

2.7.1 Introduction

This section details the assessment of pilots, other aircrew members and Air Traffic Controllers (ATC) who suffers or who may suffer from renal disease or from urological disorders.

The aim of the renal assessment within the aeromedical examination is to ensure that applicants do not suffer from renal or urological conditions which place them at an increased risk of incapacitation or which may produce a decrement in physiological or psychological function sufficient to jeopardise the safety of air navigation. In conducting the aeromedical examination, the DAME will recognise that an individual who holds an unrestricted medical certificate must be capable of performing all the activities and of exercising all the privileges that are permitted under the class of licence held. Such activities may include flight (either as a private or professional pilot):

- For prolonged duration, often as part of a shift roster
- In a variety of weather conditions
- Subject to extremes of temperature, humidity, atmospheric pressure, noise, vibration and acceleration
- Reliant on support services (including provision of food and water) of varying quality and reliability
- With little or no medical/health support
- With the potential for an emergency/mass casualty/survival situation to occur with little or no warning, and
- Subject to disrupted sleep and time zone changes.

A number of these stressors may also affect ATCs.

2.7.2 Urinary Standard – CASR Part 67

CASR 67 The urinary standards are found in the following paragraphs of CASR Part 67:

CASR 67.150	For medical standard 1	CASR 67.150(7) Table 67.150 1.19 – 1.22
CASR 67.155	For medical standard 2	CASR 67.155(7) Table 67.155 2.18 – 2.21
CASR 67.160	For medical standard 3	CASR 67.160(7) Table 67.160 3.17 – 3.20

2.7.3 Dipstick Testing

Haematuria

Urinary 'dipstick' testing is required as part of the routine aeromedical examination to screen for the presence of haematuria. Approximately 2-5% of the population have microscopic haematuria, but only about 0.5% who are under age 70 will have a urinary tract cancer as the cause. A positive dipstick test should be repeated, and if negative, managed expectantly. (Most of these applicants will have a minor glomerular lesion.)

Initial aeromedical management of an applicant with a persistently positive dipstick test involves obtaining phase contrast microscopy of a fresh mid-stream urine sample. The sample must be examined within two hours of being passed; thus individuals more than two hours from a suitable pathology service must travel to a location that has that capability. Because of wide variation between laboratories in reporting urine abnormalities, CASA's relevant requirement for a 'normal' assessment in an applicant found to have microscopic haematuria is for three separate urine tests, all of which have less than 20,000 RBC per ml. Phase contrast microscopy of specimens with crenated cells up to 10,000 per ml, indicating a glomerular origin, are considered to be within normal limits. Cells with a 'non-glomerular' appearance are likely to indicate a urothelial problem.

Where there is 'significant haematuria' (more than 20,000 RBC per ml in any test), initial urogenital imaging is to be by Ultrasound or Intravenous Pyelogram (IVP), as some 10% of all stones are radiolucent. The requirement for further investigation should be determined on clinical grounds and on the basis of investigation results.

Proteinuria

Orthostatic proteinuria can be excluded by testing an early morning urine specimen. If an early morning specimen remains positive for protein, then a 24-hour urine protein estimation is required. Normal is <150mg protein/day.

2.7.4 Urinary Calculi

There have been no reported episodes of incapacitation involving CASA certificate holders with a known history of renal calculi. However, there have been several untoward incidents as a result of undiagnosed or unreported stone. The aviation environment may predispose aircrew to stone formation due to the low humidity environment often found in aircraft cockpits, and because of a tendency for some pilots deliberately to under-hydrate to avoid the need to urinate, particularly where there is no toilet on the aircraft.

The presence of any stone or stones in the urinary system is aeromedically significant. (For CASA certification purposes, there is no such entity as an asymptomatic stone). Renal stones as small as 1-2 mm diameter can and do cause significant symptoms. There are no reliable prognostic indicators that can determine if a stone will or will not cause symptoms, and the chance of a stone present for 10 years moving in the subsequent 24 hours is the same as it moving after being present for 10 days. The time a stone has been present is not a reliable indicator of risk.

