Management of the Urological Patient

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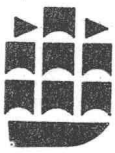

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Preface

The successful outcome of modern surgery depends as much upon the teamwork of medical, nursing and ancillary personnel as upon advances in the medical sciences and techniques. The aim of this book is to explain the basic procedures encountered in the daily routine of any unit caring for patients with urinary tract disease. It is not intended to be a substitute for the larger textbook but a guide and stimulus to those engaged in urological nursing. To this end I have made comments and a bibliography at the end of the chapters hoping like Saint Paul 'to provoke to good works'. From hospital to hospital there will be variations in some procedures, but I have tried to show the 'Why' as well as 'How' in urological management, the reader will intelligently apply the principle to the local situation.

I acknowledge the debt to my teachers in Newcastle upon Tyne, in particular to Professor John Swinney and Professor D. N. S. Kerr and their medical and nursing colleagues of the Department of Urology. I count myself fortunate in working in a centre where the happy atmosphere of enthusiastic teamwork is continued. This book is written with the hope that its readers will enjoy nursing urological patients with the same intelligence and dedication as the staff of these centres.

This book could not have been written without the help of my co-authors and the constructive comments of Mr L. Clarke, S.R.N., over the years they have made many contributions to the care of patients with urological disease. I and my co-authors thank Miss L. Connor for her assistance in preparing the manuscript.

Liverpool 1976 R. M. Jameson

Introduction

Chapter 1. *Basic Investigations*

Principles of diagnosis. Collection and examination of urine specimens. Bacteriology, pyuria and the white cell excretion test. Differential renal function tests. Urine specific gravity and osmolarity. Urine cytology. Collection of 24 hr. urine specimens. Ward urine tests with reagent strips. The blood urea and creatinine. Radiological investigations: the urogram, angiogram and cystography. Retrograde pyelography. Lymphography. Ultrasound. Renal biopsy. Isotope studies. Urodynamics.

Chapter 2. *Ward Care of the Urological Patient*

The day case ward. Minor and neonatal surgery. Preparation for major surgery; premedication, informed consent. Talking to relatives. Post operative care; diet, fluid balance, intravenous therapy and nutrition. Chest infections, deep vein thrombosis. Renal failure, paraplegia and transplantation.

Chapter 3. *Catheters and Bladder Drainage*

Choice of the catheter, types of catheter. Catheter introduction and care. The sterile closed drainage system. Bladder irrigation and washouts. Catheter removal.

Chapter 4. *Infections and Renal Diseases*

Nursing management in proteinuria, glomerulonephritis, amyloid pyelonephritis and analgesic nephropathy. Renal disorders in lupus erythematosus, hypertension and tubercle. Diuretics.

Chapter 5. *Trauma, Outlet Obstruction and the Male Genitalia*

Injuries and nursing care. Prostatectomy and urethroplasty. Surgery of the male genitalia, impotence and infertility.

Chapter 6. *Malignant Disease and Terminal Care*

Factors causing malignancy. Role of surgery, radiotherapy and chemotherapy and nursing procedures. Terminal care.

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Contents

1. Basic Investigations in Urological Diagnosis

To make a diagnosis three questions must be answered; where is the disease? What functions are affected? How did it occur? The case history and clinical examinations are the first steps in reaching a diagnosis. Confirmation of a clinical suspicion is obtained by investigations to show the site, extent, effects and nature of the disease. Investigation of the urinary tract is only complete when the following questions have been answered.

1. Are both kidneys present and of normal site, shape and size?
2. Are both kidneys functioning satisfactorily and is it possible to improve renal function rather than perform an unnecessary nephrectomy?
3. Are the drainage systems of the renal pelvis, ureters, bladder and urethra able to drain urine without obstruction or reflux?
4. Is the control of micturition normal without urgency, frequency, retention or incontinence?
5. If infection is present can it be eradicated and any predisposing factors removed?
6. Having localized a disorder is the rest of the urinary tract normal?
7. If, as a last resort, a decision is made to remove a kidney, is the other capable of supporting life? If the renal function is inadequate is the patient suitable for either dialysis or transplant and are the facilities available?

