, basic procedure of renal biopsy and competent in managing post renal biopsy complications.

6. Communicate with patient on renal diseases, especially in relation to obtaining consent for investigations and treatment, prognosis of common renal disorders, and those related to renal replacement therapy and renal transplant.

7. Identify the indications, describe the necessary preparations and perform under supervision the following procedures.
    a. collection of urine for microscopy and culture ABST.
    b. maintenance of a fluid balance chart
    c. analysis of urine for reducing substances, protein.
    d. collection of urine from a catheterized patient.

    The following procedures will be learnt in Urology appointment.
    e. digital examination of the rectum to evaluate the prostate gland.
    f. urethral catheterization in a model
    g. suprapubic puncture in a model

8. Write case notes, daily status, referrals, discharge summaries, clinic notes and prescriptions.

9. Demonstrate empathy and maintain high ethical standards especially with regards to the ethics of renal replacement therapy and kidney donations.

10. Be an effective member of the healthcare team and know the health facilities and social support available to care for renal disorders in Sri Lanka.

CHAPTER 2

CORE CLINICAL KNOWLEDGE AND SKILLS

At the end of the nephrology appointment, you should be competent in the technique of history taking, physical examination (general examination and examination of abdomen) and clinical reasoning at a level of a student about to enter the Final Year.
In addition to the cases you are allocated during the apppointment, you are adviced to see the following presentations given in the next section on "Topics to cover during Nephrology Appointment"

2.1 Clinical Presentations: Nephrology appointment

These are some of the key presentations that ought to be 'covered' during the Nephrology Appointment.

- Oliguria, anuria and polyuria
- Dysuria
- Microscopic haematuria
- Active urinary sediment
- Bland urinary sediment

2.2 EMERGENCIES

Following is a list of common nephrological emergencies.

1. Acute Kidney Injury (AKI)
2. Acute glomerulonephritis (Mainly RPGN)
3. End-stage chronic kidney disease with volume overload
4. Hyperkalemia with Kidney disease

2.3 Topics in Nephrology

These topics are often termed as the theoretical aspects of nephrology and require didactic teaching (e.g., lectures) or self-study using standard textbooks.

1. Common clinical presentations
2. Acute renal failure (Acute kidney Injury)
3. Chronic renal failure (chronic kidney disease)
4. Urinary tract infections
5. Glomerular diseases 1 (AGN, CGN)
6. Glomerular disease 2 (Nephrotic syndrome)
7. Diabetic nephropathy
8. AKI and glomerular diseases: an overview (repeat)
9. Chronic Kidney Disease (CKD): an overview (repeat)
10. Renal replacement therapy (Dialysis and transplantation)
11. Ethical issues related to renal transplantation (Donor selection, Consent etc.)

CHAPTER 3

HISTORY TAKING

MEDICAL HISTORY OF A PATIENT WITH A RENAL DISEASE

PRESENTING COMPLAINT

Patient with a renal disease could present with a variety of urinary complains such as polyuria, oliguria, anuria, increased frequency, difficulty in passing urine or dysuria. Some of them might come with haematuria, dark urine, incontinence, urgency, hesitancy, or dribbling.
There may be patients with loin pain, loin to groin pain, lower abdominal pain. There could be associated fever, nausea or vomiting. Patient with chronic renal disorders could present with more generalized complains such as fatigue, anorexia, weight loss, pruritus or restless legs.

HISTORY OF PRESENTING COMPLAINT

If the patient presented with loin pain ask about the exact site, radiation of the pain, the character of the pain such as dull, aching or colicky pain, unliteral or bilateral, whether it was acute onset or sub-acute onset or a chronic pain and the duration. Ask whether there are any aggravating or relieving factors.
Question patients about associated features such as hematuria, increased frequency, dysuria, fever, chills or rigors.
Ask questions to find out etiology such as history of poorly controlled diabetes, renal stones or any procedures such as cystoscopy, urinary catheterization or insertion of ureteric stents.
By now you would have come to a clinical diagnosis or differential diagnosis.

SYSTEMIC INQUIRY

Systemic inquiry is to identify symptoms you forgotten to ask in the history of presenting complain.