Single Renal Stone (Passed or Removed)

In applicants who have had a single episode of renal colic, about 50% will have a repeat episode within 5-7 years, and nearly 100% within 12-15 years, unless they modify their behaviour. However, for applicants who have passed all stones or had them removed and who are able to maintain adequate urine flow (>2 litres/day), the risk of stone recurrence is the same as for the general population. Thus CASA will certificate pilots and ATCs who have experienced a single episode of renal stone disease, with successful removal or passage of the stone. In such cases, the only surveillance need be by urine dipstick at routine CASA medical examinations.

Recurrent Renal Stones (Passed or Removed)

Pilots and ATCs who have experienced recurrent episodes of renal stone disease may be recertificated once they are proven to be free of all stones in the kidney or renal tract, have normal renal function and have adopted appropriate risk minimisation behaviour. CASA will require the following annual investigations and reports in these cases:

- Plain abdominal X-ray or ultrasound
- 24-hour urine calcium and urate estimations
- Urological review.

Retained Renal Stones

Where stone material remains in the renal substance or urinary tract, CASA will not permit unrestricted Class 1 or Class 3 certification unless there are clear mitigating factors that preclude renal colic, such as a staghorn calculus, a calculus in a diverticulum, or a stone clearly embedded in the renal substance. (Further stone movement is extremely unlikely in such cases.) Pilots or ATCs with staghorn calculi may be suitable for certification, on a case-by-case basis, until stone removal, provided they are asymptomatic, their renal function is normal, and movement of the calculus is considered unlikely. CASA may entertain unrestricted certification for Class 2 applicants in similar circumstances, on a case-by-case basis, and subject to annual urological review.

Approximately 20% of patients will have residual calculi three months after undergoing Extracorporeal Shockwave Lithotripsy (ESWL). Where there is a small stone or remnant following attempted removal with ESWL, generally accepted management is to leave the stone alone. However, due to the risk of inflight incapacitation with residual stone fragment movement, it may be worthwhile to offer removal of stone remnants via flexible ureteroscopy. There is currently an approximate 50% success with this procedure, but its risks include urine extravasation, which can be extremely painful. Percutaneous nephrolithotomy (PCNL) may be a better option for pilots to ensure a stone free status.

2.7.5 Medullary Sponge Kidney

Persons with medullary sponge kidneys (MSK) tend to be chronic renal stone formers. Therefore, most applicants for pilot or ATC certification who have MSK will not be issued an aviation medical certificate of any kind. However, CASA may certificate pilots or ATCs with this condition, on a case-by-case basis, if they have a history of one episode of renal colic or fewer, and if there are no residual stones demonstrated on investigation. (Beware of the applicant with only a radiological diagnosis of MSK and no history of stones or calcification. Many such persons have only a prominent medullary blush with no adverse implications for aeromedical certification.)

2.7.6 Glomerulonephritis

Thin Membrane Disease

Thin membrane disease (TMB) is due to a type IV collagen genetic defect and occurs predominantly in females. It has no major health implications and is considered benign for the purpose of CASA aeromedical certification. Patients with TMB often have an incidental finding of 80,000-100,000 RBC per ml of urine, but further investigation reveals no other abnormalities. If blood pressure is normal and renal function tests are normal (including 24-hour urinary protein excretion and 24-hour creatinine clearance), CASA will accept a presumptive diagnosis of TMB and will not require further investigation. While biopsy may be offered to confirm the diagnosis of TMB, such an investigation is not required for aeromedical certification.

Where TMB is confirmed by biopsy, there is no requirement for any surveillance. In the case of a presumptive diagnosis, the result of a serum creatinine study is required with every subsequent CASA medical examination.