To answer these questions at least three basic investigations are essential; urine examination, measurement of the serum creatinine or blood urea and an intravenous pyelogram (IVP or urogram). If the information cannot be obtained by these simple investigations then further examinations are needed.

Examination of the urine

Collection of the urine specimen

To detect infection an uncontaminated urine sample is cultured in the laboratory. The genitalia and distal urethra always contain pathogenic organisms, they are flushed out by the first flow of urine. If the first few drops of urine are included in the sample for culture the bacteria from the urethra will multiply and a false positive report of urinary infection will be obtained. Mid-stream urine (M.S.U.) or 'clean catch'

specimens are needed to obtain satisfactory samples. In men the foreskin (if present) is retracted before voiding, in women the labia are held apart. When voiding the patient is asked not to interrupt the stream and the midstream urine (M.S.U.) is caught in a sterile container. If the urinary stream is stopped and restarted to get the specimen contamination may occur. The beginning and end of the flow are collected in one or two containers, they need not be sterile and the urine saved is used for ward tests. The three glass test involves microscopy and culture of the three parts of the urinary stream. It is used to detect urethral and prostatic infections. If antiseptics are used to clean the genitals any spillage into the urine will prevent bacterial growth.

In babies an uncontaminated sample may be difficult to obtain. After feeding, the baby can be held face downwards and the renal areas massaged, the baby may void by reflex action and the urine caught in a sterile container. A sterile adhesive bag can be fixed to the genital area to collect urine and be removed as soon as the child has passed urine.

When the patient has an indwelling catheter urine may be aspirated by a sterile needle and syringe from the self sealing sampling site on the drainage tubing. Note that urine must not be obtained either by disconnecting the catheter drainage system (making it unsterile and dangerous) or by using stale urine already collected in the drainage bag. (The bag contains stale urine full of bacteria multiplying at room temperature.)

If the patient has a urinary diversion by an ileal conduit an uncontaminated specimen is obtained by passing a fine Jaques catheter into the ileal loop. This also checks that there is no stenosis of the stoma. Urine from the drainage bag is unsuitable because of contamination. Normally only a few millilitres of urine will be obtained as the ileum is designed to be a conduit not a reservoir. Patients who have a urinary diversion into the intact colon or rectum and void through the anus are unable to provide uncontaminated specimens.

In some clinics the medical staff obtain uncontaminated samples by suprapubic aspiration of the bladder, it is a safe method in experienced hands. Catheterization is not indicated as a means of getting an uncontaminated urine sample, catheter samples are conveniently used when a catheter is used as part of the treatment of the patient. Years ago it was routine to catheterize patients in order to get suitable urine specimens for culture, however it has been proved that this practice is dangerous as some patients developed pyelonephritis after diagnostic catheterization.

Bacteriological examination of the urine

The uncontaminated specimen is collected in a sterile container clearly labelled with the method of collection, the patient's name, date of birth, record number, ward or clinic and the date and time of collection. The specimen must not be placed in the sun or put over a radi-

ator to ferment but be sent straight away to the laboratory. If the laboratory is closed the specimen may be kept in a refrigerator to delay bacterial multiplication and sent for examination when the laboratory is open. Where a delay is unavoidable and the specimens are sent by post the urine is collected and sent in containers which include a culture medium, e.g. Dip slides.

In the laboratory the urine is examined by microscopy to see if any blood cells, renal tubular casts or crystals are present. A drop of urine is cultured in a Petri dish on a nutrient medium such as McConkey's agar. If bacterial growth occurs the number of organisms found are counted and the results interpreted as follows:

Under 10 000 organisms per ml	= No significant bacteriuria.
Between 10 000–100 000 organisms per ml	= Possible contamination; repeat the test; collect another specimen.
Over 100 000 organisms per ml	= Infection present. The species and antibiotic sensitivities are noted.

When the patient is having treatment with antibiotics this must be noted on the request form as the laboratory may be able to alter the culture medium to permit the organisms to grow and so identify and test the bacteria.

Early morning urine specimens (E.M.U.)