- **Cardiovascular**: Chest pain, shortness of breath, palpitations
- **Respiratory**: difficulty in breathing, cough or sputum production
- **Gastrointestinal**: abdominal pain, loose stools, constipation
- **Neurological**: altered level of consciousness, drowsiness, poor sleep, convulsions, peripheral neuropathy
- **Musculoskeletal**: muscle wasting, muscle cramps, muscle weakness, mono or oligo arthritis
- **Dermatological**: uraemic frost, scratch marks, dry skin, skin infections or healed scars

PAST MEDICAL HISTORY

Ask about any medical condition which could be an etiology or chronic long-standing disease not relevant to the presenting problem, such as diabetes, hypertension, any renal disease or Genito urinary surgeries or procedures.
Ask about more details of systemic diseases such as the control of the disease, duration, complications and any hospital admissions.
Ask about connective tissue disorders such as SLE, history of snake bite, any other disease which has affected renal function (e.g., Stroke/Migraine, snake bite, past history of calculi).

ALLERGIES

Find out allergies to food or medications and if present what type of reaction such as mild itchy rash or Angio oedema or anaphylaxis.

DRUG HISTORY

Ask about drugs that use long-term for chronic systemic diseases or any drug which could be nephrotoxic such as NSAIDS or drugs which could not prescribe in patients with advanced renal disease such as ACE inhibitors, Metformin. Ask about prior use of antibiotics if suspected to have urinary tract infections.
Ask about drugs which cause hyperkalaemia and cough with ACEI. Also, history of native treatments.

FAMILY HISTORY

Find out about diseases which has genetic predisposition such as polycystic kidney disease, malignancies and early deaths due to strokes.

PERSONAL AND SOCIAL HISTORY

Find out the financial and social status of the patient, carers at home and the wellbeing of the carers and their ability in coping with a patient with a chronic renal disease who might need renal replacement therapy.
Depending on the patient's ability to get done activities of daily living independently, assess the house hold environment, support of carers.

Smoking

Record the history of smoking and pack years of tobacco use.

Alcohol

Type, volume, duration and the frequency of alcohol use and the dependency.

Diet and fluid intake

Need to be assessed relevant to the renal disease and the stage of the disease, level of serum potassium, calcium and phosphate. Ask about toilet type and access to road, distance to hospital and transport facilities, pets at home and water source (running tap water, wells, tube wells, streams and type of filter if any.

Occupational history

Occupation is important to find out risk for further renal damage, whether patient is capable in continuing his job further. Financial status of the family, the ability to access the renal replacement therapy, transport and possibility of renal transplant in case of end stage renal disease.