IgA Nephropathy

This condition was formerly considered to be benign, but it is now clear that it may later lead to renal failure in some persons. Risk of disease progression is greater when it is associated with hypertension, abnormal renal function test results and renal scarring, detected on biopsy. In the absence of such abnormalities, the risk of renal failure in cases of IgA nephropathy is about 1% after 20 years. The condition is of aeromedical concern because of the risk associated with subtle incapacitation due to circulating toxins produced as renal failure progresses. Rapid progression to nephrotic syndrome may also occur. CASA will usually certificate pilots and ATCs who are affected by IgA nephropathy. Required surveillance measures are:

- 24-hour urine protein estimations
- Serum albumin testing
- Renal function testing.

All of these tests are to be done at six-monthly intervals.

2.7.7 Nephrotic Syndrome

Many persons affected by this condition recover spontaneously, while others respond well to treatment with steroids. If immunosuppression is necessary for treatment, pilots and ATCs may not exercise the privileges of their licences until treatment is complete. CASA will consider recertification once the condition has resolved, medication has been ceased and renal function has returned to an acceptable level (defined as protein excretion <3g per day).

2.7.8 Renal Failure

For aeromedical certification purposes, renal failure is defined by biochemical markers of impaired renal function. Physical symptoms of renal failure occur late in this disease and represent manifestations of severe end stage renal failure.

The main marker of renal function is the serum creatinine level. Most persons with chronic renal impairment who have a creatinine level <200 micromol/L suffer no untoward effects. (However, DAMEs should recall that a creatinine level <200 micromol/L may evoke severe symptoms in cases of acute renal impairment). Where an applicant's creatinine level is between 200 and 500 micromol/L, the DAME's clinical acumen will be required to determine fitness for exercise of licence privileges. A creatinine above 500 micromol/L invariably produces untoward health effects, including:

- Slowed mentation
- Poor concentration
- Lethargy
- Gastrointestinal disturbance
- Other electrolyte disturbances
- Rapid deterioration with intercurrent illness.

Aeromedical Disposition

When there are three test results of >500 micromol/L creatinine, the DAME should advise the applicant not to exercise the privileges of his/her licence and inform CASA of the details. Following a single initial test result of >500 micromol/L creatinine, the certificate holder should be advised not to exercise privileges, and a further test arranged for 48 hours later. If the second test confirms the original result, a third test is required 48 hours later again. The DAME should inform CASA Aviation Medicine Section of the results, and CASA will usually suspend the applicant's medical certificate. For reported creatinine levels between 200-500 micromol/L, the DAME will consider the possible effect on safe aviation of symptoms such as those listed above, and either advise the applicant accordingly or discuss the matter with CASA Aviation Medicine Section.

Acute renal impairment is usually associated with a significant insult which itself precludes a medical certificate holder from flying or controlling. Once recovered from the precipitating cause of acute renal failure, CASA will consider recertification on a case-by-case basis.

Renal Dialysis

Persons undergoing renal dialysis usually have significantly high creatinine levels, even soon after completing a dialysis session. Their electrolyte levels may be abnormal because of large fluid shifts that accompany dialysis. Consequently, persons undergoing renal dialysis may remain symptomatic for several hours following dialysis. CASA will not usually certificate pilots or ATCs with chronic renal failure who are undergoing dialysis (of any type). Very well controlled pilots and ATCs may be granted special certification, on a case-by-case basis, permitting exercise of privileges in the period between 12 and 36 hours (only) following a dialysis.

Renal Transplant

Following renal transplantation, most recipients receive immunosuppressants to prevent tissue rejection. They have increased risks of hypertension and of ischaemic heart disease, also of developing carcinoma. Some transplant recipients have minimal complications and normal renal function. CASA will not consider aeromedical certification for pilots or ATCs until 12 months following transplantation. If the applicant is then receiving standard immunosuppressant therapy, has well controlled blood pressure, and renal function is at an acceptable level, CASA, may consider recertification, on a case-by-case basis.