If tuberculosis is suspected it is uncommon to find the Myobacterium tuberculosis in the M.S.U. unless the infection is severe. Early morning urines (E.M.U.) must be obtained and stained for the acid fast tubercle bacillus and inoculated or cultured to confirm the diagnosis. Each sample must be the first urine voided on rising and must be sent to the laboratory for examination that very day. At least three E.M.U. specimens are needed. Urine contains substances that destroy the tubercle bacillus on standing so fresh specimens must be sent to the laboratory daily. Patients must be clearly instructed or else they will deliver three stale E.M.U. specimens at the end of the collection period and a false negative report be obtained while they are still infective cases of open renal tubercle.

Pyuria

This term means that pus cells (white blood cells) are found in the urine. When a significant bacteriuria is found in the absence of these inflammatory cells it is unlikely that any infection is present, the specimen is contaminated and another specimen should be examined. Sterile pyuria is used to describe the finding of pus cells in the urine without a significant bacteriuria. At one time tubercle was the classic

cause, now the commonest cause is analgesic nephropathy; the causes are shown in the Table 1.1. It is an important finding needing further investigation.

White cell excretion test (*W.C.E.T.*)

Normally cells from the urinary tract are shed in the urine, by ultrafiltration the cells can be collected and counted (Addis count), but this is of little value in the routine investigation. In inflammatory conditions the white cell excretion is raised and a further rise can be found after provocation by injection with bacterial endotoxin, intramuscular iron or prednisolone. Normally the white cell excretion per hour will be

Table 1.1 Causes of sterile pyuria (abacillary pyuria)

Analgesic nephropathy
Tuberculosis
Stone in the urinary tract
Recently treated urinary infection
Bladder tumour
Rejection of kidney transplant
Recent prostatectomy. Vaginal contamination of specimen.

Table 1.2 The white cell excretion test

Abnormal white cell excretion	= More than 5 cells per 1/6 high power field
	= More than 10 cells per cubic mm
	= Positive excretion test result of more than 300 thousand cells/hr or number doubled after 40 mgm prednisolone or other stimulant, e.g. Intramuscular iron.

Note that: 1. Urine promptly sent to laboratory for if kept at room temperature cells disintegrate.
2. High urine flows may give false negative result.
3. Positive result can be reversed by recent antibiotic therapy.
4. May be delay in organisms appearing in urine for 24 hours.
5. If disease inactive result can be negative e.g. pyelonephritic scarring.

under 150 thousand. The W.C.E.T. is positive if the number is doubled or exceeds 300 thousand after injection of 40 mg of prednisolone. The test can be positive in a number of conditions (Tables 1.1 and 1.2).

Differential renal tests

In order to collect urine from each kidney bilateral ureteric catheterisation with special catheters is performed, the bladder is washed out with an antibiotic solution, diuretics are given and the urine from each kidney collected for white cell counts and culture to localize the infection. Estimation of the urinary flow rates for each kidney and the

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creatinine, sodium and potassium excretion may also be measured in investigating hypertension of renal origin. These tests are not in routine use and are done on selected patients in the specialist centres. The test is described in detail in the Appendix.

Urine specific gravity and osmolarity

The normal range is 1·001 to 1·040, in advanced renal disease the tubules are unable to concentrate the urine and the specific gravity becomes fixed. This is isothenuria, the urine specific gravity is fixed between 1·010 or 1·008. To measure the specific gravity the urine is placed in a wide-mouthed container, a glass float, the hydrometer is placed in the urine. The reading on the instrument will vary with the urine temperature, most hydrometers are calibrated for 18C. For each temperature difference of 3C add or subtract 0·001 to the hydrometer reading.

Table 1.3 The ammonium chloride test

1. Patient is on a normal diet, 2 urine specimens at hourly intervals are collected and a blood sample for the urea and electrolytes taken.
2. Gelatin coated capsules of ammonium chloride 500 mgm in the dosage 100 mgm/Kg body weight are given with bread. If enteric coated capsules are not used the preparation may cause vomiting.
3. Urine samples are taken at hourly intervals and blood samples are taken at 2 and 3 hours after the ammonium chloride. The urinary pH must fall below 5·3 in normal patients. At least 3 urine samples are needed.