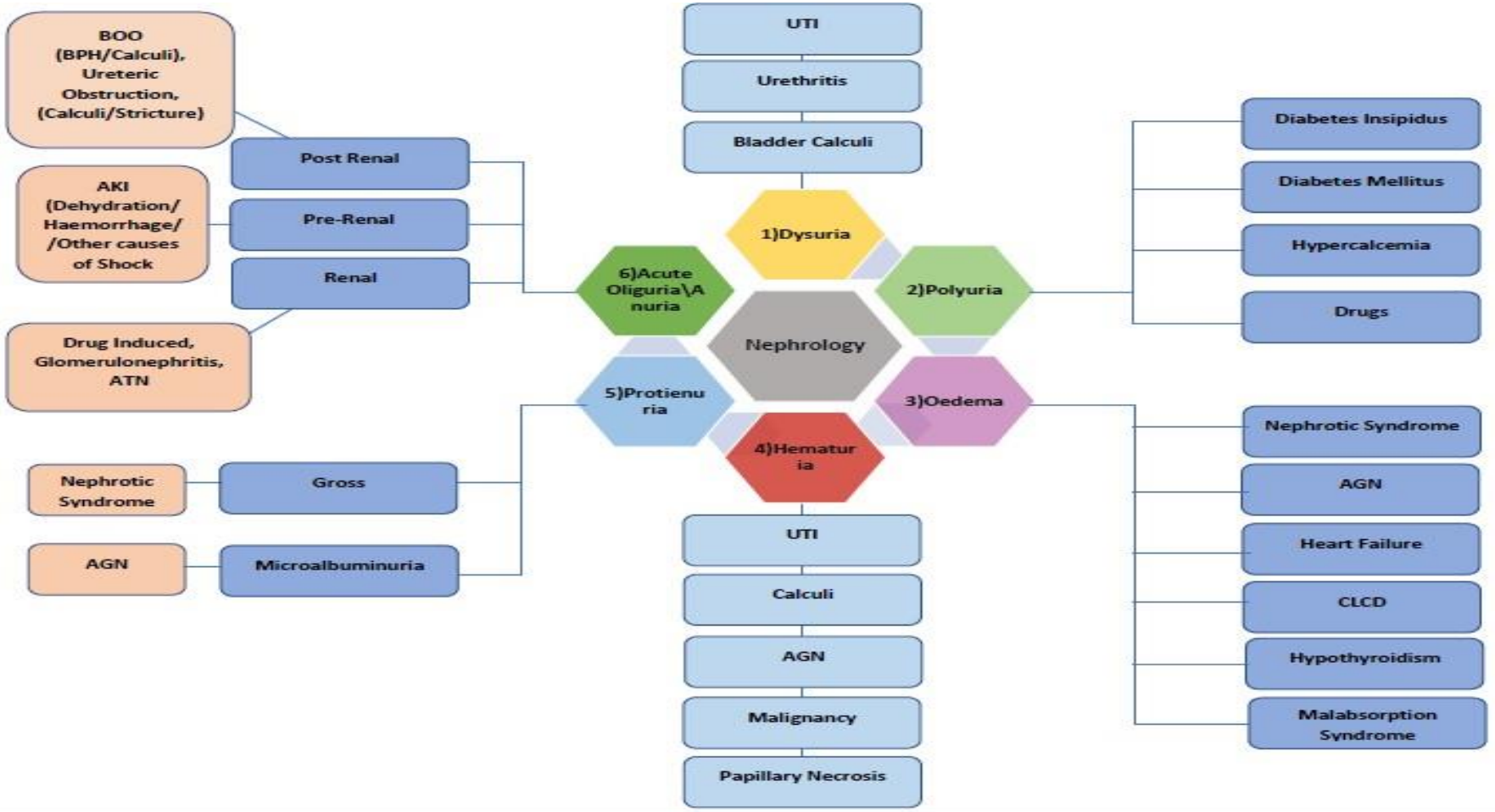
Ask about the occupation whether gem mining, farming in paddy fields, sewage workers as there is risk of exposure to Leptospirosis or Hantavirus infection.

Possibility of snake bite and whether has spend in high CKDu areas if so the period.

SYMPTOM ANALYSIS

Presentation	**Causes**	Describe presentations which help you to differentiate the causes
Oliguria or anuria	1	
	2.	
	3.	
Polyuria	1.	
	2.	
	3.	
Haematuria	1.	
	2.	
	3.	
Proteinuria	1.	
	2.	
	3.	
Dysuria	1.	
	2.	
	3.	

Following is a mand map developed to depict the key symptoms in nephrology and main causes of each symptom



UTI -Urinary Tract Infection, BOO – Bladder Out flow Obstruction, BPH – Benign Prostatic Hyperplasia, AKI – Acute Kidney Injury, ATN-Acute Tubular Necrosis, AGN – Acute Glomerular Nephritis, CLCD- Chronic Liver Cell Disease

CHAPTER 4

EXAMINATION OF A PATIENT WITH RENAL DISEASE

Look for following signs in the examination of a patient with renal disease other than your routine examination.

General examination
Observe the patient whether dyspneic, wasted, any bedside catheters, if present, check the volume and the colour of the urine.
See whether there is peritoneal dialysis catheter, nephrostomy tube.
Inspect the pallor, uremic smell, scratch marks, vasculitis rashes, bruises, or arteriovenous fistulae.
Observe whether patient is fluid overloaded such as periorbital swelling and oedema of legs or whether patient looks dehydrated.
Examination of hands may reveal, pallor, skin turgor, flapping tremors.
Examination of cardiovascular system- check blood pressure, jugular venous pressure, evidence of cardiac failure such as gallop rhythm and evidence of pericardial rub.
Respiratory system – fine bi-basal crepitations or evidence of pleural effusion.