2.7.9 Single Kidney

If an applicant has a single kidney and this condition is developmental, renal function testing should be undertaken. If this is normal, aeromedical certification will be unaffected. If an applicant has a single kidney due to nephrectomy, the cause of the kidney's removal must also be considered. If the underlying cause does not affect certification, then the same considerations of renal function testing and aeromedical disposition apply as for developmental variations.

2.7.10 Urinary Tract Infections

Female

In the young adult female, isolated urinary tract infection (UTI) is common. Investigation rarely reveals a specific cause. A small percentage of women will develop chronic or recurrent UTIs. They require investigation (including IVP) to exclude underlying anatomical causes. Some of them may need antibiotic cover for extended periods and/or post coital antibiotic prophylaxis. Female applicants receiving antibiotic treatment for recurrent UTIs are unlikely to adversely affect the safety of air navigation, and there need be no restrictions on their aeromedical certification.

Male

A UTI in a male usually indicates the presence of an anatomical abnormality in the urinary tract. The diagnostic yield from investigations is about 50%. Adequate investigation must include IVP and cystoscopy. Future aeromedical certification will depend on the findings from investigations.

2.7.11 Prostatitis

Acute bacterial prostatitis should be managed as an acute intercurrent illness (like UTI) and the pilot or ATC returned to duty only when fully recovered. Non-bacterial or chronic prostatitis is considered to be a form of pelvic pain syndrome, often accompanied by significant psychological overlay, analogous to the findings in Irritable Bowel Syndrome. Chronic prostatitis is often distracting and may be difficult to manage. Best pharmacological management is with anti-inflammatory and/or anti-depressant medications. CASA will determine future aeromedical certification of affected applicants on a case-by-case basis. The DAME should closely assess the psychological status of any affected pilot or ATC before making a recommendation concerning aeromedical disposition.

2.7.12 Urinary Outflow Obstruction

Benign prostatic hypertrophy (BPH) is the commonest cause of outflow obstruction in Australian males. Acute urine retention occurs in persons affected by BPH at the rate of 5-8% per annum. There is also a small risk of chronic incapacitation due to reduced renal function.

An acute retention episode may be treated by surgery, or by use of an alpha-blocker medication. Successful surgery will usually result in clearance to return to flying or controlling as soon as the applicant has fully recovered from the effects of the surgery. Note that alpha blockers may reduce G-tolerance—the more specific the drug, the better tolerated. Tamsulosin or alfafusin are highly selective, but are seldom prescribed in Australia as they are not currently listed on the PBS. Prazosin is listed on the PBS, but is less selective than other available agents and has more side effects. Prazosin use is not compatible with agricultural or aerobatic flying, and medical certification for pilot applicants using it will contain appropriate restrictions.

2.7.13 Testicular Cancers

Also see [Section 2.14, Malignancy](#).

Teratoma

The progress or recurrence of teratomas may be determined by use of an appropriate marker. Chemotherapy is the usual treatment and there is >90% cure rate. When the applicant has a stage A tumour and markers are normal, early return to duty may be possible. For stage B tumours, where adequate treatment requires 3-4 cycles of chemotherapy, return to duty will be delayed until at least three months after completion of chemotherapy. All such cases should be referred to CASA Aviation Medicine Section for determination of aeromedical disposition.

Seminoma

Seminomas are very sensitive to radiation, and a very low radiation dose may be curative. As there is no reliable marker available at present, surveillance can be difficult. Once treatment is complete, early return to duty may be possible. All such cases should be referred to CASA Aviation Medicine Section for determination of aeromedical disposition.

2.7.14 Prostatic Carcinoma

Prostate Specific Antigen (PSA) is a very reliable marker for progress of established prostatic cancer. However, it is unreliable as a screening test and there is still no normal range defined for it. Risk of prostate cancer against PSA may be graphed, and most laboratories recommend further investigation when a PSA is >4, but positive predictive value is poor at this level. Once PSA reaches 12, the PPV is close to 1.