To measure the S.G. a large volume is needed and the range of normal values is wide. Is is impractical in oliguric patients with suspected renal failure and the urine osmolarity is measured and compared with the osmolarity of plasma. The test only needs small volumes of urine or blood and is done by measuring the depression of the freezing point in the laboratory, it is accurate and only takes a few minutes. The normal plasma osmolarity is 300 mosmol/kg, a normal patient's urine will have an osmolarity of over 700 mosmol/l and would be able to concentrate the urine to above 1000 mosmol/l. In renal failure the urine/plasma osmolarity will be less than 2:1 urine/plasma (*see* Tables 11.2 and 11.3).

Tubular function—the ammonium chloride test

In certain disorders the renal tubules cannot acidify the urine as there is a biochemical defect in the distal tubule and the pH is never under 5·4. The plasma chloride is also raised and there can be a potassium loss in the urine causing muscular weakness. In extreme cases there is a low serum phosphate and secondary hyperparathyroidism. Bone pain and osteomalacia can develop. Many patients with renal tubular acidosis get multiple renal stones.

The tubular function can be tested by the ammonium chloride test (Table 1.3). There are many causes of renal tubular acidosis; in some a

congenital familial condition is present but in the majority the disorder is secondary to tubular damage in ascending pyelonephritis, obstruction, e.g. pelviureteric or bladder outlet, and in medullary sponge kidneys (cystic disease of the medulla).

Medullary sponge kidneys are twice as common in women, many have hemihypertrophy so different sizes of shoes and gloves are bought. The IVP is characteristic, clusters of multiple small stones are found around the calyces and they are less well shown by retrograde pyelography. Most patients have both renal tubular acidosis and hypercalcuria. From time to time colic and the passage of stone debris occurs but the condition is benign. Oral sodium bicarbonate and Mist. Pot. Cit. are helpful.

A metabolic acidosis can also be found after ureterocolic anastomosis. The bowel must be drained of urine by a rectal tube and the acidosis corrected, it is discussed later.

Urine cytology

If malignant disease is present cancer cells as well as the normal cells will be shed in the urine. By ultrafiltration the cells can be collected. A fresh specimen is needed and collected in a bottle containing an equal volume of alcohol as a fixative to preserve the cells. E.M.U. samples are valueless as the cells become distorted and burst if they are in the urine for many hours. Sometimes in women catheter urines are best because of contamination with vaginal cells. The urine is filtered and the cells stained and examined under the microscope. If positive, clumps of malignant cells will be found. Malignant cells may be detected in the urine many months before tumour can be seen in the bladder; a carcinoma-in-situ of the apparently normal mucosa will shed cells. Cytology is used to detect asymptomatic cancer amongst those at risk. When tubercle is suspected in the differential diagnosis cytology must not be done because of the risk of infecting laboratory staff. A fine brush can be passed up the urethra or ureter to obtain a smear for cytological study. In patients with stone or recent surgery atypical cells may be found from the deeper layers of the urinary epithelium giving a result which may be misleading. If haematuria is severe the test cannot be done. Previous radiotherapy will also produce abnormal cells in the urine. It is a reliable screening test used in the early detection of cancer amongst heavy smokers, those at risk in industry, and the long term patient follow up of those with analgesic nephropathy as they are reputed to be at risk of ureteric cancer. It is of little value in the detection of renal tumours.

Collection of 24-hour urine specimen

For various metabolic studies a 24 hr collection of urine may be needed for with many body functions there is variation during the day. In some studies the patient may need to be on a diet for several days

before samples are collected. Before starting the collection the patient empties his bladder, the urine is discarded and the time noted; all the urine passed is saved in the container until the same time 24 hours later when the patient voids again, completing the collection. Sometimes a preservative is added to the container by the laboratory staff before it is issued, this must not be thrown away. If the collection is inaccurate the test is useless and will need repeating. For example, if the volume of the collection is under a litre the patient may not have saved all the urine for the test. Written as well as verbal instructions should be given