Examination of the abdomen
Inspection- Look for sacral edema, nephrectomy scars, peritoneal dialysis scars, any visible masses in the renal angle and the suprapubic area

Palpation- Tender areas in all 9 quadrants, but specially in the loin area.
Distended bladder, ballotable kidneys

Percussion- Check for ascites

Auscultation- Listen for renal bruits

For the completion of your examination, perform digital examination of the rectum, ophthalmoscopic examination of retina for hypertensive or diabetic retinopathy, Urine dipstick for sediments.

Presentation of a short case of a patient with a renal disease (given as examination of abdomen)

History presentation is different from history taking. You may ask various questions and system review when taking history. In contrast, you should state the important positive and negative findings when presenting the history. In the same way examination should also be carried out in details however you may select important positive and negative findings to present.

You will be given time to examine the patient and at the end of the allocated time you will be prompted (e.g. ringing a bell) to conclude examination and present your findings to the examiner. Always remember before leaving the patient after examining them, cover the clothes that you exposed and thank the patient. Then you turn towards the examiner and make eye contact with them. It is not appropriate to look at the patient again, time to time while you present your findings to the examiner.

You may start presenting the findings on general examination, "I examined this middle-aged man, who looks overweight and lying comfortably in the bed. He is pale, has a dry skin with uraemic frost and has bilateral pitting ankle oedema up to his knees. There are half-half nails in hands and feet but no demonstrable flapping tremors. There is an AV fistula over left arm and cubital fossa, which is functional with a bruit and in his neck, there are few scar marks suggestive of previous central venous line insertion. His jugular venous pulse is not elevated."

You may proceed to present the findings of abdominal examination. "on inspection of the abdomen, it looks distended with fullness in the flanks. Abdomen moves with respiration and is symmetrical and has no scars. On palpation I could not feel the liver or spleen. There are ballotable masses on both lumbar areas suggestive of enlarged kidneys. They are not tender. There is flank dullness compatible with ballotable kidneys and no evidence of shifting dullness to suggest the presence of ascites."

You may present if additional relevant findings you gathered. "I extended my examination to check the lung bases and listened to heart sounds. The lungs are clear and there is no murmur heard at the precordium"

You may now conclude your findings and present the diagnosis or differential diagnosis you have. "in conclusion, this patient has polycystic kidney disease with chronic kidney disease and had been on haemodialysis and now has created a functioning AV fistula for long term haemodialysis. He has evidence of ankle oedema without evidence of ascites and pulmonary oedema and is not dyspnoeic at rest."

Your examiner will ask questions based on this patient on the discussion part given after the presentation.

CHAPTER 5

COMMON INVESTIGATIONS

1) Urinalysis
   a) Collect and paste or copywrite sample urinalysis results of following conditions and highlight the characteristic features of each condition.
      i) Culture positive UTI
      ii) Nephrotic syndrome
      iii) Acute glomerulonephritis
      iv) Acute ureteric colic
      v) Hypertensive emergency with nephrosclesrosis
      vi) Acute tubular necrosis

   b) How do you identify the significance of pyuria when you suspect UTI in men and women?

   c) What are the common causes of culture negative pyuria? (aseptic pyuria)

   d) What are the common causes of painless and gross haematuria?

   e) How do you quantify the proteinuria?

   f) What are dysmorphic RBCs? How do you interpret the presence of them in urine?

g) Draw or paste pictures of different types of casts seen in urinalysis and mention possible causes for them.

h) What are the different types of crystals you might see in urinalysis?

2) Serum Creatinine

a) Explain the pathophysiological basis of use of creatinine as a measure of kidney function.

b) How do you calculate the GFR using serum creatinine value?

c) Explain how AKI is developed in rhabdomyolysis?

3) Blood urea

a) Briefly explain clinical situations where blood urea is useful in diagnostic evaluation.

4) Serum electrolytes

a) What are the common causes of hyponatraemia?

b) What are the ways of replacement of sodium in a patient with hyponatraemia?

c) Mention common causes of SIADH

d) What are the principles of management of SIADH?

e) Mention common causes of hyperkalaemia

f) How do you treat hyperkalaemia?

g) Paste a copy of an ECG with hyperkalaemic changes and demonstrate them.

