Guidelines for renal Surveillance in asymptomatic Spinal Cord Injured Patients

1.0 Background

Complications arising from the renal tract are no longer a major cause of mortality to spinal cord injured patients but do contribute significantly to patient morbidity through infection, renal calculus formation, hydronephrosis, ureteric reflux and renal scarring.

There is no worldwide consensus on method or interval for renal tract surveillance in spinal cord injury (SCI) (1,2,12), though most are in agreement that it is warranted. The most common modalities used include ultrasound (with or without plain radiograph), isotope renography (with or without effective renal plasma flow estimation), intravenous urogram and videourodynamics (1,3,4,5,6,7,8,9,10). CT, MRI and DMSA scintigraphy and cystography tend to be reserved for evaluation of complications related to the renal tract.

The approach to imaging will depend on several factors including the method of bladder emptying used by the patient, time since SCI and locally available imaging resources. The approach will also be directed depending on the approach of physician or institution. An aggressive approach to lowering bladder leak point pressure to less than 40cm H_2O will result in a significant increment in urological imaging. It is established, however, that a combination of increased use of SIC (11), decreased dependence on indwelling urethral catheter and lower bladder leak point pressure (LPP) will result in a decreased incidence of calculi, ureteric reflux, scarring and episodes of UTI .

An important consideration in SCI patients is radiation dose as the median patient's age at onset of spinal cord injury is low and any imaging algorithm which advocates regular radiation exposure requires good justification.

Reflex voiding is regarded as a relatively high risk method of voiding as patients may develop silent high filling and voiding pressures leading to increased incidence of reflux and upper tract dilation. It is recognised however that in some patients it may be a highly convenient method of bladder emptying and many patients suffer no adverse effects as long as patients are carefully monitored.

2.0 Modalities

2.1 Ultrasound

Ultrasound is effective at detecting hydronephrosis, some renal calculi, renal scarring and bladder calculi. It is less effective than IVU or isotope renography at detecting early upper tract dilatation which might signify raised intravesical pressure or ureteric reflux. It is the most common method used for renal tract surveillance.

2.2 AXR

AXR is sensitive for detecting calculi, usually in combination with ultrasound. It does not detect all renal tract calculi, however. If there is equivocation following AXR then CTU is indicated.

2.3 Isotope renography

Comparative studies indicate renography is a very sensitive but not specific method of examining the renal tract. It has the advantage of a low radiation dose compared with IVU, no contrast reactions and no bowel preparation required. Its principal use is in detecting early outflow obstruction or calculi, particularly when other studies such as ultrasound are normal. ERPF estimates are not accurate in compromised renal function. Other important considerations are significant intra-patient variability in renal clearance results and the fact that tetraplegic patients have increased renal clearance in the first two years following injury. These factors need to be taken into account when interpreting renograms.

2.4 Intravenous urography

This remains an excellent test for detection of early upper tract dilatation, renal scarring and calculi but it carries a significant risk of contrast reaction and is time consuming. Its use has declined as a surveillance tool. It is less sensitive but more specific than isotope renography.

2.5 Videourodynamics

This is the only method of evaluating rising intravesical pressure and has the advantage of also assessing the presence of ureteric reflux. Though some centres advocate regular routine VUD, capacity is frequently an issue so that it is more often used as a second line investigation when urography/US/ IVU identified potential outflow obstruction.

3.0 **Proposal for imaging:**

The following algorithm is based on an approach aimed at early detection of raised leak point pressures and renal calculi. It is also based on the fact that the incidence of complications including urinary tract infection is at its highest in the early years following cord injury.

This approach will have a major impact on videourodynamics as a result of abnormal renograms detecting early outflow obstruction.

This proposal does not seek to include cystoscopy, or biochemistry monitoring.

Table 1

	Reflexic bladder			**Areflexic bladder**	
	SPC/IDU	**SIC**	**Reflex or strain voider**	**SPC/IDU**	**SIC**
First admission	**Renal tract U/S/ AXR + Videourodynamics**				
Year 1	**Renogram + AXR**				
Year 2 - 4	Renal Tract US + AXR	Renogram + AXR + urodynamics	Renogram + AXR + urodynamics	Renal Tract US + AXR	Renal Tract US + AXR
Year 5	Renal Tract US + AXR + urodynamics				
Year 6	Renogram + AXR	Renogram	Renogram + urodynamics	Renogram + AXR	Renogram
Year 7	Renal Tract US + AXR	Renogram + AXR	Renogram + AXR	Renal Tract US + AXR	Renal Tract US + AXR
Year 8 & 9	Renal tract US + AXR				
Year 10	Renal Tract US + AXR + urodynamics				

The cycle is continued as from year 6 – 10 for life.

AXR – abdominal radiograph to include kidneys and bladder.

Note: Ileal conduit / SARS not included

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Appendix 1

The NSIC senior medical staff believe that Table 1 is the optimum renal surveillance methods based on current published literature. The centre has not yet the capacity to institute this and Table 2 outlines the interim surveillance schedule.

Interim renal surveillance

Table 2

	Reflexic bladder			***Areflexic bladder***	
	SPC/IDU	**SIC**	**Reflex / strain voider**	**SPC/IDU**	**SIC**
First admission	**Renal tract U/S / AXR + Videourodynamics**				
Year 1	Renal Tract US + AXR	Renogram + AXR + urodynamics	Renogram + AXR + urodynamics	Renal Tract US + AXR	Renal Tract US + AXR
Annual	Renal Tract US + AXR				
Every 5 years	(Renogram) + AXR	Renogram + AXR	Renogram + urodynamics	(Renogram) + AXR	Renogram + AXR