Table 1.4 Causes of coloured urine

Colour	Cause	Comment
BLACK	Old haemoglobin in acid urine, phenol poisoning, porphyria; brown urine which blackens on standing. Melanin pigment in patients with metastatic malignant melanoma.	Very concentrated blood in the urine looks black, red colour appears on dilution. Porphyria can mimic an acute abdomen, barbiturates can precipitate attacks.
BLUE-GREEN	Methylene blue	In De Witt's pills and proprietary medicines.
GREEN-BLACK	Severe jaundice.	Bile pigments and bilirubin in urine.
BROWN	Myohaemoglobin	Crush injuries and burns. Blackwater fever (Malaria). Renal failure can occur.
ORANGE-RED	Haemoglobin in fresh alkaline urine. Vegetable dyes, eosin in boiled sweets, furadantin, Vit. B. Pyridium.	Beetroot, carrots, some berries. A paediatric puzzle, red urine on Mondays after a weekend of greed.

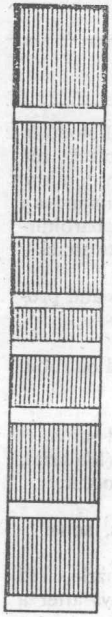
to each patient, if an incomplete collection is obtained the patient may need admission. The unreliability of patients to obey the simplest of instructions is not related to their educational attainments and where the result of the test is of great importance it is often simplest to admit the patient.

Ward urine tests

Every patient admitted to the ward or attending the Out Patient Clinic must have the urine tested. The sample is inspected after collection in a clean glass or plastic vessel and its colour noted (Table 1.4). Its specific gravity and pH are noted and it is chemically tested with reagent

strips (Table 1.5). Usually the first and last voids obtained during the M.S.U. are saved and used for further tests. Normal urine is of a clear amber colour. Haziness of the urine does not prove that infection is present; it is more likely to show the condition of mind of the observer. The only proof of infection is by urine culture.

Table 1.5 Urine analysis using reagent strips

Urine reagent strip test	Substance	Time of reading	Comment
	NITRITE (for Bacteriuria)	30 sec	A negative result does not exclude infection. For best results fresh sample that has been retained in the bladder for more than 4 hours.
	BLOOD	30 sec	Cancer, stone, glomerulo-nephritis hypertension, severe infection. POSITIVE RESULT NEEDS FURTHER INVESTIGATION.
	BILIRUBIN	20 sec	May be positive before jaundice appears; hepatitis, obstructive jaundice.
	KETONES	15 sec	Diabetic coma, starvation, vomiting.
	GLUCOSE	10 sec	Diabetes, pregnancy glycosuria, low renal threshold.
	PROTEIN	At once	Nephritis, hypertension, infections amyloid, cardiac failure. Pre-eclamptic toxaemia.
	pH	At once	Acid = pH 5–6, Alkaline = pH 8. Calcium stones do not form in acid urine; urate and cystine stones do not form in alkaline urine. pH 8 suggests infection with B. protous or Ps. Pyocyaneus. In acute renal failure; pH 5–5·5 = acute tubular necrosis pH 7·5–8 = glomerular disease.

Chemical reagent strips are made by the AMES company

The use of reagent strips for urine examination has replaced messy and time consuming side room tests which involved boiling the urine. Urine tests must be performed on every admission and out patient attendance.

SAVE ALL URINE IN OLIGURIC PATIENTS ADMITTED NO MATTER HOW SMALL THE VOLUME

The blood urea and serum creatinine

These substances are some of the end products of metabolism and are excreted by the kidney and found in high concentration in the urine, in

renal failure their levels in the serum rise. The level of the blood urea is influenced by diet; on a high protein diet it rises, on a low protein diet it will be low. The urea will be raised if it is reabsorbed from the bowel after gastro-intestinal haemorrhage. It will be raised if the patient is dehydrated with diarrhoea or vomiting, in haemoconcentration the haematocrit is also high so the packed cell volume (PCV) will be above 45 per cent. However, in pregnancy there is an increased blood volume diluting the plasma and lowering the normal level of the blood urea. This effect is marked in the third trimester so that levels which may be accepted as normal are in fact abnormally high. In the newborn the kidney is not fully developed in its function and full capacity is only reached at the age of two years. For convenience the results in children are related to surface area so that only one figure need be remembered for all sizes and ages of children. At any age the body will respond to injury and the healing reaction to trauma and surgery will produce a transient rise of the blood urea for a few days, the