5) Imaging of kidney, ureter and bladder (KUB)

a) Draw and explain the sizes, positions and anatomical relationships of kidneys, ureters and bladder.

b) How do you utilize the ultrasonographic findings to help diagnose following conditions? Give the pathophysiological explanations.

i) AKI

ii) CKD

iii) Diabetic nephropathy

iv) Obstructive uropathy

v) Acute pyelonephritis

c) How do you prepare a patient for X-ray KUB?

d) What are the types of radiolucent renal/ ureteric stones?

CHAPTER 6

EXERCISES

1) Meet a patient and obtain a history from a patient who had AKI and complete the followings based on your patient.
   a) Write the summary of a patient presented with AKI that you encountered.

   b) List the common causes of AKI classifying them in to pre-renal, renal and post renal causes.

   c) Revise the pathogenesis of AKI and draw a diagram to summarize it

d) What is the cause for AKI in your patient? Clinically reason out your answer.

e) Write down the immediate management plan implemented for the patient at presentation.

f) Mention 5 drugs that are commonly used, and best be avoided or need dose reductions in patients having AKI.

2) Meet a patient and obtain a history from a patient who had Acute Glomerular Nephritis (AGN) and complete the following based on the patient.
   a) Write a summary of the patients' presentation (history and examination findings)

b) What are the cardinal clinical features that your patient had, pointing towards the diagnosis of AGN?

c) Revise the pathology associated with AGN and draw a picture of a glomerulus in AGN

d) What are the investigations done at the beginning, when the AGN is suspected?

e) Explain the significance of presence of dysmorphic red cells in AGN.

f) Mention common causes for AGN that were considered in your patient.

g) State the management implemented on admission for your patient

3) Meet a patient and obtain a history from a patient who was diagnosed to have nephrotic syndrome (NS)
   a) Write the summary of the presentation.

   b) State the diagnostic criteria of NS.

   c) What are the likely complications of NS?

d) Outline the initial management of your patient.

e) Explain the likely pathophysiological basis of development of NS in your patient

4) Study a patient presented acutely with worsening CKD, needing urgent haemodialysis (HD) and answer the following questions based on your patient.
   a) State the indication(s) to offer urgent HD for your patient.

   b) What are the key clinical parameters that were recorded in your patient at the presentation to ensure safety of the patient?

   c) What are the important pre-HD preparations and checking carried out on your patient?

d) What are the likely complications of HD?

e) How do you investigate further to find the cause for worsening of renal function?

5) Take a history from a patient being treated for pyelonephritis (PN) and complete the work below.
   a) What are the clinical features that supports a diagnosis of PN in your patient?

   b) Write the investigations you would order for further care of your patient. Give reason(s) for each investigation that you requested.

   c) What are the conditions that could predispose to recurrent UTI?

d) Mention the suitable antibiotics for the treatment of PN according to the current national guidelines. State the pharmacological principles to choose those drugs.

6) Take a history from a patient with mild to moderate (non-end stage) diabetic nephropathy.
   a) How do you conclude diabetic nephropathy on your patient?

   b) What are the changes in the management that you should implement when you diagnose the development of diabetic nephropathy in a diabetic patient?

   c) Draw or paste the pictures of different stages of diabetic nephropathy and appreciate the changes.

   d) Briefly outline the management of diabetic nephropathy.

7) Complete the following on renal replacement therapy (RRT)
   a) What are the types of RRTs you know of?

   b) What are the indications for hemodialysis?

   c) How do you take consent from a patient undergoing HD for the first time?

8) Write Brief descriptions on following topics.

   a) Hepato-renal syndrome

   b) Contrast nephropathy

   c) Post-streptococcal glomerular nephritis.

CHAPTER 7

CASE BASED SCENARIOS

In this section we expect you to write case histories (5 cases as complete documentations) of patients that you encountered during your nephrology appointment.

This book is peer reviewed and recommended as a teaching and learning material for the Department of Medicine, Faculty of Medicine Sabaragamuwa University of Sri Lanka, by the following experts,

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