In established disease, the PSA is a proxy measure of prostate bulk and of cell turnover. PSA levels >50 are associated with a significant risk of pathological fractures, cerebral and other metastases. However, applicants with prostate cancer and a PSA of <30 have a positive bone scan in <1% of cases. An applicant with PSA of <20 will have cancer mass of only a few grams, while a PSA <12 is not associated with significant risk of metastases.

Aeromedical Certification

Post-radical prostatectomy, if the operation has been successful, PSA should fall to undetectable level. If the level remains undetectable at three years post surgery, there is <5% chance of recurrence of disease. In such circumstances, applicants can be considered cured after four years. Radiotherapy now produces similar outcomes and if PSA remains at nadir levels for 3-4 years following radiotherapy, a similar assessment may be made. Usually, certification for all classes of medical certificate may be possible 3-4 months post surgery or after completion of radiotherapy. CASA will require annual follow up urological reports and PSA estimations. However, if the PSA remains undetectable five years after surgery, no further reports will be required.

Pilots and ATCs with advanced prostatic cancer and PSA >30 must also undergo bone scan as part of their required investigations. CASA will usually only contemplate certification for this group on the basis of 'as-or-with co-pilot' or 'as-or-with second controller only'.

Treatment with anti-androgen therapy produces significant side effects in about 10-20% of cases, particularly lethargy. LHRH agonists may rarely cause a chronic confusional state. Prior to return to duties, an applicant receiving anti-androgen therapy will require an operational check. (Also see [Section 2.13, Medication – Drugs and Flying / Controlling.](#))

2.7.15 Renal Cell Carcinoma

Cerebral spread from a renal cell carcinoma is highly likely. Previously, this cancer has usually been detected late, and affected persons have had poor survival rates. However, recently these tumours have often been detected incidentally by ultrasound. 80% of these tumours are now <5cm in diameter when found, and five-year survival in those affected persons is >90% following treatment. Even for larger tumours (<10cm), five-year survival is >70% following treatment.

Aeromedical certification

As the outcome of renal cancer is unpredictable, and as cerebral metastases are common, CASA will determine aeromedical disposition of pilots and ATCs with this condition on a case-by-case basis. If granted, initial certification is likely to be 'as-or-with co-pilot' or 'as-or-with second controller only'. Certification will not be granted until at least six months following completion of treatment. Unrestricted class 1 certification will not be considered until at least three years post treatment. Class 2 applicants will be considered for unrestricted certification after two years, and Class 3 applicants after one year. CASA requires follow up investigations as follows:

- Six-monthly CT scans for Class 1 applicants
- Annual CT scans for class 2 and 3 applicants.

In all cases, additional investigations must include Full Blood Examination (to exclude polycythaemia), Liver Function Tests, and Urea and Electrolyte estimations.

After 10 years without recurrence of tumour following treatment, an applicant may be deemed 'cured'. Thereafter, no additional surveillance measures will be required.

2.7.16 Polycystic Kidneys

Polycystic kidneys (PCK) may be associated with several complications that could adversely affect the safety of air navigation. These include acute pyelonephritis, haemorrhage into cysts, renal stones, berry aneurysms and cardiac valvular disease. However, most persons with polycystic kidneys do not experience these complications. The commonest side effect of the condition is hypertension, usually readily controlled by medication. Due to the statistical association of polycystic kidneys with berry aneurysm, all applicants with known PCK must provide the result of a recent Magnetic Resonance Angiogram (performed within 12 months). If this is normal, CASA will usually approve medical certification. However, the test must be repeated and results provided to CASA at intervals of five years while medical certification is maintained. If the DAME detects any cardiac murmur when examining an applicant with PCK, CASA requires an echocardiogram and report for initial certification. This is also the case when any new murmur is noted.

2.7.17 Amyloid

This is a systemic disease with possible renal, neuropathic and cardiological manifestations. On diagnosis of the condition, inform CASA Aviation Medicine Section and advise the applicant not to exercise the privileges of his/her licence until investigations have been completed and results assessed as satisfactory by CASA. Following appropriate investigations, CASA will determine aeromedical disposition on a case-by-case basis.