Table 1.6 Normal range of serum creatinine, urea and electrolytes

		S.I. units
Normal serum creatinine in adults and infants	= Below 1·3 mgm%	(110 μmol/L)
Blood urea in infants and babies under 2 years	= Below 20 mgm%	(3 mmol/L)
Blood urea in later pregnancy and puerperium	= Below 20 mgm%	(3 mmol/L)
Blood urea in adults on normal diet	= Below 40 mgm%	(7 mmol/L)
Blood urea in adults on high protein diet	= Below 70 mgm%	(12 mmol/L)
Average rise in blood urea as metabolic response to injury or surgery	= 50 mgm%	(8 mmol/L)

In practice any adult with a blood urea above 8 mmol/L needs further investigation.

Electrolytes: Sodium, 134–144 mmol/L; Potassium, 3·4–4·4 mmol/L; Chloride, 94–104 mmol/L; Carbon Dioxide, 20–30 mmol/L.

average range of the metabolic response is 10–60 mg per cent. It has become obvious that the level of the blood urea is influenced by many factors and so is only a rough guide to renal function. (Table 1.6)

The serum creatinine shows little variation with diet, body build or state of hydration. It is an end product of muscle metabolism and the serum levels give an accurate measure of renal function. Creatinine is excreted by the glomeruli by filtration and only when excessive amounts accumulate in the serum is it excreted by the renal tubules. Moreover, most of the glomeruli are functionless before the blood urea rises, while the serum creatinine will rise early in renal disease with the fall in the glomerular filtration rate. The accuracy of the creatinine estimation in the serum can only be made of little value by an improperly performed clearance test where the urine sample is not completely collected over the period of time. For accuracy the average result of three consecutive twenty-four hour clearance tests is used.

The urogram or intravenous pyelogram

This is the basic radiological investigation of the urinary tract. A preliminary film of the abdomen and pelvis is taken to exclude stone and skeletal disorders. A dye (contrast medium) containing iodine is injected intravenously, this is concentrated by the functioning renal tubules and becomes radio-opaque, demonstrating the urine collecting systems, i.e. the pyelogram consists of the renal calcyces, pelvis and ureter filled with the opaque contrast. The quality of the urogram (i.e. renal tissue shadow plus the pyelogram of the pelvi calyceal system) depends upon the dose of iodine given and not upon the volume or concentration of the contrast medium used. The urogram is a crude test of renal function for if the tubules are unable to concentrate the contrast medium there will be no pyelogram or a delayed appearance of dye on the affected side. If there is an obstruction present the medium may collect first in the renal tissue producing a nephrogram effect before it is slowly excreted into the calyces and pelvis. If there is a delay in excretion a film taken several hours later may show the site of obstruction. To show further detail films taken with different depths of the kidney in focus, tomograms, may be taken during the urogram. Films taken of the bladder before and after voiding to reveal abnormalities related to bladder outflow. To get the most information from the urogram and with the least discomfort to the patient the process should be supervized by a radiologist. The author is opposed to access to X-ray Departments by family doctors as unsatisfactory films done with little or no supervision are obtained so that the investigation, being incomplete, has to be repeated after delays in referral, i.e. extra irradiation. In well organized hospitals urograms can be done as emergencies when needed, e.g. high dose IVP.

It is important to note the date of the last menstrual period as any abdominal X-ray should be avoided in the last fortnight of the menstrual cycle and pregnancy. In an emergency it can be done with little risk to the fetus if the number of films is limited. Note should be made of the number of pregnancies and if the woman is using an oral contraceptive, these factors will alter the appearance of the urogram. Most patients are apprehensive about the examination, it is part of the nurse's job to reassure the patient to prevent needless worry. Unfortunately few nurses during their training work in a radiological department. The urogram is a safe but uncomfortable investigation. It takes about an hour, most of the time is spent by the patient lying upon a hard radiological table with firm linen compression band strapped across the abdomen. Immediately after the injection of the contrast medium about half the patients experience a bitter taste or transient nausea. Serious side effects are very rare, the patient is treated with antihistamines and steroids and the urogram must be continued to obtain information. Patients with asthma may get mild bronchospasm.

To obtain good quality films the patient must not have any oral

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